SKILLS FOR GREEN JOBS STUDY - BARBADOS
SKILLS FOR GREEN JOBS STUDY - BARBADOS
Small island developing states (SIDS) are being significantly impacted by climate change. These effects will challenge the sustainability of households, firms, governments and the overall economy. One approach to adapting to climate change is through greening the economy. Such an approach would enhance the efficiency of resource use, increase competitiveness and stimulate investment in existing and new industries. Creating a supportive environment has the potential to lead to the emergence of so-called green jobs. These green jobs are likely to provide decent work opportunities and help to alleviate one of the key challenges that most small states face: unemployment.

This report provides an initial assessment of the status of green jobs in the small island developing state of Barbados. The country is an ideal place to examine this issue, as policymakers have set the island the ambitious target of being the greenest economy in Latin America and the Caribbean. Using secondary data sources, stakeholder interviews, as well as desk research the study provides the first comprehensive attempt to map the status of green jobs in the island. Stakeholders identified individuals who are able to do solar PV design and installation, energy auditors, among others as being in demand at present while the knowledge of energy storage systems and smart grid modelling were highlighted as important skills for the future.

It appears as if green jobs will likely expand in the future on the island: to boost this growth, policymakers will need to continue the support to educational institutions, helping them to stay current and in touch with the demands of industry.
The ILO awarded the bid for consultancy to undertake the Skills for Green Jobs study in Barbados to the Centre for Resource Management and Environmental Studies and the Department of Economics, of the University of the West Indies, Cave Hill Campus, Barbados. Professor Winston Moore, Ms Crystal Drakes and Dr Adrian Cashman undertook the research and authored the present report. We feel that it has resulted in a solid body of insights, analysis and recommendations, allowing for informed discussions with constituents and partners to take the subject forward in Barbados.

We are indebted to everyone interviewed: those who eagerly participated in group discussions and focus groups; collaborators who shared literature, data and recommended additional sources of information. We also acknowledge the value of global research and literature based on case studies, applied research and policy.

We express our heartfelt gratitude to the team at the Barbados Ministry of Labour, Ministry of Environment, Barbados Renewable Energy Association (BREA), Samuel Jackman Prescod Polytechnic, Barbados Vocational Training Board, Caribbean LED Lighting, Williams Solar, Innogen Inc., Barbados TVET Council, as well as research colleagues.

ILO members of staff contributed in various ways to this report. Ms. Dagmar Walter, Deputy Director, Decent Work Team and Office for the Caribbean (DWT/O/POS), initiated and managed the initiative from start to finish. Ms. Catherine Saget, Sr Specialist, Research Department, provided extensive comments. Mr Hassan Ndahi and Mr Kelvin Sergeant, Sr Specialists DWT/O/POS provided technical inputs and Ms Gennike Mayers undertook the editorial review.
# Table of contents

Foreword i  
Acknowledgements ii  
Table of contents iii  
Tables iv  
Acronyms and abbreviations v  

1 Introduction 1  
1.1 Background 1  
1.2 Methodology 3  

2 Major changes in the economy and employment 4  

3 Key policies and regulations 11  

4 Skills development measures for the green economy 16  
4.1 Skills needs identification / anticipation 16  
4.2 Education and training 17  
4.3 Active Labour Market Policies (ALMPs) and retraining measures 19  
4.4 The role of the private sector in skills training 19  
4.5 The role of institutional set-up 20  

5 Analysis of case studies 22  
- Case Study 1 - Barbados community college 22  
- Case Study 2 - Samuel Jackman Prescod Polytechnic (SJPP) 22  
- Case Study 3 - University of the West Indies, Cave Hill Campus 23  
- Case Study 4 - Innogen 24  
- Case Study 5 - Electric vehicles: MegaPower 24  
- Case Study 6 - Williams Solar 25  

6 Conclusions and recommendations 26  
- Recommendations 27  
- Next Step 28  

References 29  
Appendix 36
Figures

Figure 1: Unemployment Statistics 1999 – 2017 4
Figure 2: Proportion Persons Working in Green Industries (2004 – 2014) 7
Figure 3: Proportion Employed Individuals working in Green Industries (2004 – 2014) 7
Figure 4: Proportion of Females Working in Green Industries (2004 – 2014) 8
Figure 5: Highest Educational Attainment of Individuals in Green Industries (2004 – 2014) 8
Figure 6: Proportion Head of Households in Green Industries (2004 – 2014) 9
Figure 7: Fuel imports (% of merchandise imports) 9
Figure 8: Schematic Diagramme of Stakeholders and their relationships for Green Job Training in Barbados 20

Tables

Table 1: GDP and Employment Share by Industry 5
Table 2: List of Green Jobs and SITC Codes 6
Table 3: Renewable Energy Transition Targets 10
Table 4: Occupations and skill sets in demand (existing and future) 16
Acronyms and abbreviations

ALMP    Active Labour Market Policies
BCCI    Barbados Chamber of Commerce and Industry
BHSD    Barbados Human Resource Development Strategy
BREA    Barbados Renewable Energy Association
BVTB    Barbados Vocational Training Board
CARICOM Caribbean Community
CC      Climate Change
CVQ     Caribbean Vocational Qualification
CDB     Caribbean Development Bank
ECLAC   Economic Commission for Latin America and the Caribbean
GHG     Green House Gas
GOB     Government of Barbados
ILO     International Labour Organization
METI    Ministry of Education, Science, Technology and Innovation
MLSD    Ministry of Labour, Social Security and Human Resource Development
NVQ     National Vocational Qualification
PAGE    Partnership for Action on Green Economy
PV      Photovoltaic
RE      Renewable Energy
SIDS    Small Island Developing States
SJPP    Samuel Jackman Prescod Polytechnic
SWHT    Solar Water Heater Technician
TVET    Technical Vocational and Educational Training
UNEP    United Nations Environment Programme
NIS     National Insurance Scheme
NEB     National Employment Bureau
(Top) Students undergoing solar photovoltaic training at Samuel Jackman Prescod Institute of Technology, Barbados.
(Centre) Fishermen (pexels.com)
(Bottom) Electric vehicle courtesy Megapower365, Barbados.
Introduction

1.1 Background

Climate change (CC) projections of increased global temperatures due to global Green House Gas (GHG) emissions are expected to result in warmer and expanding ocean waters, melting glaciers and ice sheets and sea level rise. Small island developing states (SIDS) such as those in the Caribbean, due to CC, will experience negative impacts such as: salt water intrusions into freshwater aquifers, coastal erosion, and stronger more frequent hurricanes which is already a major challenge to infrastructural development and environmental preservation and more notably, event associated deaths (Bueno, Herzfeld, Stanton, & Ackerman, 2008). In addition to these climatic and environmental threats, inherent vulnerabilities, such as small size, limited capacity (resources and human), and high national debts constrain Caribbean SIDS ability to adapt to global climate changes (ECLAC, 2011; Briguglio, 1995). Despite the negative impacts associated with CC, changing climate presents an opportunity for all countries to work towards greening their economies in order to curb the amount of GHG emitted into the atmosphere while also building more sustainable societies.

Internationally and regionally there are various definitions for the terms “green economy” and “green job”. UNEP (2001) defines a green economy as “one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities”. In doing so, new areas such as renewable energy, green technology and products provide the basis for meeting economic and social needs while curbing and/or eliminating the use of fossil fuels. Moreover, a sustainable perspective of a green economy is proposed to be an economy that does not generate pollution or waste and is hyper efficient in its use of water, energy, materials and resources (UNEP, 2008). In the Caribbean a green economy is understood to be many things. It would be in vain to try to capture the vast range of green economy concepts into a single definition of Caribbean green economy, as they all consist of coherent, mutually reinforcing concepts that focus on the building of a more resilient, productive and environmentally sustainable future (CDB, 2014). To understand the complexities associated with the economic shift and structural transformation associated with green economies a major component must be highlighted: green jobs. One definition for green jobs is any occupation in agriculture, manufacturing, construction, installation and maintenance, as well as scientific and technical, administrative and service-related activities that contribute substantially to preserving or restoring environmental quality (UNEP, 2008). An updated description of green jobs is given by the International Labour Organization (ILO) where green jobs are those that reduce the environmental impact of enterprises and economic sectors to levels that are considered sustainable. Green jobs must satisfy the criteria of preserving and/or restoring the quality of the environment while meeting the requirements of decent work (adequate wages, safe conditions, workers’ rights and social dialogue and protection). Green jobs also include work associated with mitigation and adaptation to climate change.

Across the Caribbean region efforts have been made to initiate and enhance the transition towards green economies. In Jamaica the concept of green economy and green jobs is summed up into a central strategy:

*“By basing new jobs and industries on sustainable use of natural resources and unique environmental assets (renewable energy sources, promoting organic agriculture, genetic potential of local endemic species) will help build a green economy” (UNEP, 2016).*
Saint Lucia, in framing their transition to a green economy adopted the Caribbean Natural Resources Institute definition:

“A green economy in the Caribbean context aims for long term prosperity through equitable distribution of economic benefits and effective management of ecological resources; it is economically viable and resilient, self-directed, self-reliant, and pro poor” (UNEP, 2016).

Barbados has committed to a national vision of becoming “the most environmentally advanced green country in Latin America and the Caribbean.” The Government of Barbados (GOB) has described the concept of a green economy as “an integrated production, distribution, consumption and waste assimilation system that at its core reflects the fragility of our small island ecosystems” (UNEP, 2017). To this end, the country has drafted policies that assist in the effort of transforming its main areas’ economic activity into a full-fledged green economy. Barbados counts some longstanding green economy industries like the production of solar panel water heaters. Also, research aimed at identifying the export opportunities of Barbados’ green goods and services by Moore (2013) contributes to mapping how the country achieves its Green Economy agenda. In 2012, a Green Economy Scoping Study (Moore W., et al., 2014) was undertaken, which has since been discussed and adopted by Parliament as a national reference document, confirming broad-based support. Moreover, the best practice framework of social dialogue, the Barbados Social Partnership, also has ‘greening’ as part of its Agenda. Through a coordinated effort from Ministers the country joined the Partnership for Action on Green Economy (PAGE) in 2016.

In the literature, there are two main definitions guiding the discussion on green jobs. The first type of definition is static in nature associated with clearly identifiable jobs such as solar panel installers and recyclers where the second is a more dynamic definition where it is argued once there is a push to green an economy, this will impose green skills requirements on most jobs that weren’t required prior to greening. The second definition therefore allows for a job to be partially a green job (Georgetown University, 2015) or the transition of an existing job to a green job. Taking these definitions into consideration it is important to understand and find clarity on what a green economy means for an island such as Barbados. In doing so, one of the indicators of a green economy would be the number of existing and emerging green jobs. The ability therefore to define and measure green jobs contributes towards the country’s vision of being the lead green economy in Latin America and the Caribbean.

This study aims to create a baseline to support further policy dialogue with stakeholders on the green economy, and more specifically, green jobs and their related skills in relation to education and labour market adaptation, and concrete action to facilitate the economic and social transition for sustainability. The main objectives of the study are to:

- Identify the priorities and challenges of CC, and the sectors with greening potential;
- Assess and analyse the current skills needs (gap) for green jobs and the incorporation of such skills into policies, programmes and institutional framework at the regional, national, sectoral and enterprise level;
- Analyse the coordination of initial and continuing training programmes with respect to systemic provisions, delivery channels, ad hoc versus anticipated skills responses, and skills response by different actors and providers; and
- Conclude and propose policy actions and recommendations on skills policies and strategies, skills at all levels and further research needs to meet the demand of greening the economy in Barbados.
Since the terms “green economy” and “green jobs” are relatively new despite their popularity, there is still some ambiguity in their meaning. In order to meet the aforementioned objectives, qualitative research was undertaken. At the core of the study is, understanding what is the meaning of green jobs and its associated skills and competencies and how various identified stakeholders view the concept of a green job. To do this, it is necessary to engage in methods that seek to uncover trends, thoughts, and opinions within a culture-specific context (Mack, Woodsong, MacQueen, Guest, & Namey, 2005). Therefore the following methods were undertaken:

1) Literature Review
2) Semi-structured Interviews
3) Case Studies

### Literature Review
To establish preliminary framework of the green economy and skills for green jobs in Barbados a literature review was conducted. Data and information was collected and analyzed regarding greening policies and strategies at the international and regional scale. In addition, reports and other documentation related to current and potential greening sectors, labour programmes, institutional capacity at the national, sectoral, local and or enterprise level in Barbados were analyzed. This background information formed the basis for the questions developed for the semi-structured interviews and in some instances, validated primary information.

### Semi-Structured Interviews
To ascertain primary data, particularly the trends, views, facts and description of processes of skills for green jobs within the Barbadian context, key stakeholders in the public and private sector as well as civil society were identified and semi-structured interviews were conducted. Semi-structured interviews were chosen as it was acknowledged there may be key information unknown to the research team that may need further investigation once the information was disclosed (RAND Corporation, 2009). Questionnaires were tailored for each stakeholder to enhance the quality and relevance of the information gathered to meet the objectives of the study. The initial list of stakeholders was expanded via snowball sampling to determine the key players in the network of providing training for green skills and competencies. Each interview was on average an hour in length and while discussions were allowed to flow freely the questionnaire was the key instrument guiding the dialogue (see Appendix).

### Case Studies
To buttress the information collected from the semi-structured interviews, in-depth case studies were compiled to identify (i) (re)training needs deriving from structural changes in the labour market and major employment shifts within and across sectors due to climate change and demands for greening the economy; (ii) new green occupations which emerge in the context of adaptation to climate change and mitigation of negative impacts in Barbados and (iii) new types of skills, competences and skill gaps which need to be incorporated into existing occupational profiles (greening existing occupations). Case studies were identified based on the stakeholder groupings; private sector companies, public sector programmes and educational/training institutions.

---

2 Identity Factors refer to attributes of an individual or community such as one’s sex, age, socio-economic status, education, literacy, ethnicity, disability, religion and so forth. Some of these identity factors can be the reason for a person and/or community being in a position of vulnerability and marginalization. It is critical to note that none of these identity factors are in a silo. There is intersectionality among all of them and not one identity factor fully represents an individual and/or community.
Barbados has a relatively high level of economic development. In 2016, the total nominal value of goods and services produced was US$4.8 billion (current international $), while GDP per capita (on a purchasing power parity basis, PPP) was US$16,096. Indeed, GDP per capita in Barbados was almost 46 per cent higher than the average for a group of comparator countries.\(^1\) Within the Caribbean, only the Bahamas (US$23,124) as well as St. Kitts and Nevis (US$16,725) had a higher level of GDP per capita.

After seven consecutive years of positive growth, economic activity declined by 4 per cent in 2009 as a result of the global financial crisis. Economic activity has been modest only, with growth in most years being less than one per cent or virtually zero. In fact, real GDP growth between 2010 and 2015 was just 0.4 per cent per annum, significantly lower than the average rate of growth (2.3 per cent) experienced between 2002 and 2008. The anemic rate of GDP growth between 2010 and 2015 can be attributed to an average 6.6 per cent annual decline in construction over the period, as well as declines in hotels and restaurants, transport, storage and communications, finance and business services and manufacturing which more than offset a pickup in personal and other services as well as public administration of government services.

Like most small open economies, Barbados is characterized by a narrow domestic production base, i.e. production is concentrated on a few goods and/or services. Since the 1950s, Barbados has largely been a service-driven economy. Within the last 25 years this dependence has deepened even further. The services industry is largely driven by tourism, finance and business and government services.

\(^1\) Comparator countries include – Antigua and Barbuda, The Bahamas, Barbados, Belize, Dominican Republic, Dominica, Grenada, Guyana, Haiti, Jamaica, St Lucia, St Kitts and Nevis, St Vincent and the Grenadines, Suriname and Trinidad and Tobago – and from the Pacific Islands Palau, Mauritius, Seychelles and Malta. The latter four countries from outside of the Caribbean region were chosen because their GDP per capita (current PPP US$) and population size are relatively similar to Barbados.
The single largest industry is Finance and Business Services, which accounts for almost one third of total value added (Table 1) or US$1.3 billion. In addition to finance, hotels and restaurants accounts for 13 per cent of GDP or US$518 billion and an indirect contribution of 40 per cent to the overall economy. Such a large indirect contribution obviously means that the industry has significant spillover effects on virtually all the major industries in the economy. In addition, any threat to the tourism industry has the potential to impact on the entire economy. Cashman, Cumberbatch and Moore (2012) report that as tourists become more cautious of their carbon footprint, the demand for travel from major metropoles in the west could decline, while on the supply-side, the damage caused by sea level rise to the hotel infrastructure could increase operating costs.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>62.8</td>
<td>1.6</td>
<td>3.7</td>
<td>2.9</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>158.75</td>
<td>3.9</td>
<td>9.8</td>
<td>7.6</td>
</tr>
<tr>
<td>Electricity, Gas &amp; Water</td>
<td>105.8</td>
<td>2.7</td>
<td>2.9</td>
<td>2.3</td>
</tr>
<tr>
<td>Construction, Mining and Quarrying</td>
<td>137.2</td>
<td>3.5</td>
<td>12.1</td>
<td>9.4</td>
</tr>
<tr>
<td>Wholesale &amp; Retail Trade</td>
<td>388.85</td>
<td>9.8</td>
<td>20.2</td>
<td>15.8</td>
</tr>
<tr>
<td>Hotels &amp; Restaurants</td>
<td>518.5</td>
<td>13.0</td>
<td>15.8</td>
<td>12.3</td>
</tr>
<tr>
<td>Transport, Storage &amp; Communications</td>
<td>460.4</td>
<td>11.6</td>
<td>6.3</td>
<td>4.9</td>
</tr>
<tr>
<td>Finance &amp; Business Services</td>
<td>1260.35</td>
<td>31.7</td>
<td>5.5</td>
<td>4.3</td>
</tr>
<tr>
<td>Personal &amp; Other Services (Incl. Private Education &amp; Health)</td>
<td>347.15</td>
<td>8.7</td>
<td>42.3</td>
<td>32.9</td>
</tr>
<tr>
<td>Government Services</td>
<td>432.35</td>
<td>10.9</td>
<td>9.6</td>
<td>7.5</td>
</tr>
<tr>
<td>Gross Domestic Product at Factor Cost</td>
<td>3971.1</td>
<td>100.000</td>
<td>128.2</td>
<td>100.000</td>
</tr>
</tbody>
</table>

The share of employment for the various industries largely matches those reported for GDP. Hotels and Restaurants again emerges as one of the single largest industries in terms of employment generation. In addition to this category, wholesale and retail, as well as personal and other services also emerge as major areas of employment.

These major service industries have significant potential for greening and supporting greening activities in other industries. Moore et al. (2012) noted that there exists tremendous potential for greening the tourism industry. Efforts at greening could reduce the industry’s dependence on imported inputs, fossil fuels, and the external environment. Addressing these issues could help the industry adapt to the likely effects of climate change and can be supported through such tools as certification schemes, triple bottom line reporting, indicators of sustainable tourism and the utilization of environmental codes of conduct.

While not as large as tourism in terms of their contribution to GDP, there also exist other potential opportunities for greening including transport, construction as well as agriculture (Moore et al., 2012). Options for greening transport included the greater utilization of public transport systems, standards for fuel mixes as well as more fuel-efficient vehicles. It is therefore likely that green jobs could emerge around the maintenance of fuel-efficient vehicles, as well as the management of an integrated public transportation system. Construction, a major source of employment also has opportunities...

---

for transforming existing jobs, and in some instances the creation of new jobs in relation to the construction of green buildings and the retrofitting of existing buildings. In relation to agriculture, the revitalization of the sugarcane industry by pairing it with energy generation and the greater production of local fertilizers, soil conditions and animals all seem to have significant potential.

In addition to greening particular industries, the finance industry, one of the largest industries on the island has the potential to play a supporting role in relation to hastening the transition to a green economy. This can take the form of providing green finance for fuel efficient or electric vehicles, loans for alternative energy projects, eco-savings deposits and other initiatives. These new financial products can not only generate jobs within the finance company offering these new loan products, but also as a result of the new or existing companies that could experience expanded and additional business emerging from the new initiatives.

Using data from the quarterly labour force survey, this section of the study attempts to identify key trends in green jobs in recent years. Following Stoevska and Hunter (2012) green jobs were defined as jobs in environmental areas that result in the output of environmental goods and services or activities that help establishments to reduce or eliminate their impact on the environment. Using this definition, the authors identified persons working in the following areas as green jobs (Table 2).

<table>
<thead>
<tr>
<th>SITC Codes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Crop and animal production, hunting and related service</td>
</tr>
<tr>
<td>2</td>
<td>Forestry and logging</td>
</tr>
<tr>
<td>3</td>
<td>Fishing and aquaculture</td>
</tr>
<tr>
<td>36</td>
<td>Water collection, treatment and supply</td>
</tr>
<tr>
<td>37</td>
<td>Sewage</td>
</tr>
<tr>
<td>38</td>
<td>Waste collection, treatment and disposal activities</td>
</tr>
<tr>
<td>39</td>
<td>Remediation activities and other waste management services</td>
</tr>
<tr>
<td>42</td>
<td>Civil engineering</td>
</tr>
<tr>
<td>50</td>
<td>Water transport</td>
</tr>
<tr>
<td>52</td>
<td>Warehousing and support activities for transport</td>
</tr>
<tr>
<td>53</td>
<td>Postal and courier activities</td>
</tr>
<tr>
<td>70</td>
<td>Activities of head offices; management consultancy activity</td>
</tr>
<tr>
<td>71</td>
<td>Architectural and engineering activities</td>
</tr>
<tr>
<td>72</td>
<td>Scientific research and development</td>
</tr>
<tr>
<td>74</td>
<td>Other professional, scientific and technical activities</td>
</tr>
<tr>
<td>75</td>
<td>Veterinary activities</td>
</tr>
<tr>
<td>81</td>
<td>Services to buildings and landscape activities</td>
</tr>
<tr>
<td>82</td>
<td>Office administrative, office support and business support</td>
</tr>
<tr>
<td>86</td>
<td>Human health activities</td>
</tr>
<tr>
<td>90</td>
<td>Creative, arts and entertainment activities</td>
</tr>
<tr>
<td>91</td>
<td>Libraries, archives, museums and other cultural activities</td>
</tr>
<tr>
<td>93</td>
<td>Sports activities and amusement and recreation activities</td>
</tr>
<tr>
<td>95</td>
<td>Repair of computers and personal and other household goods</td>
</tr>
</tbody>
</table>
The data used in this study are the quarterly labour force surveys conducted by the Barbados Statistical Service between 2004 and 2014 to estimate various labour market indicators such as unemployment, employment in various industries, and the average hours worked in various industries. The data is then annualized for each survey year and merged in STATA using the “append” command creating a database of 161,152 observations.

Using the definitions of green industries and those that are potentially green highlighted earlier, it is estimated that on average between 2004 and 2015, 15 per cent of the employed labour force can be classified as holding some type of job working in one of the areas identified in the previous paragraph (Figure 2). These jobs can vary from the skilled to the unskilled and from the production line to the back-office. Prior to the downturn in economic activity, the proportion of jobs attributed to the green industries highlighted was even larger in 2005, an estimated 21 per cent of the employed labour force held a job in a green industry. By 2010, this ratio had shrunk to just 9.7 per cent and remained around this level for the remainder of the period under consideration.

Of those employed individuals working in green industries, the top seven green areas were libraries and cultural activities (6.5 per cent), services to buildings and landscape activities (1.9 per cent), human health services (0.8 per cent), scientific research and development (0.8 per cent), forestry and logging (0.8 per cent), business support activities (0.7 per cent), as well as crop and animal production (0.6 per cent).
Prior to the beginning of the 2008 economic recession, there was a roughly 50-50 split in relation to gender and employment in green industries in Barbados. In 2008, almost 56 per cent of green jobs on the island were held by females. By 2011 this ratio had fallen to 42 per cent, but had recovered somewhat to 44 per cent by 2014 (Figure 4). Most of the job losses that occurred in the post 2008 period were in relation to back office operations as well as health services.

One of the reasons for the declining employment in green industries during the recession is, many of the employees and business owners only have primary or secondary education (Figure 5) making it difficult to transition from one form of employment to another. During the period under review, more than half (57 per cent) of employees and self-employed in green industries indicated that their highest level of education was either at the primary or secondary level. This finding was confirmed during the stakeholder interviews conducted. The manager of one manufacturing firm of green products indicated that most of the workers on the production line were normally educated up to the secondary school level. Any other training required was provided by the company. These production line workers also constituted the bulk of employees in the company.
In addition to the educational characteristics of individuals, two interviewees also noted that most of the workers in the plant were female and the head of the household. This is an observation that is also supported by the national statistics for the island. Based on data from the national labour force survey, approximately 48 percent of individuals in green industries were classified as the head of their household (Figure 6). Given the ambitions of the island to enhance its green credentials, this could provide a degree of household income stability, as new jobs would be emerging in the economy and providing income-earning opportunities for these individuals. However, this also suggests that a downturn in domestic green industries, could have a significant and negative impact on households and household poverty on the island.

The Barbados Energy sector is also a vital factor in greening the economy. In 2013 the country imported $376 million Barbados dollars (BDS$) for the generation of electricity and fuel costs per kilowatt-hour (kWh) which made up almost 75 per cent of the total power generation costs in the same year (Hohmeyer, 2015), representing around 7 per cent of the country’s GDP. Fossil fuels largely dominate the island’s energy mix. Heavy fuel oil, largely used for electricity power generation accounts for 37 per cent of total energy used. The other major categories included diesel (18 per cent), gasoline (17 per cent) and Kerosene (7 per cent). Most of the other categories account for less than 10 per cent of total energy use. Since 2012 fuel imports as a percentage of total imports has been steadily decreasing to 15 per cent in 2016, representing a reduction of approximately half of the fuel imports in 2012 (Figure 7). This reduction may be due to the decrease in world oil prices reflecting the high vulnerability of the island to external shocks to international oil prices.

---

To reduce the high vulnerability and dependence of the country from fossil fuel Barbados in its draft National Energy Policy 2017-2037 has indicated the following targets:

Table 3: Renewable Energy Transition Targets

<table>
<thead>
<tr>
<th>Fossil Fuel Reduction</th>
<th>RE Production for Electricity Generation</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>19%</td>
<td>34%</td>
<td>2022</td>
</tr>
<tr>
<td>38%</td>
<td>50%</td>
<td>2027</td>
</tr>
<tr>
<td>56%</td>
<td>56%</td>
<td>2032</td>
</tr>
<tr>
<td>75%</td>
<td>75%</td>
<td>2037</td>
</tr>
</tbody>
</table>

Source: (Ince, 2017)

The transition to 75 per cent RE by 2037 indicates a movement towards new and repurposed occupations within the energy sector. This is acknowledged in the policy under the objective; increasing the number of persons locally with qualifications and skills relating to energy production and management of renewable sources (Ince, 2017).
There are no specific policies aimed at the creation of green jobs in Barbados. This section will therefore provide a general overview of labour market regulations on the island, key fiscal incentives for greening and other policies that are related to green occupations and skills development.

Labour market regulations in Barbados cover a myriad of areas. There exist regulations on: freedom of association, collective bargaining and industrial relations; elimination of child labour, protection of children and young persons; equality of opportunity and treatment; labour administration; employment policy, promotion of employment and employment services; education, vocational guidance and training; employment security, termination of employment; cooperatives; conditions of employment; conditions of work; occupational safety and health; social security; migrant protection; migrant workers; specific categories of workers, and; international agreements. The actual implementation of these regulations, however, is a “mixture of legislation, common law doctrines, custom and policy”. There are two main pieces of legislation governing terms and conditions of employment in Barbados. The Employment (Miscellaneous Provisions) Act attempts to avoid the exploitation of particularly vulnerable groups. The Act prohibits the employment of children (a person under the age of 16 years), and the employment of persons during the night (between 9 pm and 7am), unless the enterprise satisfies the authorities that adequate arrangements have been made for the transportation of employees to and from their place of work. There is also an Employment Rights Act that covers employee rights in six key areas:

1. the right to a written statement of the details of employment;
2. the right to a written statement of remuneration paid;
3. the right to be consulted before changes to the regular hours of work are made;
4. the right to priority of rehiring for those workers who were previously made redundant;
5. the right to a certificate of employment details when made redundant, and;
6. the right not to be unfairly dismissed.

In addition to the rights laid out above, the Act also established an Employment Rights Tribunal as somewhat of an arbitrator of any disputes relating to these rights.

Industrial relations in the country have also been regularized through the Social Partnership and the articulation of this social compact: the Social Protocols. These protocols outline the norms expected from all three groups (government, unions, and the private sector) in relation to employment and industrial relations. The Protocol also contains specific commitments from all three groups pertaining to best practice industrial relations.

The freedom of association and collective bargaining is regularized through the Trade Unions Act. This legislation provides for the registration of trade unions and the rules for peaceful picketing. Through the Holidays with Pay Act workers are also provided with at least three weeks of paid holiday if he/she has been employed for less than five years and at least four weeks if the period of employment exceeds five years. When an employee is made redundant, the Severance Payments Act covers payments from the employer to the employee. Once the employee has been employed by the company continuously for 104 weeks working at least 21 hours per week is made redundant, the Act requires two and a half weeks’ basic pay for between one and ten years, three weeks’ basic pay for between 10 and 20 years and three and a half weeks basic pay for any period of employment exceeding 20 years.
Most of the green tax incentives available through the Customs and Excise Department take the form of duty-free imports or reduced import duties on selected items. In relation to home energy efficiency materials which keep houses cooler, such as thermal barriers, roof insulation, window tints and ceramic roofing coatings by treating them as “energy efficient systems/components” are subject to an import duty of 5 per cent rather than the present 20 per cent. In relation to energy-saving fluorescent light bulbs, the rate of the import duty was reduced from 20 per cent to 5 per cent.

Materials or equipment to be used exclusively for the purpose of generating renewable energy and conservation are exempt from import duty of 20 per cent (e.g. wind turbine systems; solar photovoltaic systems; apparatus/machinery designed to produce motive power, heat, light or electricity through the utilization of renewable sources of energy; and the like). Similarly, electric and other hybrid vehicles also benefit from a lower rate of import duty. For example, hybrid vehicle, which is powered by either electricity or gasoline or by electricity and diesel, where the engine capacity does not exceed 1600cc, the rate of duty is 20 per cent instead of the lowest rate of 46.95 per cent.

The income tax incentives generally: (1) allow individuals or businesses to access income tax rebates to fully or partially recover the cost of investing in energy efficient and renewable energy items; (2) allow businesses to enjoy tax-holidays when installing renewable energy systems; (3) allow businesses to pay lower taxes through tax deductions. For example, an individual can deduct from assessable income, 150 per cent of the actual expenditure not exceeding BDS$10,000 and a person carrying on a registered business can deduct 150 per cent of the actual expenditure not exceeding BDS$25,000 each year for five years in respect of the conducting of: Energy audits；and 50 per cent of the cost of retrofitting premises or installing systems to produce electricity from sources other than fossil fuels. Similarly, businesses that have incurred expenditure on an energy audit and the retrofitting of a building, or the installing of a system to provide electricity from sources other than fossil fuels, 20 per cent of 150 per cent of the amount expended to be deducted over a period of five (5) years, on such depreciable property as in use in the business at the end of the year.

### Value Added Tax (VAT) Incentives

Building materials and supplies for construction of a facility dedicated to the generation and sale of electricity from a renewable source are duty free and VAT free. Zero rate of VAT is applied to all RE and EE systems and products produced in Barbados. The administrations responsible for the execution of VAT and import duties are the Customs Department and the Barbados Revenue Authority. Persons eligible for the ten (10) year tax holiday are those who are developers, manufacturers and installers of renewable energy systems and products (Income Tax (Amendment) Act, 2013, Section 37 I. (1) and (2). Eligible businesses can deduct up to 150 per cent of the amount expended to be deducted over a period of five (5) years, on such depreciable property as in use in the business at the end of the year.

| a) | the construction of a new facility to sell off electricity from a renewable source; |
| b) | the construction of a new facility for the installation or supply of renewable energy and energy efficient products; |
| c) | the upgrading of an existing property so as to generate and sell off electricity from a renewable source (Income Tax (Amendment) Act, 2013, Section 37J (1) (a) and (b)). |

4 “Energy audit” means an evaluation by an authorized energy auditor of the energy consumption in a residential or non- residential property to determine the way in which energy can be conserved.

5 “Developer” means a person who has performed applied research to acquire new knowledge directed towards a specific practical aim or objective and has done experimental development by way of systematic work directed at producing new material, products, devices and improving those that have already been produced; ( Income Tax (Amendment) Act, 2013, Section 37I. (3) )

6 “Installer” means a sole trader or company who has a major focus on installing, maintaining, or assembling renewable energy such as photovoltaic systems, wind turbines, wind farms, hybrid renewable energy systems; (Income Tax (Amendment) Act, 2013, Section 37I. (3) )

Manufacturers means a person who performs the physical or chemical transformation of materials, substances or components into new products using a clearly defined process. (Income Tax (Amendment) Act, 2013, Section 37I. (5))

6 “Eligible business” means a business engaged in the installation, manufacturing or supply of renewable energy and energy efficient products and the generation and selling of electricity from a renewable source. (Income Tax (Amendment) Act, 2013, Section 37I, Subsections (4) and (5))
Individuals can claim the funds spent on RE and EE training provided by Educational and Vocational Institutions that are approved by the Barbados Accreditation Council in computing their taxable income. Parents of minors and adult students (up to the age of 25 years), can deduct the funds spent on RE and / or EE training provided by Educational and Vocational Institutions that are approved by the Barbados Accreditation Council. The student must not be employed and is studying in the area of RE and/EE (Income Tax (Amendment) Act, 2013, Section 4(2) (a) and (b)).

A person carrying on an eligible business is allowed to deduct against assessable income with effect from income year 2012, 150 per cent of the amount actually expended in (a) the marketing of products that are for the generation and sale of electricity from a renewable energy source, or (b) the marketing of products that are related to the installation and servicing of renewable energy electricity generation systems or energy efficient products. A person operating an eligible business is allowed to deduct against assessable income with effect from income year 2012, 150 per cent of the amount expended in respect of product development and the conduct of research related directly to (a) the generation and sale of electricity from a renewable source; or (b) the installation and servicing of renewable energy electricity systems or energy efficient products (Income Tax (Amendment) Act, 2013, Section 37M. (1)(a)(B)).

Where venture capital funds are invested in eligible businesses the funds are exempt from the payment of corporation tax with effect from income year 2012 for a period of ten (10) years. Contributions made by persons to venture capital funds are allowed as deductions in calculating assessable income with effect from income year 2012, where the investments are made in the renewable energy and energy efficient sectors for a period of ten (10) years. Dividends received by shareholders investing in entrepreneurial businesses described as eligible businesses are exempt from withholding tax with effect from income year 2012 for a period of ten (10) years (Income Tax (Amendment) Act, 2013, Section 37(O.). Income earned from the sale of electricity produced from the utilization of renewable energy equipment by an individual who owns and wholly occupies residential property is not included in calculating assessable income (Income Tax (Amendment) Act, 2013, Section 3 (aa)).

Other policies that directly or indirectly address skills development for green jobs are analysed next.

Under the Barbados National Energy Policy draft provisions have been made for human resource capacity and development. Overall Objective 11 of the new policy states “Increasing the number of persons locally with qualifications and skills relating to energy production and management of renewable sources”.

The policy outlines the development of skills and knowledge in the energy sector will result in a sector that:

- has a skilled workforce able to fulfil the requirements of the new renewable energy sectors;
- has standards of qualification for all aspects of the energy sector especially in renewable energy;
- maximizes information-sharing between educational institutions and the energy sector in establishing degree programmes, vocational programmes and school curricula;

---

7 “Venture Capital Funds” means a fund from which equity financing is provided to business ventures specified by the Minister and on such conditions as the Minister approves, and “venture capital” shall be construed accordingly. (Income Tax (Amendment) Act, 2013, Section 37 N. (1), (2) and (3)).
• Incorporates new skills relevant to emerging conventional and renewable energy sectors in syllabuses in tertiary institutions such as Barbados Community College (BCC), Samuel Jackman Prescod Polytechnic (SJPP), and University of the West Indies (UWI) etc.;
• has an increased number of scholarships available for persons interested in studying new areas related to energy and aspects of sustainability in the oil and gas sector;
• has an increased number of qualified persons in conducting energy audits;
• emphasizes the concept of ‘innovation’ throughout curricula related to energy at various levels of education.

The new energy policy from the above objectives will clearly target the development of green skills in the energy sector of Barbados.

In the BHDS the National Qualification Framework provides the foundation for the integration of green skills for jobs in the training system of Barbados. The integration of skills for green jobs would aid in updating and improving the standards of many jobs as the global job market progresses to more sustainable practices. Implications towards the integration of skills for green jobs has been suggested indirectly throughout the document, where there is consideration to general openness towards integrating current and developing training programmes for RE. This is done, where indication towards the need of ‘requisite’ skills for jobs are required to be as dynamic and advancing as the global market (Ministry of Education and Human Resource Development & Ministry of Labour, 2010)

This policy mainly deals with a broad spectrum of topics of both concern and acknowledgement of the current issues, goals achieved and gaps in the educational system up to 2014. The realization that there is a need for diversity and enhancement of skills, paves the opening for green skills to be included in a new or revised educational policy. The need for green skills could be highlighted in future policy since it has not been emphasized as important in the advancement of the labour force. The Barbados labour force needs to progress as new technology is created and skill sets will also need to advance accordingly. There is also some limitation on how much information is provided about technical and vocational training in the policy, where there is more gender analysis and requirement for the overall ‘life skills’ as a main emphasis of the discussion. The policy provides a futuristic outlook of education, where sustainability, education quality and good governance and accountability are recognized as key factors at work. These are basic requirements if green skills and by extension green jobs will be appropriately assimilated into the labour force. The movement towards sustainable development is considered a vital component within the policy but lacks a direct narrative related to green skills inclusion in the education system (Ministry of Education, Science, Technology and Innovation, 2014).
The CARICOM Training System proposes a system model which shows the progression of the bidirectional relationship between those receiving training and those creating and reinventing programmes. The model suggests that at the point of Assessment Services, the integration of green skills can be applied, especially regarding the upgrading and retraining aspects of the segment. These would have to be first taken to the oversight bodies at both the national level, up to the regional level, through and involving the ministries of the SIDS. National Training Authorities (NTAs), being formed from a “broad representation” of TVET organizational bodies, are in charge of developing and incorporating new techniques into the programmes provided in TVET from the top-down. With this, green skills (existing and emerging) will have to be recognized at this level in order to ensure the development of the necessary programmes in areas of RE.

In order to be implemented, approval for green skills will have to undergo coordination, assessment of need, quality assurance, accreditation and monitoring, promotion of workplace development and certification. This is in conjunction with trainers being trained and certified accordingly, meetings with stakeholders which will provide insight into the labour market information that will be required to adequately assess what will be economically viable to the Barbadian labour market.
Skills development measures for the green economy

4.1 Skills needs identification / anticipation

The Ministry of Labour, Social Security & Human Resource Development (MLSD) is the main body responsible for skills identification and anticipation studies in Barbados. The MLSD uses employer surveys which are distributed through sectoral associations such as the Barbados International Business Association. National employer surveys have been done arbitrarily due to limited resources in 2007, 2010, and 2012. The MLSD is currently undertaking an employer survey which targets four sectors: International Business and Finance, Manufacturing, Cultural and Creative Industries, and Tourism. The survey does not target sectors e.g. renewable energy or construction that would have a high probability of requiring persons with green skills as the employer survey is designed to target sectors that contribute significantly to the country's Gross Domestic Product. Green sectors could be categorized as new and emerging and therefore would not be assessed by the national employer survey. The current employer survey comprises of the following sections: Initial Screening Questions, Profile Information, Employment Practices, Skills Gaps and Demands, Recent School Leavers/Graduates, Future Workforce Needs and Planning, and Investment in Employee Learning and Development. Future employer surveys could include green and/or potentially green sectors to assess and anticipate skill needs in those sectors, also other methods could be employed such as macro-level forecast and sectoral studies to enhance the reliability and robustness of the results (OECD, 2016).

In addition to the current employer survey being conducted, a labour market and information study was recently carried out for the renewable energy sector. The following occupations and skill sets were identified by collating information from the Labour Market and Information study carried out in 2014 (Sault College and Samuel Jackman Prescod Polytechnic, 2014) and stakeholder interviews conducted during this study:

<table>
<thead>
<tr>
<th>Occupations &amp; Skill sets in demand</th>
<th>Future / Emerging Occupations and Skill sets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricians (certified), with alternate and direct current knowledge</td>
<td>Non-roof installers (ground/pole/ballast)</td>
</tr>
<tr>
<td>Electrical and Mechanical Engineers</td>
<td>Mechanics with the ability to work on electric batteries and fuel cell technology</td>
</tr>
<tr>
<td>Solar PV Design with the ability to understand electrical code compliance</td>
<td>Knowledge of hybrid systems</td>
</tr>
<tr>
<td>Site Assessors able to use satellite imagery</td>
<td>PV Designers able to design batteries and off grid systems</td>
</tr>
<tr>
<td>PV installers with the ability to read and understand drawings &amp; skills using hand tools</td>
<td>Micro grid knowledge (energy resource, generation, loads and boundaries)</td>
</tr>
<tr>
<td>Energy Auditor able to conduct audits, sound scientific knowledge, familiarity with system dynamics</td>
<td>Knowledge of wind turbine technology, with marine and aquatic skills, vertical wind technology</td>
</tr>
<tr>
<td>Energy Conservation and energy efficiency</td>
<td>Smart grid technology</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>Plumbers with knowledge of solar heating systems</td>
<td>Knowledge of waste energy systems (science of anaerobic digestion processes and related systems)</td>
</tr>
<tr>
<td>IT Networking Skills</td>
<td>Engineering Designers with retrofit design knowledge for sustainability (RE/EE, air flow and quality, wastewater reuse, etc.)</td>
</tr>
<tr>
<td>Sound knowledge of inverter and converter systems</td>
<td>Electrical and computer skills for energy management systems to automatically manage solar, AC, DC and grid connectivity</td>
</tr>
<tr>
<td>Knowledge of construction standards and practices</td>
<td>Smart metering knowledge and training</td>
</tr>
<tr>
<td>Project management training and experience</td>
<td>Energy storage knowledge with engineering skills for batteries (lithium), compressed air tanks, water, synthetic and alternative fuel</td>
</tr>
<tr>
<td>Health and safety training</td>
<td>Advanced meteorology with application to PV systems, Agriculture cold storage using PV systems, Aquaponics and hydroponic knowledge, Smart and sustainable farming training, Wind turbine technology for fishing vessels</td>
</tr>
</tbody>
</table>

Source: (Sault College and Samuel Jackman Prescod Polytechnic, 2014) and Author compilation

The Barbados Standard Occupational Classification (BARSOC) based on the International Standard Classification of Occupations (ISCO), was established in 2016 and 204 occupations in existing or potential green sectors can be categorized as having tasks that are:

- Green enhancing skill – tasks that are added to existing skills;
- Green increased demand – increased demand for the occupation;
- Green new and emerging – new occupations with new tasks.

The BARSOC could be used as a tool in skills assessment and anticipation studies, however limited human capacity constrains the analytical value of the BARSOC.

### 4.2 Education and training

The main new occupations emerging from Barbados moving towards a green and sustainable economy are occupations within the renewable energy sector. Due to the demand from employers for renewable energy technicians and system installers, TVET institutions across the island have developed RE programmes within their course offerings.

The main vocational and training institutions on the island are: The Samuel Jackman Prescod Polytechnic (SJPP), The Barbados Vocational Training Board (BVTB) and the Barbados Community College (BCC). At present the incorporation of green skills, as understood by the main TVET institutions, into programme curricula is in the preliminary phase. The Barbados TVET Council and the BVTB do not have a direct mandate for the inclusion of green skills for new and existing occupations within their programmes.
programmes and curricula. This may be due to a number of challenges such as lack of resources (human, financial and infrastructural) and the absence of policy directly mandated to include green skills in curricula development.

The SJPP has incorporated three month long programmes that incorporate green skills which include:

1) Solar Panel Installation
2) Photovoltaic (PV) Electrical Installation
3) Energy Advisory
4) Wind Energy

Students within the Electrical Engineering programme are encouraged to take the PV electrical installation programme in order to broaden their skill set and all of the above programmes’ curricula are aligned to National Vocational Qualification (NVQ)/Caribbean Vocational Qualification (CVQ) certifications. The Energy Advisory and Wind Energy programmes are expected to be offered in December 2017/January 2018. The SJPP in the future intends to combine the above four programmes into a two (2) year renewable energy programme. Also noteworthy is the fact that SJPP and BCC share technical and infrastructural resources in order to deliver the Solar Panel and Photovoltaic Installation courses.

The BVTB has two apprenticeship scheme programmes associated with green jobs/occupations:

1) Solar Water Heating Technician (SWHT) and
2) Skills Training Course in Horticulture/Landscaping

The SWHT three year apprenticeship programme curriculum includes units on: Safety on site and workshop; Trade tools and practices; Pipe fitting and pipe welding; Solar heater construction and installation; Installation of plumbing fixtures; Repairing; Maintaining and servicing plumbing systems; Maintenance of pipes and plumbing theory. At the end of the programme a Certification of Apprenticeship is awarded. The horticulture/landscaping course runs for thirty-four weeks accompanied by a four week job attachment. Students of the course are exposed to vegetative propagation, propagation by seeds, crop production, landscaping of an area, hedge trimming both manually and mechanically, no dig gardening – using trans-planter, compost and sheep manure, composting – done in conjunction with the trainees in the skid steer/loader class, leaf and grass mulching. The BVTB has plans to introduce a course designed for developing skills and competencies for the irrigation and harvesting of rainwater. The SWHT Programme success rate has been very low, as apprentices were unable to complete their courses due to lack of capacity within private companies. In the horticulture/landscaping course in the last two years nineteen persons out of twenty-one registered candidates successfully completed the course and were certified.

The programmes discussed above clearly include elements of sustainability and “green” skills however there seems to be lack of direct incorporation of skilled persons into major infrastructural and/or economic transition projects. Therefore, the delivery of education and training programmes with “green” skills may be considered a piecemeal approach. To attain the national goal of becoming the most environmentally advanced green country in Latin America and the Caribbean, there needs to be a comprehensive framework for upgrading existing skills and the introduction of new skills for green occupations that complement a national green transition strategy. This approach must be taken to ensure labour market skills match emerging and growing markets’ job opportunities and can be facilitated through social dialogue under the Barbados Social Partnership framework.

It has been found that almost 41 per cent of the Barbadian employed labour force have no formal certification and many may find themselves marginalized due to lack of certification in the near future. The Ministry of Labour and Social Development and the Barbados TVET Council, are expected to
work to ensure that both NVQs and CVQs are further developed and expanded to the fullest extent possible. To achieve this objective, workers who may have acquired their skill sets through on-the-job training and other programmes will be given opportunities to demonstrate their competencies to a recognized certifying body and will be examined by skilled and experienced assessors. Also to ensure skills are aligned with real work requirements the MLSD is expected to conduct with its partners, curriculum and programme assessments to determine the use of competency-based education and training (CBET) methodology in training institutions and the provision of any necessary technical assistance. The MLSD has pledged to support the implementation of a system of Prior Learning Assessment and Recognition (PLAR), to acknowledge the skills and competencies already acquired by persons outside of traditional academic and training settings (Manpower Research and Statistical Unit, Ministry of Labour, 2014).

4.3 Active Labour Market Policies (ALMPs) and retraining measures

There are currently no specific ALMPs that are targeted towards green skills. However, Barbados does have ALMPs such as public employment services which include training schemes free of cost to citizens provided through the BVTB. In addition, through the National Insurance Scheme (NIS) the National Employment Bureau has a retraining fund of BDS$10 million. The purpose of the fund is to provide active job seekers with retraining opportunities to improve the skills and competencies of the unemployed citizens. Once citizens have applied for unemployment benefits with the NIS they are eligible to access the opportunities associated with the retraining fund offered at the SJPP, BCC and BVTB. The courses in high demand under the retraining fund that could have a green component are: electrical installation, plumbing, masonry, and construction. The retraining fund has encountered operational challenges such as limited physical capacity, and the inability to procure new technology.

4.4 The role of the private sector in skills training

The private sector in Barbados plays a key role in both market-driven skills identification and (re)training and providing new opportunities through green jobs. The majority of the training is done at the enterprise level where employees are trained either within the organization, sometimes led by internationally certified experts, or employees are sent abroad (Canada, United States of America and Germany) to training programmes to upgrade their skills. Training at the enterprise level is currently, mainly being done in companies within the RE and transport sector and to a lesser extent in waste management. All of the employers interviewed for this study noted they in some way provide training for their employees. This finding is also supported by Ashton et al. (2000) and Barbados Employers’ Confederation (2001) who indicate that companies in Barbados engage in a high degree of on-the-job training, especially for technical and vocational workers (Downes, 2009) such as those technicians in the RE sector.

The private sector also engages in dialogue with the TVET institutions on the island on what and how courses are delivered, that directly fill the gap for specific skills and jobs. Also, the BVTB in collaboration with companies offer occupational base skills development schemes. An example of this type of arrangement between the private sector and training institutes is Williams Solar, which has worked with the SJPP and BCC in the development of their solar panel installation courses. These programmes provided Williams Solar with some of the needed skilled labour to effectively carry out their day-to-day operations. Moreover, there is now the need to enhance the offerings of the Solar Panel Installation course to include more technical skills such as battery technology, energy storage and engineering and design of systems.
In the near future private employers will be encouraged by government to utilize the National Employment Bureau, to register their vacancies and complement traditional methods used in the recruitment of workers. Traditionally, there has been a heavy emphasis on elementary, low-skilled occupations that has characterized the public sector employment service and the government is committed to increase the proportion of professional and technical array of jobs available. To this end, government is seeking to fully engage the private sector and the student bodies of all major tertiary institutions (Manpower Research and Statistical Unit, Ministry of Labour, 2014). This initiative has the potential to be a key instrument by which the demand for green skills can be matched through a private-public partnership.

4.5
The role of institutional set up

Due to the strong and open social dialogue mainly under the Social Partnership, stakeholders of the tripartite group actively engage in discussion with each other on various issues of national importance. Given the mandate for achieving a green economy, the provision of training for green skills is no exception. Four main stakeholder groups in Barbados engage in the provision of training for green skills: government agencies and training institutions, private sector companies, international institutions (standards, policies and training) and non-governmental organizations. Through various programmes and initiatives at all levels (enterprise, sectoral and national) training and skills development is provided to the national labour force. One of the major strengths of the current stakeholder network is the active involvement of all major stakeholders in the development of curricula and training material. This active working relationship could be further optimized with the implementation of a coherent strategy for green transition.
A best practice example of institutional strength and capacity at the sectoral level for the enhancement of green skills is the Barbados Renewable Energy Association (BREA). BREA has 60 members from across the Caribbean and internationally (Canadian). As an NGO, BREA is currently improving its capacity by including the following key pillars in addition to its advocacy role for RE on the island:

(i) **Education and Training** – the Association supports market-driven processes of skills anticipation and identification. In doing so, the BREA conducts stakeholder consultative sessions with its membership where a number of specific training programmes are identified. In the facilitation of these programmes BREA has partnered with key funding agencies such as Caribbean Development Bank, Barbados Investment and Development Corporation and US AID Caribbean Clean Energy Programme in the roll out of these interventions.

(ii) **Capacity-Building** – The above interventions and training programmes led by industry experts are expected to not only enhance the competencies and skills of workers in the RE sector, but more importantly, the international competitiveness of the renewable energy and energy efficiency technicians and engineers to export their services internationally.

(iii) **Research and Development** – in order to deliver on its new mandate BREA entered into a number of strategic partnerships with leading training institutions. Under its mandate for R&D, BREA is working with the University of Berkeley to strengthen the Association’s research and development needs starting with the transportation sector, more specifically the penetration of electric vehicles within Barbados. A pilot study is being conducted in partnership with the Government of Barbados through the Division of Energy and the Ministry of Transport in the facilitation of a Pilot Electric Vehicle Study. This study should identify the necessary basic and technical skills and overall framework needed to support the transition of the sector from predominantly fossil fuel operated vehicles to RE.

The Barbados Chamber of Commerce and Industry (BCCI) aims to strengthen the focus on development of the green economy in Barbados, and more specifically, renewable energy and energy-saving efforts. Due to the large undertaking of this initiative a Green Committee was specifically formed within the BCCI. The Green Committee is comprised of members of the BCCI who work closely with the Division of Energy, BREA and the University of the West Indies (UWI) in a number of areas:

- Schools initiative – raising awareness and education on Renewable Energy technology.
- Clarity on incentives available for energy efficiency (EE) and renewable energy (RE) in collaboration with the Division of Energy.
- Working with BREA to raise awareness in the business community on EE & RE. More specifically we have ensured that we aligned with BREA to maximize our combined efforts.
- Working with BL&P and UWI to create alignment on “One Plan” for a totally renewable energy Barbados (Barbados Chamber of Commerce and Industry, 2014).

At the Ministerial level there is coordination between the Ministry of Labour, the Ministry of Environment (Division of Energy), the Ministry of Agriculture and the Ministry of Education to identify, develop and administer the requisite training programmes aimed at providing decent work through sustainable businesses and occupations. At present, there is no formal arrangement that guides the policies and programmes between ministries, however, the ministries work hand in hand at the operational level where technical officers work together from various ministries to integrate sustainability and green economy concepts into all of the programmes being developed and implemented.
Analysis of case studies

---
**Case Study 1**
**Barbados Community College**

The Barbados Community College (BCC) was established in 1968 by an Act of Parliament and provides post-secondary education where it was previously inaccessible to a large portion of the population. By 1990 the Barbados Community College Act provided the institution with the authority to grant certificates, diplomas, associate degrees, degrees and other awards to students upon completion of their studies. The College’s mission statement is as follows:

> “The Barbados Community College is a dynamic center of learning which exists to meet the changing education, training and development needs of the societies that it serves, by providing a range of courses and programmes of study in a learning environment conducive to the intellectual, physical and social development of students and staff, so that they can make a meaningful contribution to their country, region and the wider community.”

The College provides an array of courses that prepare students for careers in fields associated with green jobs. These include two-year Associate Degree Programmes in Environmental Health Inspection, Mechanical Engineering, Environmental Sciences, Chemistry, Biology, Physics and Mathematics. BCC also offers training in Electrical Installation and Plumbing, both skills which are necessary for the installation of PV cells in addition to the PV installation programme. At the College there is a Curriculum Development Office that is responsible for developing and reviewing the study programmes and curricula and this is done through consultations with specialist in the relevant fields. The development of the PV programme however was a joint effort with Samuel Jackman Prescod Polytechnic in order to avoid duplication of effort. Upon completion of the courses graduates often go on to work in private companies that specialize in PV installation. The exact number of BCC graduates who are currently employed in this occupation is unknown. BCC also has a Memorandum of Understanding with several North American colleges through the USA-CARICOM Programme and the Canada-CARICOM Scholarship Programme allowing them to build their technical capacity and improve green skills and training for the Barbadian labour force.

---
**Case Study 2**
**Samuel Jackman Prescod Polytechnic (SJPP)**

Barbados currently leads in the installation of solar water heaters per capita in the western hemisphere with approximately 50 per cent of households using them (UNDP, 2009). This has been largely driven by financial and fiscal incentives by the Government to encourage the use of solar water heaters (GOB, n.d.). As a result there is a demand for skilled technicians on the island. The institution’s mission “is to be the leader in the preparation of a highly trained workforce by providing qualified persons with quality competency-based technical and vocational training that responds to the future employment and lifelong needs of its students.”
In 1969 the Samuel Jackman Prescod Polytechnic was established and has since developed an Institutional Partnership with Sault College, one of the most highly recognized training institutions in the field of renewable energy in Canada. Through this partnership with Sault College the SJPP was able to develop curricula in Photovoltaic Installation and Solar Photovoltaic Electrical Installation in 2015 and has since had over 200 graduates. In developing the training programme, an advisory committee represented by both public and private sector organizations was consulted to identify the most relevant skills students would need to work in green industries upon graduating. Four classes are run simultaneously, each with their own instructor. The courses run for one semester with a limit of 16 students per class (i.e. 128 students per year). Funding was also made available for the institution to obtain equipment for teaching such as solar panels, inverters and turbines. SJPP offers two-year courses in Electrical Installation, Plumbing and Masonry, all skills that are required for the installation of solar panels as well as Mechanical Engineering which provides the foundation for a career in servicing electric vehicles. The institution currently has plans to provide specialized training in the renewable energy field with programmes in Wind Energy and Energy Advisory by the end of 2017.

The students who enroll in the PV installation courses are usually certified electricians with jobs who want to gain additional skills. As such, the courses are usually run after work hours to facilitate attendance. This enables them to make a smooth transition into the renewable energy field since they would have both certification and experience. There is no record of how many graduates have actually transitioned into green jobs.

The University of the West Indies is a multi-campus regional university which serves the English-speaking Caribbean. In 1963 The University of the West Indies Cave Hill campus in Barbados was opened with a capacity of 500 students. Over the years it has grown significantly to accommodate 7000 to 9000 students per year. It currently offers a range of tertiary level programmes at both the undergraduate and postgraduate level that provide students with qualifications for careers that are transferable to a green economy. Some of these include:

- Bachelor of Science - Biology
- Bachelor of Science - Biochemistry
- Bachelor of Science - Chemistry
- Masters of Science - Biosafety
- Masters of Science - Renewable Energy Management

With these qualifications, graduates from these programmes can have careers in the research and development of green technology and practices for Barbados and some have gone on to work as consultants for private green companies in Barbados though the total number of persons is unknown. Persons wishing to pursue higher degrees in electrical and mechanical engineering can attend the St. Augustine campus located in Trinidad and Tobago.
Innogen is a locally-based company that focuses on the installation of PV cells for residential and commercial buildings. The company was started in 2011 and currently employs 12 full-time and 14 part-time workers. Currently, there are approximately 1100 solar plants connected to the grid with Innogen being responsible for the maintenance of over 600 systems. A wide variety of skills is required for the operation of the company and these include electrical and planning engineers, construction workers and labourers. The company mainly hires from the local labour force unless persons do not have the required skill/qualification/experience. Innogen works with the Biology and Chemistry Department of the University of the West Indies for research and development support and these employees are often already certified in renewable energy before being hired. Training institutes on the island such as BCC and SJPP provide the foundation, basic knowledge and certification, particularly in the installation of solar panels, however further applied training is often done by Innogen so that employees become specialized in the area for which they are employed. Within the first three months of being hired, technicians undergo practical and classroom training, known as the Innogen Solar Energy course and receive certification once the training is successfully completed. Employees also participate in online courses offered by various institutions in order to improve their skills in electrical installation and renewable energy efficiency. One of the organizations used most frequently by Innogen for this training is the Schneider Electric Energy University. The courses provided are modular and self-paced and participants can take anywhere between 18 months to two years to complete, at the end of which they are awarded certificates.

MegaPower is the largest importer of electric vehicles in Barbados. The company began operation in 2013 and since then, over 200 electric vehicles have been sold. They offer various models of electric cars and vans with their most popular being the Nissan LEAF, along with a network of charging ports available throughout the island either free of charge or for a small fee. They also provide personal and commercial charging ports with the option of them being solar powered. After the first year, vehicles require full servicing which is more frequent than fossil fuel powered cars. The company employs a team of mechanics who are trained by MegaPower to perform service maintenance. These mechanics are certified by the International Maintenance Institute in Electrically Propelled Vehicle Repair and Placement (Level 3) as well as trained in the use of CONSULT-III Diagnostic Tool. Chargers and Solar/Wind equipment do not require regular maintenance however, MegaPower can procure parts, as well as, connect customers with engineers and/or electricians should it become necessary. Currently, the majority of vehicles in Barbados still use fossil fuels. The transportation sector utilizes 31 per cent of the total fuel consumption and is the second largest contributor to CO2 emissions on the island. Shifting to green vehicles on a larger scale would require further training of mechanics to provide them with the skills necessary for the upkeep of electric vehicles. This may also involve training of electricians to equip them with the skills for installing residential and commercial charger ports.
Barbados currently ranks 4th in the world in the installation and use of solar water heaters. Residents benefit from tax exemptions for solar water heating equipment and it has been made mandatory for new public housing. Williams Solar is a privately owned and operated company that specializes in the installation of solar equipment for both commercial and residential buildings. Like Innogen, they also employ graduates from Barbados Community College and Samuel Jackman Prescod Polytechnic for PV installation. In recent times the company has found it easier to fill many of its technical positions due to the training provided by these institutions and has developed a strong working relationship with them. Though graduates may have the technical skills required for the job, many of the new hires lack experience therefore they must undergo some on-the-job training within the company. This training tends to be ad hoc and not structured as new employees are mentored by more experienced personnel. Employees are sometimes sent to the United States of America or Canada to sit the North American Board of Certified Energy Practitioners (NABCEP) exam. These courses are intended to keep employees abreast of best practices in the renewable energy field since these standards are updated every three years. Included in the training are different techniques for installing solar panels and efficiency in installing inverters. Periodically Williams Solar employees also participate in PV installation training workshops in Barbados which usually run for up to five days in order to provide training for the trainers. Those who participate in the training courses receive certificates of completion however the workshops do not.

Williams Solar plans on branching out into the development of wind energy in the future. A proposal to produce wind energy on barges offshore has been put forward. In this regard, employees would receive training from SJPP which is currently the only institution in Barbados with a curriculum in wind energy.
Conclusions and recommendations

Conclusion

Barbados has adopted the definition of a green economy as one which, at its core, reflects the country’s small island ecosystem in all economic activity. Therefore, any job that promotes and enhances this type of economy is considered “green”. Despite its high level of economic and social development Barbados has experienced low or zero growth since the global economic crisis in 2009. The downturn in economic activity and the need to increase resilience to climate change has prompted a drive to green sectors including tourism, transport, construction and agriculture. The energy sector is leading the charge in achieving a green economy and a number of fiscal incentives are available. It is estimated that on average between 2004 and 2015, 15 per cent of the employed labour force can be classified as working in a green job however, by 2010 the ratio had decreased by 9.7 per cent and has remained around this level until the end of 2015. These workers comprised persons whose highest level education was either primary or secondary, and are the head of their households. In-demand and emerging green skills include those associated with occupations in PV installation systems, wind turbine technology and engineers and designers with knowledge of green application to physical structures and energy systems.

To reduce the high vulnerability and dependence of the country on fossil fuel a new draft National Energy Policy 2017-2037 has indicated a transition of 75 per cent of the country’s energy to be produced from renewable sources by 2037. The new policy proposes measures to enhance the human resource capacity and development through various programmes that would elevate the skills and competencies of those working in the RE sector. This framework supports the existing fiscal incentives for greening and other policies that indirectly address green skills development. The new Energy Policy may act as an interim plan for green jobs given there is no specific policy mandate targeted at the creation and improvement of green jobs in Barbados, this may be due to lack of accountability of where the responsibility for the creation and growth of green jobs lies within government. It is clear that some sectors of the economy are ahead of others in the creation of green jobs, particularly emerging economic sectors such as renewable energy and energy efficiency. Therefore, there is a need to ensure more balanced development across economic sectors and that the opportunities in the more traditional sectors, such as agriculture are not left behind. In general, there needs to be a more coherent, comprehensive and integrated approach to underpin a transition towards a green economy and by extension growth of green jobs.

The main skills assessment and anticipation tool used on the island are employer surveys which are conducted by the MLSD in an arbitrary manner due to limited resources. In addition to the MLSD the private sector in Barbados plays a key role in both market-driven skills identification and (re) training and providing new opportunities through green jobs. Due to the strong and open social dialogue mainly under the Barbados Social Partnership, stakeholders have the opportunity to actively engage in discussion with each other on various issues of national importance. Given the mandate for achieving a green economy, the provision of training for green skills should not be an exception.

The case studies provided in the study are best practice examples of the development and facilitation of green jobs and training programmes in Barbados by companies and educational institutions. Despite representing a small percentage of the economy, these microcosm cases, can act as a framework for scaling up activities and expanding training programmes to achieve a sustainable economy.
Recommendations

Overall, the study has highlighted the need for a comprehensive and integrative approach to the Barbados green economy, and by extension, the creation of green jobs and skills development. This approach should be done through stakeholder consultation, driven by government and its various ministries (Labour, Environment and Education, Science and Technology etc.) in collaboration with the private sector and an operational framework should be constructed where all actors understand their role and relationships with other actors, in order to achieve the national goal of becoming the most environmentally advanced green country in Latin America and the Caribbean. By creating the operational framework scarce resources can be allocated efficiently by addressing skill development areas of critical and strategic importance and eliminating efforts of duplication. More specifically, the following recommendations are proposed:

1. Create a national policy that mainstreams the development of green jobs in the overall economy and the development of a roadmap that outlines the markets, resources, technology and physical infrastructure necessary to achieve the vision of a green economy;

2. Develop and implement a labour market policy which is a bi-product of the national policy mentioned above, that specifically addresses the creation and advancement of “green” skills education and training based on labour market demand;

3. Develop a national committee where the Ministry of Labour, NGOs such as BREA, private companies and educational institutions (SJPP, SJPP, BVTB and UWI) across the island, identify skills gaps and emerging skills to develop curricula and programmes for green or greening sectors driven by sectoral demand;

4. Incentivize private companies, particularly micro, small and medium enterprises (MSMEs), and individuals to engage in training activities through fiscal incentives such as:
   - tax rebates that fully or partially cover the cost of investing in certified job training and education of green skills where the cost of the training/education is divided amongst the company, the employee and the state;
   - offering tax deductions to companies in green sectors that engage in systematic training for employees, similar to those offered for RE retrofitting and technology installations;

5. Create part-time training programmes for women working in green sectors, particularly those working in lower level occupations, to enhance their skills to increase their flexibility in the job market. These training programmes may be done through the BVTB and the SJPP which already have flexible programmes and the necessary capacity;

6. Enhance the technical and vocational training programmes at the SJPP, BCC and BVTB by developing student exchange programmes with international education institutes and colleges;

7. Introduce and mainstream green concepts, education and skills at the secondary level to improve the level of competency of those entering tertiary education programmes;

8. Amend UWI undergraduate compulsory foundation courses to incorporate the issues of sustainable development and their relevance to Barbados and the Eastern Caribbean;

9. Include green and potentially green sectors in future national employer surveys to identify existing and future skills demanded by those sectors;

10. Update occupational health and safety at work standards and guidelines to include the handling and management of, particularly “end of life” materials used in green activities.
Next Steps

1. There needs to be a better understanding of the opportunities and needs of specific sectors of the economy with respect to greening not just the labour force but also of the way they operate. Initially, up to four sectors could be looked at: tourism, financial services, construction and agriculture.

2. A better understanding of the numbers and factors that, on the one hand, might drive the transitioning of existing jobs to green jobs (substitution) and the creation of new green jobs (complements) and the relative scope for growth within each of these.

3. Professionalization of government (as an exemplar); implementation of an eGreenGov initiative to make greater use of ICT, encourage higher skills and reduce numbers.

4. Greening of Building Codes, Codes of Practice and Regulations governing how business is done and embedding of sustainable development as a core facet.

Further practical research

1. To support step one above, research should be carried out into the leverage points and opportunities for greening the supply and value chains of key sectors. This would be especially important for those economic sectors where there are jobs that are classified as green but in which the actual operation of those sectors is not green. This would also identify the scale and scope for job substitution and job complementation.

2. Refine and extend existing macroeconomic models of the Barbadian economy to investigate the conditions and economic growth impact of transitioning to a green economy and green jobs. This would also look at the impacts and effectiveness of fiscal and other incentive schemes.

3. Investigate in greater depth the potential for and impact of Smart Island Infrastructure on economic growth and green jobs.

4. Investigate in greater depth Green Industries, which ones to target, state of preparedness and greatest impact matrix.

Coordination Mechanisms

1. Include in the system of national accounts the incorporation of TEEB – The Economics of Ecosystems and Biodiversity.

2. Introduce a triennial National Green Score Card.

3. Bring together an umbrella body with NIS, Barbados Accreditation Council, Ministry of Labour and Private Sector (a PPP) to provide accredited training opportunities, a technical and resource use service to support the transition to a green economy apprenticeship scheme.

4. Establish a One-Stop-Shop for persons wanting to set up green businesses which would cover advice and assistance with VAT, taxes, loans and business startup.


REFERENCES


UNEP. (2017). *Inclusive Green Economy.* Obtenido de UN Environment:
http://www.unep.org/greeneconomy/sites/unep.org.greeneconomy/files/
discurso_primer_ministro_barbados.pdf


*Southern Economic Journal, 60*(1), 136-145.


Recuperado el October de 2015, de http://data.worldbank.org/products/wdi

Zee, H., Stotsky, J., & Ley, E. (2002). Tax Incentives for Business Investment:
A Primer for Policy Makers in Developing Countries.
*World Development, 30*(9), 1497-1516.
Appendix

UWI-ILO Skills for Green Jobs

Government Ministry Interview Questionnaire

1) What is the national definition of a green economy and by extension green jobs?
2) Does the Ministry have a specific mandate on “green” job creation?
3) What sectors in Barbados do you think have the greatest potential for greening?
4) What government policies/programmes/incentives are in place for current “greening” sectors (e.g., energy) and for future sectors to create an enabling environment?
   • What has been the success rate of the above policies and what challenges were incurred?
5) How has the Ministry incorporated into its policies, the transition to and need for green jobs to achieve the mandate of Barbados becoming a green economy?
6) Will the Ministry be updating the BHRDS 2011-2016 in the near future? How will that new policy speak to skills development and needs?
7) Does the Ministry have a formal arrangement with the Ministry of Environment and/or Education and vocational institutions in promoting skills and competencies in “green” sectors?
8) Do you believe there is a skills gap for technical jobs in “green” business?
   • If yes, describe the gap and how it may be addressed (what role would the Ministry play in filling the gap)?
   • If no, what current programmes are available and how are they carried out?
9) Do the policies of the Ministry (climate change, sustainability, scoping study) cohere with those of Ministries e.g. (Barbados Human Resource Development Strategy 2011-2016)?
10) What are the main skills assessment and anticipation tools used by the Ministry?
11) What are the active labour market policies currently being implemented?
12) Is there a current monitoring programme for job skills to meet UN SDGs, particularly renewable energy?

Table 5: Barbados Stakeholder List

<table>
<thead>
<tr>
<th>Organizations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of Labour</td>
</tr>
<tr>
<td>Ministry of Environment</td>
</tr>
<tr>
<td>Barbados Renewable Energy Association (BREA)</td>
</tr>
<tr>
<td>Samuel Jackman Prescod Polytechnic</td>
</tr>
<tr>
<td>Barbados Vocational Training Board</td>
</tr>
<tr>
<td>Caribbean LED Lighting</td>
</tr>
<tr>
<td>Williams Solar</td>
</tr>
<tr>
<td>Innogen Inc</td>
</tr>
<tr>
<td>Barbados TVET Council</td>
</tr>
</tbody>
</table>