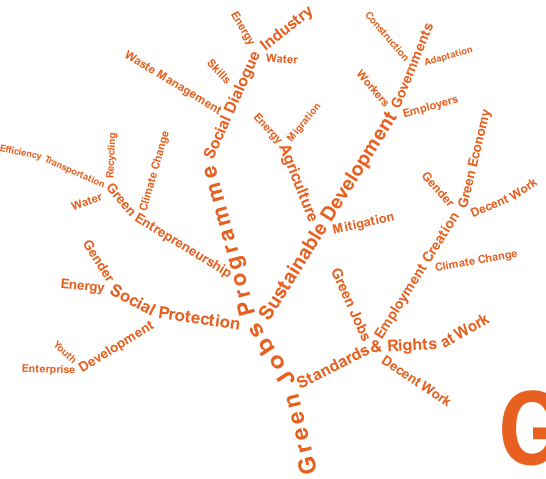

International Labour Office

Geneva

Green jobs assessment

Mauritius

GREEN JOBS ASSESSMENT MAURITIUS

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Abbreviations

AFD	Agence Française de Développement
FRC	Albion Fisheries Research Centre
EU	European Union
GCLs	Green Credit Lines
GDP	Gross Domestic Product
GEF	Global Environmental Fund
GEF-SCP	Global Environmental Fund- Small Grants Programme
ILO	International Labour Office
IO	Input-Output
MCB	Mauritius Commercial Bank
MEXA	Mauritius Export Association
MFA	Multi-Fibre Agreement
MID	Maurice Île Durable
MUR	Mauritian Rupee
OECD	Organisation for Economic Co-operation and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
SBM	State Bank of Mauritius

Executive summary

This report provides an assessment of existent and potential green jobs in major economic industries of a small island developing state: Mauritius. It aims to inform and shape the *Maurice Île Durable* (MID) project, which was launched in 2008 with the objective to make Mauritius a world model of sustainable development.

The study focuses on four industries, which were identified by the Government as the growth poles of Mauritius' economy: sugar agriculture, textiles, tourism (hotels) and financial services.[3] The employment effects of greening these industries are assessed to determine whether economic growth is compatible with more environmentally friendly production systems. However, Mauritius is striving to diversify its four-pillar economy to make it more resilient to shocks and support differentiated growth and job creation. Also, GDP-oriented growth strategies do not always encompass employment and pro-poor focused development paths. Therefore, industrial activities with a strong social and environmental dimension such as renewable energy, waste management and recycling, non-sugar agriculture, construction, forestry and fishery were added to the analysis. Combined these industries contribute to more than 50 per cent of GDP and employment.

In order to determine the number of green jobs and distinguish them from conventional employment, each industry was disaggregated into a sustainable and a conventional component. Three methods were used to differentiate the industries: (i) the process-based method, (ii) the output-based method, and (iii) natural resource conservation method.

The process-based method defines green jobs as those in enterprises, within an industry, which are among the 10 per cent most energy and water efficient. This methodology was notably used for the textiles and hotel industries.

The output-based method refers to the environmental beneficial characteristics of final products or services. It is based on the European industrial classification of environmental goods and services. This method was for instance applied to the energy and electricity industry.

The natural resource conservation method seeks to identify industries and jobs, which directly contribute to protecting or enhancing environmental quality. Such employment could conceptually be accounted for under the output-based method. However, these activities provide public goods with no direct market value. Accordingly, if natural conservation activities are not priced through, for example, payments for ecosystem services, creating jobs in these industries relies on public investment. This explains why they are separately accounted for. Green jobs are, indeed, found in national parks and marine conservation activities.

A fundamental aspect of green jobs is their decency component. Regarding this aspect, formal contracts and compliance with Mauritian national law were used as indicators for the assessment. Additionally, where possible, certifications were also used as a proxy for decent work. For instance, the Fair Trade certification in the sugar agriculture industry certifies working conditions and fair pay.

[3] These industries are inter alia outlined in the *Vision 2020*.

The Green Globe certification in the hotel industry also certifies employee protection, basic services for workers and no exploitation of labour.

In 2010-2011, green and decent jobs in Mauritius stood at around 35,000, representing 6.3 per cent of total employment estimated at 558,100. Around 14 per cent of employment in the primary sector (non-sugar agriculture, sugar agriculture, forestry and fishing) can be considered green as well as decent. In the secondary sector and notably the textile industry, only around 5 per cent of employment revealed to be green and decent. Some textile companies have been greening their production processes with, for example, solar water heating systems, grey water use, recycling and natural air –cooling practices. These investments create job opportunities and can reduce energy use by up to 30 per cent. Similar technologies have been introduced in the hotel industry where roughly 3 per cent of the jobs were found in highly energy- and water-efficient tourist resorts.

To assess the employment effects of shifting industrial activity to greener practices, it is important to emphasize that each industry is linked with others within the economy. For example, if textile production increases due to the opening of a new plant, this will require additional electricity and hence increase demand from the energy and electricity industry. Thus, a strategy to enhance production in a particular industry will also lead to a rise in employment and production in others, through backward and forward linkages along the supply chain.

To capture the indirect linkages, the output and employment multipliers were calculated using the *input-output* method. The 2009 *input-output* table provided by the Central Statistics Office in Mauritius was disaggregated to account for the green and conventional components of industries. Green industry extensions were therefore created for the following: green sugar agriculture, green non-sugar agriculture, sustainable fishing, green textile, recycling, green hotels, public bus transport, green recreational services and renewable energy. The production linkages for these green activities were adjusted using partial survey methods. These industry extensions allow for a comparison of output and employment effects between conventional and green accounts for each industry using the multiplier analysis.

In the sugar agriculture industry the output and employment multipliers for the green extension was found to be higher than for the conventional account (1.2 vs. 1.3 for output and 2.6 vs. 2.7 for employment). Accordingly, employment gains range from plus 5 per cent and plus 7 per cent for output. This is due to the fact that green agriculture relies relatively more on inputs produced locally, such as organic fertilizers. When planters use inputs from the domestic economy as opposed to imported inputs - such as chemical fertilizers - activity and employment is stimulated in supplying industries.

The green textile industry stands out because of its very high direct employment effect (1.7 vs. 0.7). This translates into employment gains of plus 67 per cent in comparison to the conventional component. This is explained by the use of solar water heaters, recycling measures and grey water systems, which are more labour intensive than conventional operating systems in textile factories.

With respect to the tourism, green hotels tend to employ solar water heater systems, recycling facilities, energy saving equipment and are continuously engaged in training their staff in environmentally friendly practices. This operation approach seems to be responsible for– in

comparison to the conventional industry - higher employment effect (1.5 vs. 0.7). Employment gains of over 60 per cent can be expected when greening the hotel industry.

Renewable energy revealed to create relatively more output (2.5 versus 1.6) and employment (1.4 versus 0.8) than conventional fossil based electricity generation. This translates into employment and output gains of around plus 75 per cent. The main reason is the generation of renewable energy relies on inputs from the domestic economy, notably bagasse, which generate employment and output in its supply chain. Fossil fuels are imported, have a very short supply chain and therefore generate little jobs. Conversely, the supply and by-firing of bagasse entails jobs in haulage, feeding and operation of the electricity generating plant.

By taking a macro-economic perspective, a simple comparison can be drawn between a green and a conventional growth scenario. Assuming a conservative 2.5 per cent GDP growth in selected industries allows for short-term employment projections of a conventional and green scenario.

Four main industries – sugar agriculture, textile, hotel and energy and electricity – were selected for simulation. A 2.5 per cent annual growth in final demand is assumed in each of these four industries. Per year, a total increase of 3,648 new jobs can be expected in the green scenario as opposed to 2,262 new jobs when following a conventional growth path. This results in a net annual gain of 1,386 jobs when shifting towards greener practices in only these four industries. According to the model, economy-wide changes towards greener growth will have even larger net employment effects.

The difference between the green and the conventional growth scenario is mainly due to the higher integration of green industrial activities through strong linkages with other value chains of the Mauritian economy.

In conclusion, recognizing the limitations of Input Output modelling and its assumptions (i.e. fixed prices and technology, linear production functions and excess capacity), the projections indicate that redirecting growth towards a greener scenario can result in higher output and more jobs.

1. Introduction

Since the turn of the 21st century, complex interactions of social and economic factors are leading to unprecedented trends in environmental degradation. These include rapid globalisation and urbanisation, widespread poverty, unsustainable consumption and production patterns, and population growth.[4] The recent report by the United Nations Environment Programme (UNEP), entitled, *Keeping Track of Our Changing Environment: From Rio-to Rio+20,* concludes with the observation that "with limited progress on environmental issues achieved and few real "success stories" to be told, all components of the environment – land, water, biodiversity, oceans and atmosphere – continue to degrade". [5] Current global environmental change, such as climate change, calls for the utmost need to modify the unsustainable development path that many countries have been pursuing for decades as to not undermine achievements and future social and economic progress.

Switching to greener economies, in the context of sustainable development, provides a response to such challenges. The promotion of green and decent jobs, i.e. green jobs, has emerged central to the green economy transition. Indeed, employment is the driver of economic growth and is key to the promotion of human wellbeing and social inclusion. Taking an employment centred approach, therefore, holds the promise of combining poverty alleviation and socio economic development with environmental sustainability. Green jobs claim to offer a way out of the current unsustainable development model of 'grow first, clean up later' but instead promote strategies to 'grow clean, create employment and eradicate poverty'. Thus, they address the double challenge of poverty reduction and increasing resource scarcity linked to environmental degradation and climate change.

Despite increasing evidence that the greening of economies seem to lead to equal employment levels or even net job gains on a global scale, there are nevertheless significant national and sectorial differences in employment effects. It is therefore important to analyse the employment outcomes of greener economies on a country-by-country basis. Such national assessments offer a better understanding of the labour market implications of going green and help decision makers design policies that will ensure a just transition of the workforce.[6] Experiences from countries around the world indicate that the right policy mix of macroeconomic, sectoral, social and labour policies is essential to minimize job losses, maximise employment gains, and protect workers and enterprises in the transition

This report provides a green jobs assessment for a small island developing state: Mauritius. Its objective is to inform and shape the Maurice Île Durable (MID) project, launched in 2008, which aims to make Mauritius a world model of sustainable development. Agreed by national stakeholders is the need for Mauritius to follow a development model that encompasses economic, social, cultural and environmental dimensions of sustainability. It involves, amongst others, the efficient use of resources, the reduction, reuse and recycling of wastes, a decline in pollution, equitable access to

[4]UNEP, UNICEF, WHO (2002) *Children in the New Millennium: Environmental Impact on Health*.
[5] UNEP (2011) *Keeping Track of Our Changing Environment: From Rio to Rio+20 (1992-2012),* (Nairobi), p.90.
[6] ILO (2013) *Working towards sustainable development: Opportunities for decent work and social inclusion in a green economy*, (Geneva).

resources for all and decent work.[7] In the context of the MID project, a particular opportunity is the promotion and creation of green jobs.

In order to best align the green jobs assessment to the national context, the industries of Mauritius´ "four-pillar" economy – sugar agriculture, textile, tourism (hotel) and financial services – form the focus of this study. These were identified by the Government and the Ministry of Finance and Economic Development – inter alia outlined in the Vision 2020 - as the four national economic growth poles. Mauritius is nevertheless striving to diversify its four-pillar economy to make it more resilient to shocks, enhance its productivity and competiveness, and support growth and job creation. By acknowledging Mauritius' diversification strategy and considering that GDP-oriented growth strategies do not always entail employment and pro-poor development, the study thus also examines other industries across the economy. As a result, the green jobs assessment features numerous industries grouped under Mauritius' primary, secondary and tertiary sectors. These include: sugar agriculture, non-sugar agriculture, fishing, and forestry (primary sector); sugar industry, textile, manufacturing, construction, energy and electricity, and water (secondary sector); hotel, transport, sewage and environmental protection, recreational service, and financial service (tertiary sector). The above-mentioned industries account for more than 50 per cent of total employment in Mauritius. Section 3 of this report provides a brief description of the Mauritian economy and an overview of its employment structure.

In order to assess the current number of green jobs in the above-mentioned industries the study identifies whether there is a sustainable (green) manner of conducting industrial activity within each industry. It thus separates the share, which is green from its conventional counterpart. Even though challenging, such disaggregation of output and employment is a precondition to estimate current and future green jobs projections in Mauritius. As green jobs strategies need to be examined within the specificities of each industry, this requires different measurements of sustainability. Accordingly, the framework designed to identify green jobs and to classify industrial activity into its green and conventional counterpart is based on three methods (i): the process-based method, (ii) the output-based method, and (iii) the natural resource conservation method.

The process-based method involves examining the production processes of enterprises to identify those adopting sustainable practices and moving towards cleaner production systems. The process-based method is associated with increasing energy and resource efficiency. This method was applied to the textile and hotel industries.

The output-based method reviews final products to determine whether they comply with some form of green certification and thus helps differentiate sustainable versus unsustainable practices. This method was notably applied to the sugar agriculture industry.

The natural resource conservation method examines industries that directly contribute to natural resource conservation and are associated with protecting or enhancing environmental quality. Green jobs identified based on the natural resource conservation method are linked to safeguarding

[7] MID (2011) Consultative Workshops 14 June- 29 July 2011, *Working Group 4 Employment/Economy: Final Report*, Available at: http://www.gov.mu/portal/sites/mid/file/wg4.pdf

the natural capital of the island. This method was applied to identify activities such as watershed management in the water industry.

In order to account for the decency aspect of green jobs, formal contracts and compliance with Mauritian national law were used as indicators for the assessment. Additionally, where possible, certifications have also been used as a proxy for decent work.

Case studies on green construction, green practices within the hotel industry, cleaner production methods in the textile industry, recycling enterprises and renewable energy are provided to exemplify green job in Mauritius. The link between green jobs, poverty alleviation and decent work is also highlighted in these case studies. Moreover, the study also pays close attention to green financial services, as a means of promoting and allocating resources for green jobs creation and sustainable development.

The findings on the current number of green jobs in each of the selected industries are described in section 4. This section defines the criteria used to differentiate the green and conventional components for each industry, exposes the current status of green jobs, and presents case studies where applicable.

It is important to emphasise that all industries are linked to one another within the economy. A strategy to increase employment or to enhance production in green activities within a particular industry will consequently lead to a rise in employment and production in other industries through the supply chain. The output and employment multipliers provide indicators of the direct and indirect supply and demand linkages, and thus help guide policy-makers to design strategies that boost employment. Such an analysis using the input-output (IO) approach and the undertaking of a "what if" policy scenario is indeed important to complete the study. The conceptual framework, IO method and other methodological issues are further detailed in section 2.

Section 5 puts forward the results of the IO direct and indirect multipliers to show the potential of green jobs creation resulting from a total aggregate demand of MUR 1 million in each industry. In addition, it also seeks to answer the question "what would be the potential change in employment and output resulting from a 2.5% GDP growth scenario driven by green and conventional industrial activities?" The growth of the green components of the sugar agriculture, textile, tourism (hotel) and energy and electricity industries are compared to their conventional counterparts through this "what if" scenario projection. Such analysis aims to shape policymakers' strategic orientation in economic and financial planning in the short to medium term. Section 6 underlines the policy implications of promoting green jobs and transitioning towards a green economy in Mauritius and section 7 provides some conclusions.

2. Conceptual framework and methodological issues

2.1. Definitions of green economy and green jobs

The main challenge facing policy makers is the design of a development model, which leads to economic growth, creates employment, eradicates poverty, ensures food and energy security and promotes environmental sustainability. While the concept of sustainable development has been defined in the Brundtland Report as development that "meets the needs of the present without compromising the ability of the future generation to meet their own needs"[8], its application to the consumption and production structure of current economies has proven rather limited and difficult.

The recent traction of the green economy concept is a response to the widespread disillusionment with the prevailing economic paradigm. According to UNEP, a green economy is "one which results in improved human well-being and social equity, while significantly reducing environment risks and ecological scarcities".[9] In practical terms, a green economy is one whose growth in income and employment is driven by public and private investments that reduce carbon emissions and pollution, enhance energy and resource efficiency and prevent the loss of biodiversity and ecosystem services. Importantly, it also has the capability of replicating itself on a sustainable basis.[10]

Within the context of a green economy, green jobs provide decent work opportunities and contribute to preserving and restoring the environment. Green jobs are defined as those that help (1) improve energy and raw materials efficiency; (2) limit greenhouse gas emissions; (3) minimize waste and pollution; (4) protect and restore ecosystems; and (5) support adaptation to the effects of climate change.[11] Green jobs can be created in all sectors, industries and types of enterprises. They can be promoted in urban and rural areas, and in countries at all levels of economic development.

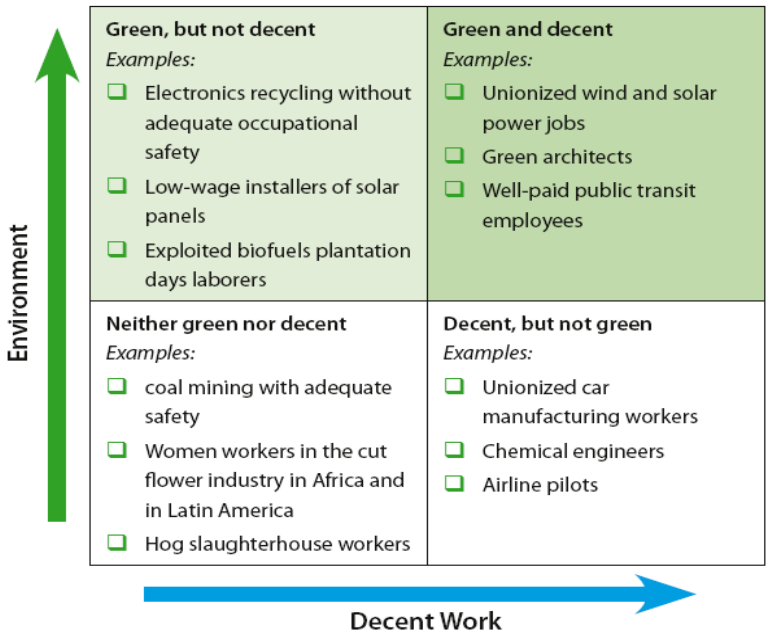
The decency component of green jobs is fundamental. According to the ILO, decent work involves "opportunities for work that is productive and delivers a fair income, provides security in the workplace and social protection for families, better prospects for personal development and social integration, freedom for people to express their concerns, organize and participate in the decisions that affect their lives and quality of opportunity and treatment for all women and men".[12] Green jobs therefore integrate both environmental and social dimensions of sustainable development with economic development.

The greening of jobs can be depicted along a scale of 0 to 100 per cent, illustrating the degree to which green practices and decent work conditions are embraced. As shown along the vertical axis in figure 1, the top-left quadrant includes strategies that lead to environmental improvements but do not upgrade the conditions and welfare of workers. The horizontal axis shows an increase in the

[8] UN (1987) *Report of the World Commission on Environment and Development*, General Assembly Resolution 42/187. Available at: http://www.un.org/documents/ga/res/42/ares42-187.htm
[9] UNEP (2011) *Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication,* (Nairobi); p. 16
[10] Pearce, D. (1992) "Green Economics"*, Environmental Values*, Vol.1, No. 1; pp. 3-13.
[11] ILO (2013) *What is a green job?* Available at: http://www.ilo.org/global/topics/green-jobs/news/WCMS_220248/lang--en/index.htm
[12] ILO (undated) *Decent work*. Available at: http://www.ilo.org/global/topics/decent-work/lang--en/index.htm

welfare of workers. However, the bottom-right quadrant includes jobs that are decent but do not contribute to environmental protection. These 'shades of green' are an important feature of the green jobs concept, as they show the extent to which enterprises are being greened. As such, every enterprise at any level of technological and economic development can start with small green initiatives and investments and move up the green ladder towards 'darker shades' of green initiatives. Reaching the objective of 100 per cent green and decent jobs is clearly the ultimate long - term objective.

Figure 1: Green and Decent Jobs



Source: UNEP, ILO, IOE, ITUC (2008) *Green Jobs: Towards Decent Work in a Sustainable, Low-Carbon World*.

2.2. Methods for identifying green jobs

Defining the green economy and green jobs sets the conceptual framework for the assessment. It is also important to highlight that the economy is made up of various industries with each having a different relationship with the natural environment.

The green jobs assessment therefore defines a sustainable threshold to differentiate the green component in each examined industry from its conventional counterpart. Each industry certainly presents its own criteria for measuring progress towards sustainability. To meet the study's objective, three methods were used to estimate green jobs in Mauritius: (i) the natural resource conservation; (ii) the process-based method and (iii) the output-based method. These are further explained in detail below.

Regarding specifically the decency aspect of green jobs, formal contracts and compliance with Mauritian national law have been used as indicators for the assessment. Additionally, where possible, certifications have also been used as a proxy for decent work. For instance, the Fair Trade certification in the sugar agriculture industry certifies working conditions and fair pay. The Green

Globe certification in the hotel industry also certifies local employment, employee protection, basic services for workers and no practices of forced and bonded labour, notably amongst children.

(1) Natural resource conservation method

Green jobs identified under the natural resource conservation method safeguard and improve the quality of the natural environment, ecosystems and associated environmental services. This comprises employment in the forestry and water industries and in marine conservation institutions.

For instance, green jobs in forest management contribute to reversing deforestation by conserving existing areas of primary forest or promoting the expansion of forests through regeneration and reforestation. Green investments can also be directed towards improving the management of existing forests and agro-forestry systems to ensure that forests continue to provide a wide range of ecosystem services.

Similarly, green jobs involved in marine conservation contribute towards rebuilding depleted fish stocks and can help implement effective management policies that lead to sustainable marine fisheries.

(2) Process-based method

The process-based method theoretically applies to all industries and economic activities. It considers industrial processes as sustainable depending on the techniques and practices employed. These include cleaner production methods, recycling and reusing waste, increasing the durability of products and reducing the dispersion of toxic substances during the production process.[13] For the purpose of the assessment, the 10 per cent most energy and water efficient enterprises are considered as green. Applying such a national benchmark has the advantage of identifying those national enterprises that have already successfully adopted green practices in Mauritius. Furthermore, applying a percentage- based indicator also sets a working target for enterprises to continuously pursue efforts to green their production processes and adapt to new technologies and practices.

The textile and hotel industries were assessed using these two resource efficiency indicators. Defining green processes based on this compound indicator can poses a challenge as some enterprises may only perform well in one resource but relatively poorly in the other. Thus, the following criteria was used for the assessment: the 10 per cent most efficient enterprises in electricity and water use are considered as 'green', while those which are efficient in at least one of the resources are considered as 'moving towards green'.

[13] Virjan, D. (2011) "The Rethinking of the Economic Activity Based on principles of eco-efficiency", *Theoretical and Applied Economics*, Vol XVIII, Issue 7; pp. 143-154.

(3) Output-based method

The output-based method focuses on identifying activities and jobs producing environmental friendly goods and services. According to Eurostat[14], these must have environmental protection or resource management as their main objective. A distinction is normally drawn between 'non-market valued' jobs (the natural resource conservation method) and 'market valued' jobs (the output-based method) for statistical, private and public investment scenario purposes. Therefore, only jobs that produce market-sold environmental goods and services fall under this criteria method, whereas those providing public goods are accounted for under the natural resource conservation method.

Both environmental classifications according to Eurostat definitions and product certifications were used to distinguish goods and services contributing to environmental protection. For example, green-labelled sugar was used to identify practices within the sugar agriculture industry as contributing to sustainable resource management. Despite the fact that no organic certification exists in Mauritius' sugar agriculture industry, the Fair Trade certification was nonetheless used to examine the industry. Even though the label focuses on certifying working conditions and fair pay, it does however include a slight component on responsible environmental management, which can help distinguish greener products within the industry.

The output-based method was also applied to the following industries: non-sugar agriculture, fishing, manufacturing, construction, energy and electricity, recreational service, transport, sewage and environmental protection, and financial service.

2.3. The Input-Output (IO) Model

The Input-Output (IO) model provides the analytical framework for the green job assessment in Mauritius. It is widely used as an accounting matrix that estimates all transactions and inter-industrial linkages within an economy. The method enables to evaluate the direct and indirect effects on output, income, and employment of different policy and investment scenarios. An overview of this method is provided in Box 1.[15]

It is important to understand the strong inter-industrial linkages within economies. To illustrate, if the demand for a product in a particular industry increases (industry 1), to serve its rising demand, this industry will need to produce more. Most likely, this specific industry will also need products from other industries (industry 2, industry 3, industry 4, etc.) as inputs for its own production process. This implies that demand for industry 2, industry 3, industry 4, etc. will also increase, generating a second phase of production requirements. Therefore, an initial rise in demand for products in a particular industry in turn increase demand for products in other industries, creating a multiplier effect of input and output requirements. Capturing these multiplier effects is crucial to analyse the effects of various policy scenarios and development strategies. Ultimately, industries that have relatively high multiplier effects should be prioritized in national development planning.

[14] European Commission (2009) *The environmental goods and service sector. A data collection handbook,* Eurostat Methodologies and Working Papers (Luxembourg: Office for Official Publications of the European Communities).

[15] Interested readers can find more elaborate explanation on the IO approach in Miller, R., Blair, P. (1985) *Input–output Analysis: Foundations and Extensions,* (Englewood Cliffs, NJ: Prentice-Hall).

The output and employment multipliers are the main focus of the study. Indeed, the assessment compares the multipliers of both the green and conventional components of industries to identify and help guide policies towards those industrial activities, which represent an employment creation potential in Mauritius.

The 2009 Input-Output table provided by the Mauritian Central Statistics Office, based on the System of National Accounts (SNA) classification as per the United Nations, was the main requirement to calculate the output and employment multipliers. However, as the green and conventional components of industries were not separately accounted for, partial-survey methods were used to extend the IO table to feature these green industry extensions i.e. the green component of industries. This exercise involved adjusting the technological coefficients to reflect the production functions of these various green activities.

Box 1. Output and employment multiplier – an input-output approach

Suppose x_i represents the output of industry *i*, which can be consumed in two ways: either it is sold to consumers as final consumption, or it can be used as 'intermediate inputs' to produce other products or services. The proportion which is consumed by consumers is called 'final demand' and, for simplicity, it is denoted by Y_i. There are also a number of industries which will use x_i as inputs in their production.

The part which is consumed by a particular industry, industry 1 (or which is sold to industry 1) may be represented by x_{i1}; similarly industry 2 will use x_{i2}, and industry '*n*' will consume x_{in}. Hence, in mathematical terms, industry i output is consumed as follows:

$$x_i = x_{i1} + x_{i2} + \ldots + x_{in} + Y_i \quad (1)$$

This can be written as follows:

$$x_i = \sum_{j=1}^{n} x_{ij} + Y_i \quad (2)$$

Each industry (j=1...n) which uses x_i as input is assumed to employ a production technology such that the quantity consumed, x_{ij}, is proportional to that industry 's output[16], x_j, with a technological coefficient a_{ij}. This can be written as:

$$x_{ij} = a_{ij} x_j \quad (3)$$

Hence, replacing (3) in (2), we have

$$x_i = \sum_{j=1}^{n} a_{ij} x_j + Y_i \quad (4)$$

Equation 4 is an economy-wide production system involving *n* number of industry. When there is a rise in demand for a product in a particular industry, the demand for products and employment in other industries will rise. This is called the 'direct effect'. In turn, the increase in demand for other products will generate subsequent rises in demand for other products and employment, creating a multiplier effect of input and output requirements. This is referred to as the 'indirect effect'. Equation 4 can be used to estimate the output and employment multiplier effect. Using matrix terminology, equation (4) can be written as: **x**=A**x**+**y** (5)

[16] This type of production technology assumes 'constant returns to scale'.

A is the technological matrix such as $\begin{bmatrix} a_{11} & a_{12} \dots a_{1n} \\ a_{21} & a_{22} \dots a_{2n} \\ .. & \\ .a_{n1} & a_{n2} \dots a_{nn} \end{bmatrix}$, $\mathbf{x}=\begin{bmatrix} x_1 \\ x_2 \\ . \\ x_n \end{bmatrix}$ and $\mathbf{y}=\begin{bmatrix} y_1 \\ y_2 \\ .. \\ y_n \end{bmatrix}$

Equation (5) can be rearranged as follows:

$\mathbf{x}-A\mathbf{x}=\mathbf{y}$ (6)

$\mathbf{x}(1-A)=\mathbf{y}$ (7)

$\mathbf{x}=(1-A)^{-1}\mathbf{y}$ (8)

The elements of $(1-A)^{-1}$ provides the direct and indirect effects on output from a unit change in industrial final demand in a particular industry.

Based on equation (8), the output impact analysis can be calculated:

$\Delta\ \mathbf{x}=(1-A)^{-1}\Delta\ \mathbf{y}$ (9)

The direct and indirect change in employment potential due to a unit change in industrial final demand would be given by:

$\Delta\ \mathbf{e}=\mathbf{L}(1-A)^{-1}\Delta\ \mathbf{y}$ (10)

L is vector of employment coefficients. Employment multipliers reveal the overall stimulus to employment from backward linkages arising from the expansion of a particular industry. They can be interpreted as the impact on employment if final demand in sector *j* increases by one unit. However, this measure is not unit free and hence, to find a unit free index, the Type 1 ratio is used. Type 1 employment multiplier is the ratio of direct and indirect effects over direct effect.

Source: The materials are based on Miller, R., Blair, P. (1985) *Input–output Analysis: Foundations and Extensions* op.cit.

2.4. Data collection

Both primary and secondary data were necessary for undertaking the assessment. While secondary data, in the form of the Input-Output accounting table and labour force surveys, provided the basis for the multiplier calculations, primary data was also required for defining and accounting for the green extensions of the IO table.

The three methods used to identify green jobs and green activities across industries conditioned the data requirements.

To estimate green jobs under the natural resource conservation method, information was needed from public institutions, such as the Ministry of Environment, the forestry department and the Albion Fisheries Research Centre (AFRC). As most public services involved in environmental conservation and protection were already accounted for in the national Input-Output table, there was no need of extending the table to account for such green activities. Yet, qualitative data was gathered on the state of the natural environment. For instance, key informants in the forestry and water department were interviewed to determine whether sustainable forest and water policies and practices are ensuring no net loss in forest cover and the overexploitation of groundwater resources.

Secondary data on electricity and water consumption per enterprise was made available from the Central Statistics Office to assess industries under the process-based method. Data allowed ranking the 10 per cent most energy and water efficient enterprises. Primary data was also collected to adjust the production function of those green enterprises. Enterprises that featured significant initiatives to green their production processes were visited. Data was collected on their

employment, energy and water consumption patterns, and their investments and savings arising from green strategies. Such data was used to extend the conventional industry accounts in the Input-Output table to feature the green extensions.

For the output-based method, primary data was mainly collected from industry associations, such as the Mauritius export association and the agricultural cooperatives association, as well as research institutes and public institutions. For example, data on the production pattern and employment level of fair trade certified sugar was gathered from key informants. Likewise, primary data was collected to determine total electricity production from bagasse and the number of people employed in this activity. This enabled to extend the IO table to feature the green extension of the energy and electricity industry to account for renewable energy.

Research undertaken for the green jobs assessment was carried out over the course of 2011 and early 2012 and it was carried out by a team of researchers from the University of Mauritius. The Central Statistics Office of Mauritius (Statistics Mauritius) provided the main economic and employment data. Additional secondary data was also collected from a desk study, which reviewed articles, academic papers and publications by the Government and International Organizations. This provided industry data and statistics on the overall structure of the Mauritian economy and insight on national green initiatives and policies. Primary data was gathered through structured interviews held with key informants from industry associations, experts, private enterprises and public officials.

3. Socio-economic profile of Mauritius

Mauritius is a sub-tropical island in the Indian Ocean with an area of 1865 sq. km, including the main island of the Republic of Mauritius, the island of Rodrigues and several smaller islands. It lies some 800 km to the east of Madagascar. Mauritius enjoys a mild tropical climate throughout the year and has two distinct seasons: a warm humid summer extending from November to April, and a relatively cool dry winter from June to September.

Since independence in 1968, Mauritius has made significant progress in terms of social and economic development. The Human Development Index increased from 0.662 (1980) to 0.728 (2011). Life expectancy is currently 70.2 years for men and 76.7 years for women and is expected to increase according to projections made by the Central Statistics Office. The current population stands at around 1.29 million with different cultures coexisting nationally.

At independence, Mauritius suffered from a stagnant plantation economy with sugar accounting for more than 90 per cent of exports. However, at the beginning of the 1980s, the relative importance of sugar dropped markedly mainly due to increased foreign exchange from exports of light manufactured goods, primarily garments. Economic growth during the 1980s was strong and persistent and was referred to as the "Mauritian Miracle".[17] The Government also developed tourism and steps for financial liberalisation were undertaken in the late 1980s. Since 2000, even further emphasis has been placed on the service industries, notably tourism and Information Technology and Communication (ICT). Table 1 illustrates Mauritius' economic transformation over the past three decades.

Table 1. Industrial distribution of GDP, 1980-2010, Mauritius

	1980	1990	2000	2010
Agriculture, forestry, fishing	12.4	12.1	6.5	3.6
Manufacturing	15.2	23.6	22.5	18.5
Construction	7.6	6.9	5.3	6.9
Wholesale and retail, Restaurants and Hotels	14.2	16.7	17.5	17.5
Transport, storage and communication	11.3	10.7	12.7	9.6
Financing, Insurance, Real Estate & Business Services	17.7	15.2	17.2	22.2
Others*	21.6	14.8	18.3	21.7
Total	100	100	100	100

Source: National Accounts, Mauritius (2010)

*Others include: mining and quarrying, electricity, gas and water, producers of government services and community, social and personal services

The figures reveal that the manufacturing; wholesale and retail, restaurants and hotels; financing, insurance, real estate and business services industries generate more than 50 per cent of national GDP. A priori, this would signify that these are the most important industries to examine for the

[17] Subramanian, A. Roy, D. (2001), "Who Can Explain the Mauritian Miracle: Meade, Romer, Sachs, or Rodrik?", IMF Working Paper 01/116, (Washington: International Monetary Fund).

purpose of the assessment due to their significant positive impact on GDP. Yet, they only contribute towards 22 per cent of total employment and mainly consist of high skilled labour, such as the finance and real estate industries. But envisioning an employment centred green growth strategy that is socially inclusive must focus on industries with high labour intensities, semi-skilled job profiles and offering new employment creation potential. Therefore, the study examines various industries across the Mauritian economy offering such potential. These include the following: sugar agriculture, non-sugar agriculture, fishing, forestry, sugar industry, textile, manufacturing, construction, energy and electricity, water, hotel, recreational service, transport, sewage and environmental protection, and financial service. These industries also present significant scope for fostering sustainable development.

The labour force in Mauritius comprises 581,300 people and employment stands at 558,100 (including foreign workers).[18] In terms of employment distribution, the sugar agriculture, non-sugar agriculture, fishing, and forestry industries (comprising the primary sector) represent 8 per cent of total employment. The total number of people employed in the manufacturing industries, predominantly textiles, under the secondary sector account for 23 per cent. In the tertiary sector, the transport and hotel industries represent roughly 7 per cent of total employment.

As the greening of the economy gains more momentum, it is likely that national industries will undergo structural changes, resulting in potential shrinkages or expansions. For instance, the manufacturing industries could benefit the most from greening as they represent the biggest share of both total employment and output level. Certainly, increased efficiency in energy use and enhanced waste management systems could create green job opportunities.

[18] Central Statistics Office (2010) Digest of Labour Statistics, Mauritius. (Figures relate to 2010 with foreign workers standing at 22000).

4. Current green jobs in Mauritius: Empirical results

Based on the assessment findings, the estimated green jobs figures for Mauritius are shown by industry in table 2. The column 'green jobs' accounts for employment associated with green practices and decent work conditions. The column entitled 'conventional employment' indicates employment levels in enterprises and institutions using conventional production processes and producing conventional outputs. To specify, the term 'towards green' is only used to qualify those light green initiatives observed in certain industries.

It is important to note that the greening of economies is a continuous process, as technologies, practices and ambitions gradually change over time. Therefore, green activities within industries will become even greener in the future as production methods and efficiency standards constantly evolve.

Table 2. Employment in the green and conventional components of industries in Mauritius

	Economic sectors	Economic industries	Conventional Employment	Green Jobs	
1	Primary	Products of agriculture, horticulture and market gardening - conventional	20757		
	Primary	Products of agriculture, horticulture and market gardening - green		210	
2	Primary	Forestry		1013	
3	Primary	Sugar plantation -Conventional	13905		
	Primary	Sugar plantation - towards Green		534	
4	Primary	Live animals and animal products	2971		
5	Primary	Lagoon	2104		
	Primary	off-lagoon		3749	
6	Primary	Ores and Minerals	240		
7	Secondary	Meat, fish, fruit, vegetables, oils and fats, grain mill products, starches and starch products and beverages	13000		
8	Secondary	Sugar - manufacturing phase		1900	
9	Secondary	Yarn and thread; woven and tufted textile fabrics	5779		
	Secondary	Yarn and thread; woven and tufted textile fabrics – green		709	
	Secondary	Yarn and thread; woven and tufted textile fabrics - towards green		201	
10	Secondary	Knitted or crocheted fabrics; wearing apparel	41595		
	Secondary	Knitted or crocheted fabrics; wearing apparel – green		1690	
	Secondary	Knitted or crocheted fabrics; wearing apparel - towards green		5024	
11	Secondary	Other manufactured goods	46000		
	Secondary	Recycling industry		130	
12	Secondary	Constructions and construction services	54000		
13	Tertiary	Wholesale and retail trade services	88800		
14	Tertiary	Lodging; food and beverage serving services	15509		
15	Tertiary	Hotel industry: conventional	18544		
	Tertiary	Hotel industry-green		654	
	Tertiary	Hotel industry -Towards green		2593	
16	Tertiary	Water, air, supporting and auxiliary transport services	9855		
17	Tertiary	Land transport	29297		
	Tertiary	Public bus transport		11304	

18	Secondary	Fossil fuel electricity	1501		
	Secondary	Renewable electricity		448	
19	Secondary	Water		1050	
20	Tertiary	Financial intermediation, insurance and auxiliary services	13200		
21	Tertiary	Real estate services	1762		
22	Tertiary	Telecommunications services; information retrieval and supply services	3629		
23	Tertiary	Other business services	33138		
24	Tertiary	Public administration and other services to the community as a whole; compulsory social security services	39100		
25	Tertiary	Education services	30800		
26	Tertiary	Health and social services	19000		
27	Tertiary	Sewage and refuse disposal, sanitation and other environmental protection services		1899	
28	Tertiary	Services of membership organizations	387		
29	Tertiary	Recreational, cultural and sporting services	7910		
	Tertiary	Recreational industry –green		1783	
30	Tertiary	Other services	10426		
		Total	523209	34891	558100
		%	**93.7**	**6.3**	**100**
Source : Authors (2011)					

4.1. The Primary Sector: non-sugar agriculture, sugar agriculture, fishing, and forestry industries

For the purpose of the green jobs assessment in Mauritius, the primary sector is divided into four distinct industries: non-sugar agriculture, sugar agriculture, forestry, and fishing. As will be detailed later, the industry accounts were extended to feature the green extensions. However, no disaggregation was necessary for the forestry industry as activities revealed to be 100 per cent sustainable. The employment levels in these primary sector industries are illustrated in table 3.

Table 3. Green jobs in the primary sector

	Economic industries	Conventional Employment	Green Jobs
1	Products of agriculture, horticulture and market gardening - conventional	20757	
	Products of agriculture, horticulture and market gardening - green		210
2	Forestry		1013
3	Sugar plantation -Conventional	13905	
	Sugar plantation - towards Green		534
4	Live animals and animal products	2971	
5	Lagoon	2104	
	off-lagoon		3749
Source : Authors (2011)			

4.1.1. The non-sugar agriculture industry (products of agriculture, horticulture and market gardening)

One of the main issues surrounding the non-sugar agriculture industry in Mauritius is the use of organic versus chemical fertilisers. Planters are indeed reluctant to apply organic fertilisers given that higher yields are associated with using chemical fertilisers in the short term. Yet, the long-term implication of applying chemical fertilisers is a reduction of yields, which has already been observed in some areas across the country. Besides, the availability of organic fertilisers is problematic, as famers willing to apply such fertilisers find it difficult to secure a sustained market supply.

It is important to stress that sustainable non-sugar agriculture involves other measures apart from just applying organic fertilisers. It also includes soil conservation, fertility management, efficient water use and management, fertigation technology to improve fertiliser use efficiency, and post-harvest technology. However, due to limited data availability the use of organic fertilisers was the only indicator applied to distinguish and account for green practices within the industry. The non-sugar agriculture industry was assessed under both the output- and process-based methods.

The study revealed that around 1 per cent of planters are currently adopting sustainable agricultural practices. The survey findings identified 210 green jobs and 20,757 people still employed in conventional practices within the industry. The identified 210 green jobs complied with minimum labour standards. The high conventional employment level within the non-sugar agriculture industry certainly offers great potential for greening the whole industry.

Some of the initiatives undertaken to enhance sustainable non-sugar agricultural practices in Mauritius are described in the following case studies. The Global Environmental Fund Small Grants Programme (GEF-SGP), a United Nations based initiative, has developed several projects in the area of sustainable farming. These highlight some of the opportunities and challenges faced in developing sustainable agriculture in Mauritius. Box 2 provides an overview of GEF-SGP projects aimed at promoting sustainable non-sugar agriculture and poverty alleviation, with a particular focus on women.

Box 2. GEF-SGP projects in sustainable non-sugar agriculture

The GEF Small Grants Programme in Mauritius and Rodrigues has funded a series of projects to green the non-sugar agricultural industry. One of the projects entitled 'Conservation Agro-Biodiversity- Organic Medicinal Plants and Vegetables' (2009-2011) aimed at empowering women farmers to produce bio-crops, such as vegetables, spices and medicinal plants. These bio-crops were certified as organic by *Eco-Cert,* an international organic label. The same project targeted a group of Mauritians who have not completed primary education and thus find it challenging to secure employment. This development strategy both promotes sustainable farming practices and helps reduce women's poverty and vulnerability in the region. Another GEF-SGP project promoting sustainable entrepreneurship, 'Use of Vetiver Technologies for Women Empowerment' (2005-2006) offered training to women on the use of vetiver roots for the production of essential oils through distillation.

Source: Mrs Pamela Bapoo-Dundoo, National Coordinator GEF-SGP in Mauritius (January 2012)

At national level, efforts are also being undertaken to green the non-sugar agriculture industry. For instance, the Agricultural Research Extension Unit (AREU) aims to improve production notably through research and farmer training. The objective is to raise farmers' willingness and ability to adopt sustainable agricultural practices (see Box 3).

Box 3. The Agriculture Research and Extension Unit (AREU)

The objective of the AREU is to produce cost-effective high-quality research and extension services for better agriculture production. It strives to meet the policy requirements of the Government in terms of agriculture diversification and food production generally.

Research and development activities mainly focus on sustainable agricultural practices to improve and sustain crop productivity, protect the environment and ensure sustainable use of agricultural resources. Examples of research programmes include: (1) the promotion of soil conservation and fertility management to prevent soil erosion and degradation and to improve soil productivity; (2) efficient water use and management through efficient gravity fed drip irrigation systems and irrigation scheduling; (3) the development of organic fertiliser packages (use of cover crops, compost and/or manures, minimum tillage and mulches); (4) sustainable crop management through crop diversification and breeding of improved crop species adapted to water and heat stress and emerging pest and diseases; and (5) sustainable livestock management through high quality fodder production and improved livestock feed.

Research is also being undertaken on the biology, ecology and management of key pests to develop and implement integrated pest and disease management strategies. Emphasis is placed on the use of biological control agents (parasitoids and predators) and materials that have minimal effect such as bio pesticides, traps, and baits.

Moreover, research is also being conducted on the use of solarisation for control of soil borne diseases, seed treatment to decontaminate seeds, non-chemical methods to manage plant diseases, use of tolerant crop varieties, and testing of chemical pesticides with low toxicity and bio-fungicides.

Moreover, AREU's Plant Pathology Division provides a plant disease diagnosis service with appropriate control and management recommendations. The laboratory has established a plant disease alert system to inform farmers of disease risk associated with climatic conditions and advice on precautionary control measures through an SMS service.

AREU has also set up a training school to strengthen farmers' capacity on good agricultural practices (integrated pest management soil, water and nutrient management, nutrient recycling/ composting); postharvest handling and hygienic practices to improve food safety; good animal husbandry practices and good veterinary practices in livestock production, and pre-harvest food safety measures to minimise food-borne health risks.

Source: Mr Abeeluck, (Assistant Director) and Mrs I Ramma (Principal Research Scientist) AREU (January 2012)

Private enterprises, such as Animaterra Ltd (see Box 4), also play a key role in promoting non-sugar sustainable agriculture in Mauritius.

Box 4. Animaterra Ltd
Animaterra is a Mauritian company that provides farmers both the know-how and inputs required to perform agriculture in an environmentally safe and sustainable manner. Indeed, the company sells inputs related to sustainable agriculture but also offers the necessary training on the utilisation of such inputs to planters. Its farming techniques and inputs have been developed over the last 15 years by Nutri-Tech Solutions (Australia), a world leader in sustainable agriculture. They are widely recognised as contributing to improved yields, profitability, environmental preservation, enhanced fertility, and the production of highly nutritious crops.
Source: Mr G. Maurel, Director Animaterra Ltd (November 2011)

4.1.2. The sugar agriculture industry (sugar plantation)

The area cultivated for sugar cane production in 2010 was 62,100 hectares and an area of 58,709 hectares was harvested.[19] Fair Trade certification was used to identify sustainable practices within the sugar agriculture industry[20] in Mauritius under the output-based method.

The Ministry of Agro-Industry and Food Security, the Mauritius Sugar Syndicate, the Mauritius Sugar Authority and the Ministry of Business Enterprise and Cooperatives initiated Fair Trade in Mauritius. The certification offers organisations and companies a creditable means of ensuring that workers at the end of the value chain are fairly compensated through better trade and working conditions. It also rewards and encourages environmentally sustainable farming and production practices. However, this certification pays greater attention to decent work in comparison to environmental sustainability. Its relatively weak environmental label explains why those organisations and companies Fair Trade certified are only qualified as 'towards green' within the sugar agriculture industry.

The study findings revealed that Mauritius accounts 13,905 conventional sugar planters. There exists nationally roughly 180 cooperative credit societies, regrouping some 10,800 planters, cultivating a total area of 6,624 hectares and producing some 436,000 tonnes of sugar. Out of these, some 32 cooperative credit societies have been Fair Trade certified, comprising an estimated 534 planters that produce approximately 16, 300 metric tonnes of sugar. The identified 534 planters are therefore qualified as contributing towards greener sugar farming practices, representing 3.7 per cent of total sugar production under cooperative credit societies.

[19] Central Statistics Office (2010) Digest of Agricultural Statistics, Mauritius

[20] The relevant information about Fair Trade in Mauritius was provided by the Mr M Nardeosing, Ministry of Industry and Cooperatives.

4.1.3. The fishing industry (lagoon, off-lagoon)

The fishing industry in Mauritius comprises fishermen and other workers involved in the extraction of fish resources. The output-based method was used to identify green jobs in this industry[21] by examining and determining the number of jobs involved in the extraction of fish (the output) in a manner that does not overexploit this renewable resource stock. This indicator was applied to distinguish sustainable and conventional fishing practices within the industry.

In Mauritius, the fishing industry is comprised of lagoon, off-lagoon and high seas fisheries. According to the Albion Fisheries Research Centre (AFRC) (the main national institution providing information on fisheries and marine resources), lagoon fisheries are considered as unsustainable whilst off-lagoon fisheries as sustainable. Indeed, the off-lagoon fish catch is well below the maximum sustainable yield as per AFRC. Table 4 presents the lagoon and off-lagoon catches in comparison to high seas.

Table 4. Production of fish (tonnes) in Mauritius (2007-2010)

	2007	2008	2009	2010
High seas	4060	3614	4115	2882
Lagoon and off lagoon	804	858	1211	1154
Total Production	6377	5660	6706	5547

Data for 2010 are provisional and are subject to amendment
Source: AFRC (2010)

Table 5 shows the breakdown of lagoon and off-lagoon fisheries for the period 2007-2010. Figures reveal that the proportion of lagoon fishing has increased compared to off-lagoon fishing over this 4-year period.

Table 5. Production of fish (lagoon and off lagoon fisheries) in Mauritius (2007-2010)

	2007 %	2008 %	2009 %	2010 %
Lagoon	55	54	60	62
Off lagoon	45	46	40	38
Total	100	100	100	100

Data for 2010 are provisional and are subject to amendment
Source: AFRC (2010)

Based on the figures in table 4 and 5, the percentage of fish catch attributed to off-lagoon fisheries averaged 10 per cent of total fish production (lagoon, off-lagoon, high seas). The 3749 fishermen employed in off-lagoon fishing can be qualified as green jobs as catch is this fishery is below the maximum sustainable yield. With off-lagoon fishing practiced by larger Mauritian companies they are said to respect national law and minimum standards of decent work.

[21] Conversely, looking at the fishing industry with the process-based method implies assessing what type of nets and wholes sizes are used and whether destroying practices such as dynamite fishing or ground razing nets are applied. Further, questions on the type of fuel (diesel or bio-fuels) and the fuel efficiency per unit output would have been needed to assess the industry.

4.1.4. The forestry industry

The forestry industry in Mauritius was assessed based on the natural resource conservation method, as employment within the industry contributes to safeguarding forests' ecological functions and biodiversity. According to the natural resource conservation method, no private good and market value is created as a result of conservation. An exception is, however, the industry's segment in productive forest management, i.e. timber production. Therefore, the output-based method was also applied to differentiate employment in timber production (output) that is environmentally friendly and respectful of sustainable resource management from conventional practices.

To determine employment levels within both segments of the forestry industry that qualify as green jobs, it is important to establish whether national institutions enforce sustainable policies and strategies. Certainly, weak governance and institutions may contribute to activities that result in the overexploitation and degradation of forests and not to their conservation.

Two major Government institutions in Mauritius are responsible for the management of State forest lands. These are the Forestry Service and the National Parks and Conservation Service, under the Ministry of Agro-Industry and Fisheries. The study revealed that a number of sustainable principles provide the foundation for Mauritius' rigorously enforced forestry policy.

To conclude whether policies developed by these institutions and governing the whole industry are actually contributing to environmental conservation, the indicator of a non-decreasing total forest cover was applied. The findings revealed no net forest cover loss in Mauritius over the past years and as a result, the whole forestry industry can be considered as sustainable. In addition, decent work opportunities are provided within the industry with formal contracts and regular working conditions observed.

Total employment in the forestry industry, comprising both forest management and timber production, was recorded at 1,013 in 2010. As explained above, all jobs within the industry can qualify as green jobs. This clarifies why no extension of the IO table was needed for this industry account. Box 5 provides more details on forestry conservation activities in Mauritius undertaken by the Forestry Service.

Box 5. The Forestry Service in Mauritius

The Forestry Service assesses the forest estate (extent, forest type, etc.) and designates function types – productive, protective, conservation, recreation and ecotourism. It recognises forests' important environmental functions in water conservation, flood control, combating soil erosion, and biodiversity conservation. The Forest Service is also responsible for designing a long-term forestry strategy to implement sustainable forest management systems that may also contribute to the socio-economic development of the country as well.

The Forestry Service is headed by a Conservator of Forests, who is assisted by a Deputy Conservator of Forests and two Assistant Conservators of Forests, two Divisional Forest Assistants, eight Forest Rangers, 10 Deputy Forest Rangers, 38 Foresters and 97 Forest Guards. The Survey Unit of the Service has one Senior Surveyor, one Survey and Mapping Assistant, one Draughtsman, one Head Poler, two Polers and six Chainmen. The Biodiversity Unit, apart from biodiversity

conservation, also deals with eco-tourism and landscaping. Territorially, there are two forestry divisions, North and South, each in charge of a Divisional Forest Assistant. Each Division has two Ranges and six Sections, making a total of four Forest Ranges and 24 Forest Sections. Forest Rangers are responsible for the four Ranges and Sections are in the charge of Foresters. Six forest nurseries, four in the North and two in the South, produce about 800 000 planting stock annually. The Forest Tree Seed Centre at Abercrombie Nursery propagates highly endangered native species for both conservation and decorative purposes.

Source: The Forestry Service: http://forestry.gov.mu/English/Pages/default.aspx

4.2. The Secondary Sector: sugar, textile, manufacturing, construction, energy and electricity, and water industries.

For the purpose of the green jobs assessment, the secondary sector in Mauritius is divided into six industries: sugar, textile, manufacturing, construction, energy and electricity, and water. Green textiles, recycling, and renewable energy were identified as the green extensions of the conventional industry accounts. The whole sugar industry (manufacturing phase) is considered green as renewable energy from bagasse is used for production. Likewise, the water industry is qualified green as policies ensure sustainable fresh water use. This explains why the industry accounts were not extended, as both were identified as green industries. For the construction industry, it was not possible to extend the industry accounts, as it was unfeasible to quantify for sustainable practices nationally.

Table 6. Green jobs in the secondary sector in Mauritius

	Economic Industries	Conventional Employment	Green Jobs
8	Sugar- manufacturing phase		1900
9	Yarn and thread; woven and tufted textile fabrics	5779	
	Yarn and thread; woven and tufted textile fabrics - green		709
	Yarn and thread; woven and tufted textile fabrics - towards green		201
10	Knitted or crocheted fabrics; wearing apparel	41595	
	Knitted or crocheted fabrics; wearing apparel - green		1690
	Knitted or crocheted fabrics; wearing apparel - towards green		5024
11	Other manufactured goods	46000	
	Recycling		130
12	Constructions and construction services	54000	
18	Fossil fuel electricity	1501	
	Renewable electricity		448
19	water		1050

Source : Authors (2011)

4.2.1. The sugar industry (sugar-manufacturing phase)

Electricity generated from bagasse, a by-product of sugar processing, is used to manufacture sugar within the industry. Accordingly, applying the process-based method enables to account for this cleaner production process. Besides, decent work conditions are observed with formal contracts provided to employees involved in sugar production. Plants are also regularly inspected to ensure that they comply with national labour standards. Therefore, the roughly 2000 workers employed in the industry can all be qualified as green jobs**.**

4.2.2. The textile industry (yarn and thread; woven and tufted textile fabrics; knitted or crocheted fabrics; wearing apparel)

The rapid growth of the textile industry in Mauritius is mainly due to the development of its Export Processing Zone, which is predominantly based on exports to Europe. Mauritius enjoyed free and preferential access under the Lomé Convention and The Multi-Fibre Agreement (MFA). However, with the phasing out of the MFA in 2005, Mauritius faced increased competition from low-cost and large-volume producers. Government policy therefore aimed to up-market the industry, where competition is based more on the timely delivery and quality of goods than on price. Some of the larger firms in Mauritius have adopted modern processing methods and have established a reputation for consistent quality and reliable delivery. However, smaller firms have made less progress in this respect. The Government together with the Export Processing Zones Development Authority is assisting such small firms to adopt best practices by improving training opportunities, establishing industrial parks and encouraging the use of information technology in design, production, marketing and communication.

The study considers two specific textile industries: (i) yarn and thread; woven and tufted textile fabric and; (ii) knitted or crocheted fabrics; wearing apparel. They produce amongst others knitted garments, ready-made garments (e.g. shirts, trousers, skirts, dresses, sport clothes, etc.), leather garments (e.g. belts and gloves) and other clothing items such as ties and hats.

The study applied the process-based method to examine the resource intensity of electricity and water use in both these textile industries. Resource intensity, defined as electricity and water use per output, was the indicator used to identify eco-efficient processes within the industries. The 10 per cent most efficient textile enterprises in electric and water use are considered as green, while those only efficient in one of these resources are considered as 'moving towards green'.

The yarn and thread, woven and tufted textile fabrics industry was estimated to employ around 7,000 workers. Findings revealed that roughly 10.6 per cent of employment is considered as green and another 3.6 per cent is classified as 'moving towards green'. For the knitted or crocheted fabrics, wearing apparel industry, 3.5 per cent of employment is qualified as green and approximately 10 per cent is identified as 'moving towards green'.

Regarding working conditions experienced in the textile Export Processing Zones, the study points to the fact that companies do not always comply with decent work standards, especially vis-a-vis foreign workers. However, employment reported to the Central Statistics Office only includes formal employment complying with Mauritian national law. Therefore, all jobs accounted for above can be considered decent and thus green jobs.

Two case studies are presented below to illustrate green jobs opportunities within the textile industry. The first provides insight into Mauritius Export Association (MEXA) Blue Carbon Awards (see Box 6).

Box 6. MEXA's Blue Carbon Awards

The Mauritius Export Association (MEXA) initiated the Blue Carbon Award in 2010 to reward businesses undertaking carbon mitigation efforts nationally. It distinguishes sustainable business practices and thus helps ensure that good business ideas can be replicated. The award promotes strong commitment of business decision makers to drive a low carbon economy in Mauritius.

MEXA, through the Blue Carbon Award intends to help its members understand the carbon footprint implications of their products, sites and services. Indeed, measuring carbon emissions at each and every step of the supply chain can lead to valuable energy savings and contribute to mitigating carbon emissions. Such efforts can also enhance brand reputation and sales. Besides, Blue Carbon awarded businesses are certainly best prepared to comply with future green policies. MEXA has over the past two years hosted a series of workshops and seminars to guide export companies in reducing their carbon footprints.

MEXA held the first Blue Carbon Award Ceremony on April 18, 2011. Companies having demonstrated an absolute reduction of their footprint or equivalent relative efficiency improvement of more than 40 per cent received their blue carbon certification, including some textile enterprises. These were namely Consolidated Dyeing & Fabric Ltd, Ferme Marine de Mahebourg, FM Denim Ltd, RT Knits Ltd, T&T International Ltd, Tamak Textile and Poster Graphics. Moreover, the Blue Carbon Award was attributed to the Best Small Organization (less than 10 employees); Best Medium Organization (11 to 75 employees); and Best Large Organization (more than 75 employees).

Companies participating in this award scheme are independently assessed at the end of each financial year by the official assessor Rexizon C.E. Ltd. Their carbon footprint is measured by a so-called greenhouse gas (GHG) Protocol for direct emissions (scope 1), emissions from imported energy sources (scope 2), and indirect emissions including business travel, commuting, and transport (scope 3). Companies have to demonstrate significant GHG emission reductions in all three areas to participate in the scheme.

Source: Mrs D. Wong, Director, Mauritius Export Association (2011)

The second case study provides a brief overview of the various technologies and practices employed by the RT Knits Ltd company to green its operations (see Box 7).

Box 7. The RT Knits Ltd Company

RT Knits Ltd is a leading textile manufacturing company in Mauritius with an annual production capacity of 16 million units of jersey wear. It comprises three fully operational production sites, including la Tour Keonig. This 800,000 sq. feet plant features several green initiatives with initial investments amounting to approximately US$25 million.

Indeed, a number of energy saving and environmental strategies have been implemented in the main processing system of la Tour Keonig. These include: solar power use for water heating; the collection and recycling of fabric, water, plastic and used oil; natural lighting in the knitting plant and storage areas; light sensors; wind power to create natural air cooling and to operate the dust

extractors; and the constant monitoring of all dyeing processes to optimize chemicals, water, heavy fuel oil and liquefied petroleum gas (LPG) use.

Assessing the carbon footprint of each garment has also enabled to decrease the number of production processes and energy sources involved. For instance, the application of an all-in-one chemical product has enabled to replace 2-3 different ones previously employed. Besides, a heat recovery system in the dye houses has contributed to significant energy savings.

The resulting impact of all of these green strategies has been a 30 per cent reduction in overall fuel consumption. Interventions have also reduced production costs, improved working conditions and most importantly have ensured textile production in the most environmentally friendly manner possible.

With formal contracts provided and compliance with national law observed, it can be asserted that the 1,600 employees in this textile plant qualify as green jobs.

Source: Mr David Fond, Project Engineer and Sharma Bucktowar, Environmental Engineer from RT Knits Ltd (December 2011)

4.2.3. The manufacturing industry (other manufactured goods, recycling)

The output-based method was applied to the Mauritian manufacturing industry (excluding sugar manufacturing and textiles) to distinguish activities producing conventional and environmentally friendly goods and services. Recycling was identified as a green extension of the industry. Arguably, it processes waste into new raw materials (the output), which can in turn be used in industrial production.

Indeed, feeding back previously unused waste into the economy creates new recycling activities and job opportunities. Recycling is an important industrial activity in generating green jobs, notably for unskilled and poor workers. Un-decent working conditions are, however, widespread especially in informal waste collection and recycling systems. Yet, formal activities currently employ 130 workers and generate a value-added of MUR 63 million in Mauritius. These formal workers, which are considered to comply with minimum decent work standards, therefore qualify as green jobs.

Table 7 provides an overview of solid waste by type for a Mauritian landfill site, showing the national potential for recycling.

Table 7. Solid waste by type at Mare Chicose landfill site 2005-2010 (tonnes)		
	2005	2010
Construction	3756	2394
Domestic	363776	402816
Industrial (including textile)	2340	1572
Tuna/sludge	5910	10949
Poultry	3930	6339
Rubber tyres	394	481
Asbestos	85	44
Condemned goods	2114	1388
Difficult and hazardous	22	42
Paper waste	-	6
Others	-	1771
Total	**382330**	**427802**
Source: Mohee, R. (2002) "Assessing the recovery potential of solid waste in Mauritius"; *Resources, conservation and recycling*, Vol. 36, Issue 1; pp. 33-43.		

Total waste generated in tonnes rose by approximately 12 per cent during the period 2005-2010 at the Mare Chicose landfill site. Table 8 shows the different types of domestic waste generated.

Table 8. Types of waste in Mauritius (tonnes)			
	Urban region	Rural region	Vieux Quatre Bornes
Garden waste/Yard waste	46	14	43
Kitchen waste/vegetable/food	23	18	25
Paper/carton	10	12	12
Plastic	3	5	13
Metal	2	5	1
Textiles	2	9	3
Glass	1	3	1
Fibres	8	24	n.a
Gravel	5	5	n.a
Miscellaneous	0	5	2
Source: Mohee, R. (2002) "Assessing the recovery potential of solid waste in Mauritius", op.cit.			

The Mauritius Glass Gallery provides insight into an innovative recycling business in Mauritius (see Box 8).

Box 8. The Mauritius Glass Gallery

The Mauritius Glass Gallery, located in Phoenix on the Central Plateau, recycles bottles obtained from the Phoenix Beverages Limited Company. Its skilled craftsmen produce a wide range of products from 100 per cent recycled glass such as home ware, decorative items, dinnerware and trophies. The gallery produces durable, affordable, and environmentally friendly products. Jean François Henri, the operation manager of the gallery states: "from raw material till the packaging of the finished products, we make use of only recycled material." For instance, used cooking oil collected from hotels at no cost is used to heat bottles to recycle the glass. Besides, natural pigments are applied to colour the glass and packaging is made of recycled paper. The 36 staff members benefitting from formal contracts can therefore be considered as green jobs.

Source: Mr Jean Francois Henri, General Manager, Mauritius Glass Gallery Ltd (December 2011)

The Solid Waste Recycling Company Ltd is another illustrative example of a recycling business in Mauritius (see Box 9). The company produces organic fertilisers, which not only improve soil quality but also enable to utilize wasted natural resources to manufacture compost. This activity generates economic value, lessens the burden of waste on the environment, and replaces costly imported fertilizers.

Box 9. The Solid Waste Recycling Company Ltd

The Solid Waste Recycling Company Ltd is the first company in Mauritius to produce compost out of municipal solid waste, generating around 20,000 tonnes of compost per year. Since the beginning of its operations, it has seen its sales continuously increase. Having reached full capacity it is now moving towards a 3-shift system to ensure 24-hour operations.

The company's waste processing system entails numerous procedures. Firstly, a manual sorting of bulky inorganic wastes is undertaken. After sorting, the waste is piled into windrows to which bioculum mixed with water is sprayed over to activate the composting process. The windrows are turned and moved every 7-10 days to favour homogenous mixing and composting. The temperature and moisture levels of the piles are closely monitored to ensure effective composting. After three turnings, the composted waste is left to dry until moisture levels reach around 20 per cent. The composted waste is then sorted mechanically in the processing units. Once the processing is completed, the semi-finished products are either stored for 15 days to ensure their maturity before delivery as coarse compost, or sieved a last time to obtain fine compost.

The objective of this composting system is to produce stable and mature compost as per norms, in order for it to be effective in enhancing agricultural productivity. The significant water retention capacity of compost makes it a great product to use during drought periods. Furthermore, using natural compost reduces the need to import chemical fertilisers that are costly for the Government.

Source: Materials were obtained from Selven Rungasamy, Manager, Solid Waste Recycling Company Ltd (September 2013)

Recycling activities also provide opportunities to link green job creation with poverty alleviation efforts. For example, the Bel-Ombre Foundation for Empowerment through its 'Grit to Gilt' project (see box 10) meets environmental as well as social objectives. It employs residents living in absolute poverty to collect glass bottles, PET bottles, aluminium cans and other similar wastes against some form of payment. Local residents also operate the recycling plant and are thus provided with a source of income. While the project monitors working conditions such as protective gear and working hours, an unknown number of informal waste collectors are still scavenging the land filling sites, collecting scrapped steel, plastic and other materials. Although these jobs provide income, they cannot be considered decent due to the unprotected, dangerous and health risky nature of the work.

Box 10. The Bel-Ombre Foundation for Empowerment Recycling Project

The southwest region has been listed by authorities as one of the 'Extreme Absolute Poverty' areas of Mauritius, with high unemployment levels. The recycling plant in Bel-Ombre, pioneered by the Bel-Ombre Foundation for Empowerment 'Grit to Gilt' project, tackles the region's environmental problems and provides employment opportunities for villagers. The recycling of glass, PET bottles, and aluminium cans reduce the volume of solid waste sent and processed at the landfill dump of Mare Chicose. Moreover, the recycling plant provides new income and jobs opportunities to the villagers. Indeed, the project has created three formal jobs at the recycling plant, four others at collection points across villages, and an unknown number of informal and indirect jobs in the collection and selling of solid waste. Besides, the revenues obtained are also used to fund other social projects benefiting the area.

This on-going project consists of a two-step approach. At first, glass, PET bottles and aluminium cans are collected from hotels and deposited in designated collection points established in each village. Glass bottles are bought at MUR 4.00 per bottle and the collection is made in plastic crates to facilitate handling. The PET bottles and aluminium cans are collected in second hand bags. They are purchased by weight, respective roughly MUR 5.00 per kilo and MUR 10.00 per kilo.

Collected materials are then processed and recycled. The glass bottles are crushed by a grinding machine, which produces glass aggregate and sand after sieving. The glass aggregate and sand are put in 20Kg bags and stored in containers until sold to potential customers. To note, the glass-grinding machine has the capacity to crush 600 bottles per hour. A shredding machine likewise processes the PET bottles, with shredded plastic also stored in 20Kg bags. The aluminium cans are also squashed and placed in 20kg bags. Moreover, newspapers and magazines are also deposited at collection points for recycling, with paper bundles sold to potential customers.

The recycling plant operates on a five-day week basis from 9.00am to 4.00pm. Both the careful selection of staff to run the plant (i.e. one supervisor, one machine operator, and one helper) and training provided by the Bel-Ombre Foundation have contributed to its success. Besides, proper procedures are also set in place to ensure decent work conditions for employees.

Source: J. Ducasse, Project Coordinator (October 2011)

4.2.4. The construction industry (constructions and construction services)

Strong linkages exist between buildings, infrastructure and the natural environment. Sustainable construction, considered as a green component of the construction industry under the output-based method, promotes ecologically sound construction practices. This includes: (i) the consideration of biodiversity in site selection; (ii) the use of environmental friendly building materials; and (iii) the application of green technologies e.g. renewable energy, energy and water efficiency technologies, and household waste management and recycling systems, to reduce the life time impact of buildings. Green building standards, such as the US Leadership in Energy and Environmental Design (LEED) standard, provide clear guidance on green building criteria. However, in the absence of such standards for Mauritius, it was difficult to quantify for sustainable construction nationally and thus extended the industry accounts. Yet, GIBB (Mauritius) Ltd provides some insight into a national company involved in environmental engineering and green construction (see Box 11).

Box 11. GIBB (Mauritius) Ltd
GIBB has undertaken major development works notably in airports, harbours, industrial estates, solid waste management, hydropower, and sewage treatment and disposal systems. GIBB (Mauritius) Ltd disposes a quality management system compliant with ISO 9001:2008, applicable to consulting, design and management services, and site based projects. The company is involved in four main activities: civil engineering, environmental engineering, structural engineering and mechanical and electrical engineering. The company employs roughly 100 workers, with only 3-4 employees specifically working in the environmental engineering unit. However, all four units carry out at least some form of green activities. Out of the total number of projects undertaken by the company in 2010, 25 per cent of them can be considered as green. For instance, the construction of a hotel in Rodrigues paid particular attention to energy and water conservation strategies (via rain water harvesting and waste water treatment for both grey and black water). Natural ventilation and daylight was also maximised throughout the hotel's architectural design.
Source: Mr M. Patte, Director of Operations and Miss B. Padaruth, Environmental Engineer GIBB (Mauritius) Ltd (October 2011)

The construction industry contributes around 6 per cent of national GDP and is considered important in both direct and indirect employment creation. The industry is expected to grow rapidly which will result in significant demand for trained professionals including, civil and structural engineers, quantity surveyors, architects, and builders amongst others. To illustrate, employment in the industry rose from 45,100 in 2000, to 52,400 in 2009 and investment increased from around MUR 15 to MUR 47 million during the same period.[22]

Despite offering huge green jobs creation opportunities, much effort still remains to green the construction industry in Mauritius. A Green Building Act could create great incentive within the industry. However, the main barriers impeding such a transition include the industry's big lobby power and resistance faced by companies in the utilisation of sustainable materials and technologies.

Nonetheless, national initiatives have been undertaken. For instance, a project titled 'Removing of barriers to energy efficiency and energy conservation in buildings in Mauritius' (2008-2012) funded by the United Nations Development Programme (UNDP) and Agence Française de Développement (AFD) promoted green construction practices. As part of the project activities, the consultancy firm ECOSIS was appointed to review existing building regulations and draft a new Building Control Bill. This Bill includes codes for energy efficiency together with several guideline documents, such as solar design guidelines.

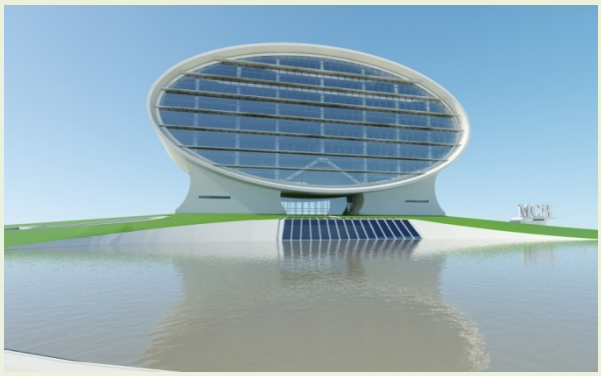
The Mauritius Commercial Bank (MCB) building is a prime example of a green building in Mauritius. Box 12 describes the building's various features.

[22] The figures are derived from the following industry associations: Mauritius Association of Architects – MAA, Institute of Engineers of Mauritius, Mauritius Quantity Surveyors Association, Mechanical, Electrical engineering contractors Association, Building and Civil Engineering Contractors Association, Association of Hotels and Restaurants of Mauritius.

Box 12.The Mauritius Commercial Bank Building

The 9-storey MCB building, at a cost of MUR 1, 65 billion, is unique because of its elliptical design and inherent environmentally friendly characteristics. The building is strategically located in Ebene, an area that has received great interest in recent years due to its growing information technology industry. Further, the area is also benefiting from the decentralisation policy of major commercial banks to move away from the city centre to reduce traffic congestion.

The building complies with the standards of the Building Research Establishment Environmental Assessment Method (BREEAM). BREEAM sets standards for best practices in sustainable building design, construction and operation and has become the leading and most widely used environmental assessment method. MCB therefore sets a world example of a green building.



The main environmentally sustainable features of the building consist of the following:

- Thermal storage system to reduce energy consumption
- Solar panels to generate part of overall energy requirements
- Optimization of building design to reduce energy losses
- Low-energy consuming lamps controlled by sensors
- 2000 photovoltaic modules to produce 430 Kw over sunny hours
- Dual water reticulation for building usage (rain water collected and potable water from mains)

Overall, in comparison to a conventional building, MCB's energy savings approximate 32 per cent arising from its various initiatives.

The MCB building is able to accommodate 1,100 staff. It includes two auditoriums with seating capacities of 250 and 20, and has parking facilities extending over 263 parking bays. Besides, the building is also particularly resistant to cyclonic conditions, up to wind speeds of 275 km/hr.

Source: Ms Leclezio Aurelie, Sustainable Development Coordinator (December 2011)

4.2.5. The energy and electricity industry (fossil fuel electricity and renewable electricity)

As emphasized in the Maurice Ile Durable agenda, a key objective is to foster the use of renewable energy sources to rely less on imported fossil energy and help improve the country's current account deficit. Fuel imports have experienced a steady upward trend, representing more than 15 per cent of total imports. In fact, the energy dependency ratio in Mauritius (total energy that is imported) stands at more than 80 per cent. Yet, the energy and electricity industry offers great opportunities for harnessing renewable sources and generating green jobs.

Electricity in Mauritius, considered as an output under the output-based method, is generated from various sources, including fuel oil, coal and bagasse. Recently, gas produced from landfill waste has been used to produce electricity in a renewable manner. The study was, however, only able to account for jobs deriving electricity from bagasse. The findings revealed that the whole industry currently employs around 2,000 workers, with formal contracts observed throughout the energy and electricity industry. As one quarter of workers are involved in by-firing bagasse, green jobs were estimated at 448 and conventional employment at 1,501.

Two case studies were selected to exemplify green jobs opportunities in the energy and electricity industry. The first is a GEF-SGP project involved in biogas production from cattle waste (see Box 13) and the other is a project by Sotravic Ltd that transforms landfill waste into electricity production (see Box 14).

Box 13. GEF-SGP project biogas production from cattle waste

The GEF-SGP project titled "An effective and economic system of livestock waste treatment with generation of biogas" (2009-2011), targeted a livestock keepers association to promote the use of digesters for biogas production. The project has helped improve farmers' livelihoods by providing them with an alternative source of energy and paid particular attention to environmentally sustainable methods of agricultural production.

A number of activities were undertaken by the GEF-SGP project. These included the construction of biogas digesters and farmer technical training for capacity building. 10 digesters of 10 m^3 were built to treat cow dung to produce biogas for cooking and water heating. As a result, roughly 1.5 m^3 of biogas is generated daily which is sufficient for 2-3 hours of cooking. Slurry produced as a by-product from the digesters is encouraged to apply to fodder crops as organic fertilizers. Moreover, training was an important project component, which had a specific gender focus with a total of 13 women trained on the use, management and maintenance of the digesters by the Animal Production Division of the Ministry.

Project beneficiaries have achieved considerable energy savings from producing biogas. To illustrate, one of the beneficiaries previously consumed about 4 gas bottles of 12 kg per month for cooking, costing roughly MUR 1, 200. Now, the farmer only uses gas bottles in case of insufficient biogas production. This represents roughly 1 gas bottle every 3-4 months. Overall, the project has enabled farmers to benefit from reduced gas bills and has provided additional revenue from selling slurry based fertilizers.

The project activities are sustainable as farmers were trained on how to operate and clean their biogas digesters. Besides, additional technical support is still available through the Animal Production Division of the Ministry.

Source: Mrs Pamela Bapoo-Dundoo, GEF-SGP Coordinator (January 2012)

Box 14.The Mare Chicose Landfill Gas to Energy Project

The Mare Chicose Landfill site, located in the Grand Port District, has been operational since 1997. The site occupies an area of about 35 hectares and can accommodate 3 million m^3 of waste. On average 1,300 tonnes of solid waste is disposed per day, representing approximately 400,000 tonnes per year. The site is under the responsibility of the Ministry of Local Government and Solid Waste Management but is regularly contracted to private investors.

In December 2006, the Joint Venture Bilfinger-Berger/Sotravic Ltée embarked on a ten year contract for the operation and post-closure management of the site. One of the specificities of the contract was the installation of a landfill gas collection system. It was later also suggested to develop a landfill gas to energy facility to generate electricity.

In July 2011, an Energy Supply and Purchase Agreement (ESPA) was signed between Sotravic and the Central Electricity Board (CEB). In November 2011, a 2-megawatt (MW) facility was commissioned to produce electricity and feed the CEB's grid. The capacity of the power plant was further expanded in 2012 to reach a total of 3MW. The 3 MW Mare Chicose gas to energy facility includes the following: 3 sets of 1 MW landfill gas generators; 3 transformers 400/22kV; landfill gas treatment module; 22kV switchgear; electrical works; offices, store and associated civil works. This represents a total investment of MUR 200 million.

The facility provides environmental benefits, as harnessing landfill gas reduces the environmental impacts of methane emissions that would otherwise result from landfill operations, thereby improving air quality.

In terms of employment, the facility has created 7 direct jobs and more than 50 indirect jobs. Training has been provided to employees by the equipment supplier and landfill consultant. Besides, engineers from Hoffstetter, Bilfinger Bergerand Finning/Caterpillar also offered training in fluid mechanics, thermodynamics, structural mechanics, electrical machines, and civil engineering.

Source: Mr Charles Deybley, Director, Socravit Company Ltd (January 2012)

4.2.6. The water industry

The water industry in Mauritius was assessed based on the natural resource conservation method. Like the forestry industry, the study examined whether national institutions are enforcing sustainable water management policies and strategies. To conclude whether such policies are effective, the indicator of sustainable fresh was use was applied, which enabled to determine the number of employment within the industry that qualifies as green jobs.

The water industry in Mauritius comprises the following institutions: the Water Resources Unit (WRU), the Central Water Authority (CWA), the Waste Water Management Authority (WMA), and the Irrigation Authority.[23]

The water policy in Mauritius was developed by the Water Resource Unit of the Ministry of Energy and Public Utilities. It promotes sustainable water management as it aims to: (i) ensure water distribution to all; (ii) develop optimum allocation principles; (iii) ensure regular monitoring for the

[23] The WRU is responsible for the assessment, mobilization, control, development, management and conservation of water resources; the CWA is responsible for the treatment and supply of water for domestic, commercial and Industrial purposes, the WMA is responsible for managing waste water, and the irrigation Authority is responsible for irrigation purposes.

conservation, protection and enhancement of water resources; and (iv) develop an appropriate legal and regulatory environment.

Moreover, various initiatives undertaken by the different national institutions ensure sustainable fresh water supply. For instance, since 1993, the Water Resources Unit has implemented numerous projects to enhance watershed management to harness the optimum and sustainable amount of water resources. The WRU has also established an integral plan to exploit additional water resources to meet the water requirements of various economic industries until 2040. This includes the development of ground water, construction of run-of-river diversion schemes and a number of storage dams. As an initial development, the construction of the Midlands dam with a capacity of 25.5 mm^3 started in January 2000 and was completed in December 2002. In addition, existing water resources infrastructure such as dams, dykes and canals have also been rehabilitated.[24]

The Central Water Authority has since 1994 also undertaken major efforts. It has replaced old and obsolete potable water infrastructure, accessed additional water resources, increased water treatment capacity, upgraded and extended the potable water distribution network, and enhanced drinkable water quality.

The levels of all water resource systems in Mauritius are constantly monitored for better management. Regular testing and sampling of both surface and ground water is being undertaken to safeguard against pollution. Measures to enhance water quality have been implemented, with two fully equipped laboratories established. One of the laboratories specifically deals with monitoring the quality of treated water to ensure compliance with WHO guidelines on potable water. As no major outbreaks or increased incidence of water-borne diseases have occurred, it can be argued that water supplies in Mauritius are safe. The second laboratory focuses on monitoring the quality of raw water resources. For instance, it measures pollution levels in aquifers and watercourses. A map illustrating identified polluting industries across the country has been created.

Based on the above, Mauritius clearly disposes of policies and initiatives governing the water industry that ensure sustainable fresh water supply. This public industry can therefore be considered as green. Besides, with formal contracts observed, the 1050 jobs accounted for in the water industry thus all qualify as green jobs.

[24] In this context, a safety analysis of seven storage dams was carried out in 1997. Based on the results of these studies, these dams are being rehabilitated to enhance their safety and life and minimise seepage losses. Mare aux Vacoas, the largest existing storage dam, has been fully rehabilitated in the year 2000, and the rehabilitation of Municipal Dyke which supplies water to the capital was completed in April 2002. The rehabilitation of other storage dams is being done in phases starting in 1999 and expected to be completed in 2007/2008. One main feeder canal has been rehabilitated in November 2002, and four other canals will be rehabilitated over the next four to five years.

4.3. The Tertiary Sector: hotel, recreational service, transport, sewage and environmental protection, and financial services industries

The green jobs assessment examines the hotel, recreational services, transport, sewage and environmental protection, and financial services industries within Mauritius' tertiary sector. The industry accounts of the hotel, transport and recreational services industries were extended to feature the identified green activities. For the sewage and environmental protection industry it was unnecessary to extend the industry account as it was classified as 100 per cent green. Concerning the financial services industry, it was only possible to quantify for conventional employment, as green practices are minimal and only starting to flourish.

Table 9. Green jobs in the tertiary sector in Mauritius

	Economic Industries	Conventional Employment	Green Jobs
15	Hotel - conventional	18544	
	Hotel - green		654
	Hotel - towards green		2593
17	Land transport	29297	
	Public bus transport		11304
20	Financial intermediation, insurance and auxiliary services	13200	
27	Sewage and refuse disposal, sanitation and other environmental protection services		1899
29	Recreational, cultural and sporting services	7910	
	Recreational -green		1783
Source : Authors (2011)			

4.3.1. The hotel industry

Tourism is the third pillar of the economy after textiles and sugar agriculture. It significantly contributes to economic growth and has been a key factor in Mauritius' overall development. Over the past two decades tourist arrivals have increased at an average annual rate of 9 per cent, resulting in an increase of about 21 per cent in tourism revenues.

In 2010, 112 hotels were recorded with a total capacity of 12,075 rooms (24,698 beds). The average room occupancy rate for all hotels was 65 per cent. Tourist arrivals were estimated at about 934,000 compared to 871,000 in 2009, and tourism earnings were estimated at about MUR 39.5 billion in 2010 up from MUR 35.7 billion in 2009. Tourism's contribution to national GDP represents roughly 8.2 per cent.

From 1970 to 2010, tourist arrivals rose from 18,000 to 934,827, nearing 1 million tourists. Arrivals from Europe have risen by 4.5 per cent, reaching 605,401 tourists in 2010. French tourists increased by 9.6 per cent, representing the leading market. Mauritius has been constantly pursuing marketing campaigns in order to remain a popular tourist destination. For instance, hotels often offer heavy discounts as a means of attracting international tourists to secure their market share. [25]

[25] National Tourism Authority (2010); The Tourism Employees Welfare Fund (2010); The Tourism Finance and Audit Fund (2010).

Tourism may be called upon to play an even more important role given the phasing out of the MFA under the WTO Agreements, which ceased preferential access of textile products to western markets. With several institutions in Mauritius shaping key policies governing tourism, such as the National Tourism Authority,[26] the National Tourism Policy promotes "selective, up-market, quality tourism".

The hotel industry is an important source of job creation nationally, representing 7 per cent of the total labour force. Employment is mainly generated in accommodation and food and beverages. Additional employment opportunities include transport, sight attractions, marketing, and tourism services.

To distinguish sustainable practices within the hotel industry, it is important to focus on hotel's operation systems. Green practices include amongst others energy and water conservation strategies, and waste recycling and reuse.

For the purpose of the assessment, water and electricity efficiency were used to examine the industry under the process-based method. Hotels were classified according to their water and electricity intensity. The 10 per cent most efficient hotels in water and electric use are considered green, and those efficient in one resource are considered as 'moving towards green'. Findings accounted for 18,544 jobs in conventional employment, while the identified green and towards green components of the industry respectively provide 654 and 2375 jobs.

Regarding decent work conditions, some irregularities were reported in terms of contracts, working hours and minimum pay. There is, however, no evidence of a systematic break of national labour law within the hotel industry. Besides, the Green Globe certification certifies employee protection, local employment, basic services for workers and no practices of exploited, forced and bonded labour. Some of the 10 per cent most energy and water efficient hotels feature this Green Globe label, such as the prestigious Labourdonnais Waterfront Hotel in Port Louis (see box 15). Indeed, it was observed in many hotels that green practices and decent work conditions seem to be aligned and mutually reinforcing. It can therefore be concluded that in principle workers in the identified green and towards green components of the hotel industry also enjoy decent work conditions.

To illustrate green initiatives within the hotel industry, three examples are presented below in box 15.

[26] The Tourism Authority is responsible for regulating the overall tourism industry. The Tourism Employees Welfare Fund establishes and carries out various activities that are desirable and promote the welfare of employees of tourism enterprises and their families. The Finance and Audit fund finances tourism infrastructure, social amenities for local inhabitants of tourism areas and develops and maintains tourism projects relating to eco-tourism and cultural-tourism.

Box 15. Green initiatives in the hotel industry in Mauritius

Labourdonnais Waterfront Hotel

The Labourdonnais Waterfront Hotel, situated in Port Louis, has carried out a number of green strategies. It was certified in 2006 with the ISO standard ISO14001:2004 (an environmental management standard) and has also received the Green Globe label. Environmental initiatives undertaken by the hotel include: light censors in offices; energy saving light bulbs; halogen lights replaced by neon; the setting on a timer of both external lighting and air-conditioning; grey water re-used for washing; and an environment risk assessment exercise that was initiated in 2005. Around 200 employees work in the hotel and all are involved in one way or the other with promoting environmental sustainable practices.

Mon Choix Ecolodge

The Mon Choix Ecolodge is considered as the first internationally graded ECO hotel in Mauritius. It provides a distinctly new approach to tourism as the hotel not only promotes environment protection, waste management, water and energy saving measures, but also encourages the consumption of local products and services such as nature sports, hiking in tropical forest and national parks.

The Long Beach Hotel

The Long Beach Hotel, located near Belle Mare in the north east of Mauritius, has heavily greened its operation processes. The hotel has undertaken major initiatives to increase energy efficiency, which have notably led to 40 to 50 per cent energy savings in air-conditioning. This has been achieved through the regular maintenance of filters to ensure optimal use of the air-conditioning systems. Room detectors have also been installed to reduce intake of energy and to switch off air conditioning when rooms are left vacant. Moreover, the hotel's situation ensures constant ventilation, which helps keep the building cool and reduce air conditioning needs.

Other strategies have also been implemented to green the hotel. These include: the use of fried oil to fuel the hotel vehicles; the recycling of heat from air-conditioning systems for water heating; the treatment of water in the swimming pools and washing machines; and the composting of waste for agricultural purposes. The hotel has also installed solar thermal water heaters and solar photovoltaic to produce energy in a renewable manner.

Long Beach hotel has not employed new personal to green its operations, as it has focused on training its staff on such green practices. For instance, electricians, plumbers and system repairers have increased their capacity on sustainable operations. Besides, the hotel regularly organises workshops to further sensitize its personnel on issues related to energy savings to promote well-developed internal management systems. Around 30 to 40 employees in the hotel can be considered as green jobs.

Source: L. Horri Quality Assurance Coordinator Labourdonnais Hotel (December 2011); Mon Choix Ecolodge website http://www.ecomauritius.com; G. Romain, Development Manager Long Beach Hotel (December 2011)

4.3.2. The recreational service industry

The conventional industry accounts, based on the System of National Accounts (SNA) classification provided by the United Nations, include recreational activities- such as casinos and racing amongst many others. However, for the purpose of the assessment, recreational activities based on the sustainable use of natural resources, such as diving and forest hiking were qualified as green activities under the output-based method. For instance, tourist guides in the National Casela Nature & Leisure Park can be considered as an economic service (output) that is environmentally friendly.

Findings however revealed that activities in Mauritius' national parks are negligible. Yet, employment generated in the hiring of motor boats for game fishing were identified as the most prominent sustainable activity within the recreational service industry which also complied with the decent work indicator used in this study. Of course, it was assumed that game fishing is not depleting fish resources.

Table 10. The recreational, cultural and sporting services in Mauritius

	Employment	Gross output (Rs 000)	Value added (Rs 000)
Hire of motor boats for game fishing with operator	1,783	621,094	301,354
Other	6,128	4,452,125	3,620,381
Total	7,910	5,073,220	3,921,735

Source: Central Statistics Office, Mauritius (2010)

A GEF-SGP project presented below provides an illustration of green jobs creation opportunities within the recreational services industry (see Box 16).

Box 16. GEF-SGP Project: employment in green recreational activities

In 2001, sand miners in Pointe des Lascars were left unemployed after a ban on sand-mining practices. This affected around 150 families out of a total of 250 villagers. Under the GEF-SGP project, "Integrated Environment & Community Development Project at Pointe des Lascars" (2003-2005), the ex-sand miners and their respective families were encouraged to develop alternative income generating activities linked to biodiversity conservation. Activities included: the development of an organic market garden; a mangrove propagation and nursery area for shoreline protection; and rehabilitation programmes against erosion and siltation. The rental of kayaks and bicycles were also promoted to encourage the development of an eco-tourism village.

This project highlights the importance of transitional programs to retrain workers left unemployed due to environmental policies. This is key to promote a just transition towards a green economy. The design of active labour market policies is also vital to promote green jobs opportunities, such as in the recreational service industry.

Source: Mrs Pamela Bapoo-Dundoo, GEF-SGP Coordinator (January 2012)

4.3.3. The transport industry (land transport; public bus transport)

The transport industry in Mauritius includes both conventional means comprising private cars (sales and repair) and taxis and public bus transport, which is considered green given higher energy efficiency per number of passengers per kilometre travelled. To note, employment in public bus transport was accounted for under the output-based method as it is considered a green public service

Even though Mauritius' old public buses are still highly polluting with soot and black carbon emitted, they still however emit less CO_2 per passenger per kilometre travel compared to cars. The public bus transport system clearly offers opportunities for further greening and development, and thus job creation. With formal contracts provided in this public function, all jobs can be considered decent.

Employment in public bus transport is estimated at 11,304 green jobs, representing 28 per cent of the total industry.

4.3.4. The sewage and environmental protection industry (sewage and refusal disposal, sanitation and environmental protection services)

The output-based method was applied to assess whether the industry can be considered green. As the treatment of sewage and refusal as well environmental protection provides a service (output) that improves environmental quality it is classified as green. All jobs within this activity are considered as green jobs as they contribute to environmental protection and employees benefit from formal contacts. There is still however much scope for promoting job creation by developing sewage treatment facilities nationally. Indeed, despite the National Sewerage Master Plan to connect 50 per cent of the population to the public sewer network by 2013, only 26 per cent of the Mauritian population is currently connected to the public sewer network with the vast majority using on-site waste water disposal systems. The industry employs 1899 green jobs.

Employment in environmental protection can for instance be found in safeguarding lagoon and marine resources within the fishing industry. Such activities are considered green based on the natural resource conservation method. Even though no direct market value or private good results from conservation, jobs enhancing sustainable marine systems (public goods) have an indirect effect on overall fishing productivity. There is clearly a strong argument for public investment in marine conservation and for providing incentives to the private sector in such conservation activities.

4.3.5. The financial service industry (financial intermediation, insurance and auxiliary services)

The green economy transition relies on a number of appropriate and enabling domestic policy frameworks with the financial service industry playing an essential role in promoting a green economy and thus green jobs. However, it is still challenging to create the necessary mechanisms and incentives to facilitate the allocation of financial resources to green activities across the economy.

The financial service industry in Mauritius was analysed under the output-based method, with green loans (an economic output) distinguished as a green activity within the industry. Several banks were identified as involved in green financial service schemes in Mauritius. For instance, the Agence Française de Developpement (AFD) has set up a partnership to provide Green Credit Lines (GCLs) to four banks: Mauritius Commercial Bank (MCB), the State Bank of Mauritius (SBM), Banque Des Mascareignes and Standard Chartered Bank. AFD has provided a €40 million guarantee for GCLs to promote, amongst others, investment in renewable energy (wind farms, solar plants, and biomass plants) and energy efficiency. The main advantages provided to partnering banks under AFD's Green Credit Lines include:

- Broader risk management extending beyond conventional credit and interest rate risks, to include environmental aspects. This promotes a real holistic approach towards credit assessments, as both financial and non-financial elements are taken into account.

- Improved reputation and enhanced stakeholder perception.
- Increased opportunities to tap into new markets that are not only financially viable but eco-friendly.
- The provision of technical expertise and advisory services.

In addition, in September 2009, AFD signed a "Convention de Financement" to the amount of €1 million to support activities under the Maurice Ile Durable Fund.

The two main commercial banks in Mauritius- MCB and SBM- represent the biggest market share in terms of loans and deposits. Assessing their business activities in energy efficiency and renewable energy investments helps illustrate advancements so far made by the Mauritian financial service industry in going green. Boxes 17 and 18 provide specific information on SBM and MCB green finance initiatives.

Box 17. The State Bank of Mauritius green finance initiative

The SBM's green loan facility, labelled as ECOLOAN, provides a new financial opportunity for those who wish to invest in solar Photovoltaic (PV) systems to generate electricity for either their own consumption or for the Central Electricity Board. This banking facility targets both individuals and entrepreneurs for either office or home use who wish to reduce their carbon footprints.

The SMB ECOLOAN facility entails the following characteristics:

- Loan conditions: Up to 7 years
- Limit: Minimum loan amount is MUR 100,000. The client can borrow up to 100 per cent of the acquisition and installation costs (including VAT) of a PV system
- Procedure: Applicants must fill in an application form. Several documents must accompany the application. These include the following: national identity card; recent proof of address; salary slip; quotation from supplier detailing cost of the PV system and installation cost; product specifications of the PV system, including compliance with internationally recognised standards as recommended by the Central Electric Board; the expected delivery date; the payment terms; the warranties offered; site plan of property offered as security; title deed/lease agreement.

ECOLAN provides numerous benefits to customers such as low interest rates from 7.4 per cent per annum; up to 100 per cent financing; a reduction in electricity bills; economic benefits through savings on utility bills; and opportunity to export excess electric production to the Central Electricity Board.

Source: The State Bank of Mauritius: http://www.sbmgroup.mu/home.php (December 2011)

A growing number of green loan practices are starting to develop within Mauritius' financial service industry. These banking approaches certainly constitute a great opportunity to green Mauritius' financial service industry and help provide added resources to green activities across its economy. This trend fits within an increasingly specialized global financial industry in green investment banking and green funds.

The United Nations Environment Programme Finance Initiative, based in Geneva, constitutes an international partnership between UNEP and the financial service industry. It comprises over 200

institutions ranging from banks, insurances and fund managers, all sharing the common objective of strengthening financial performance and investments with environmental sustainability. Banks can play a major role in ensuring that funds are directed to projects incorporating sound environmental practices. Insurance companies can likewise insure against environmental risks, such as natural disasters. To date, the partnership is heavily based on banks, which represent 66 per cent of all members. European institutions account for nearly half of all institutions, followed by the Asia-Pacific region representing 29 per cent of institutions.

Figure 2: UNEP-FI: signatories by region and categories

Source: UNEP-FI: http://www.unepfi.org/signatories/

Box 18. The Mauritius Commercial Bank green finance initiative

The Mauritius Commercial Bank (MCB) offers green loans to companies investing in projects that promote sustainable development. To receive such loans, companies need to comply with several conditions. These include: a minimum investment of MUR 1 million; all funds need to be exhausted prior to receiving the disbursed loan; and investment projects need to be recognised as green by an expert, with final approval provided by the AFD. This green loan facility falls under AFD's partnership with four Mauritian banks, including the MCB, providing Green Credit Lines (GCLs) of a total amount of €40 million.

The various characteristics of the green loan facility are detailed below:

Eligibility: A minimum of MUR 1 million for investment in environmental friendly projects with a maximum of MUR 300 million.

Conditions: Once the client has proved that the loan has been spent on the project, the granted amount, equivalent to 12 per cent of the loan, is disbursed. In terms of refunds, the client benefits from a grace period of up to 3 years, applicable for interest repayments only. The duration of the loan is for a minimum of 4 years. Interest rates are mainly dependent on the risk profile of the investment and/or of the borrower. The project must have a positive impact on environmental performance indicators, which are agreed prior with the bank. Commissions and fees charged are set according to the bank's standard business practices.

Procedure: Clients need to submit a formal application by filling in the investment proposal form and a business plan. MCB evaluates whether projects are eligible and economically viable. It then submits a request letter and eligibility assessment form to the AFD, who closely examines the applications and grants the bank a drawing right. MCB then disburses the money to the client who repays in instalments and MCB pays 12 per cent 'cash back' on evidence of payments executed.

The MCB has since revised its conventional credit processing approach as a result of its green loan facility. It has upgraded its approach to encompass social and environmental aspects to increase the number of companies that can benefit from loans.

Source Ms A. Leclezio, Mauritius Commercial Bank (2011)

5. Potential of green jobs creation: Modelling and projections

5.1. Direct and indirect output and employment multipliers

Green jobs in Mauritius represent 6.3 per cent of total employment for the year 2010-2011, based on the assessment findings detailed in chapter four (see table 4). Table 13 shows the percentage distribution of total output and employment for each industry. Dividing employment levels by output enable to calculate the employment coefficients of industries. Such coefficients indicate the number of jobs needed to produce one unit of output for each industry, which constitutes direct employment.

Table 11. Percentage distribution of output and employment per economic industry in Mauritius

	Economic industries	Gross output (% distribution)	Employment (% distribution)	Employment coefficient (per Rs million)
1	Products of agriculture, horticulture and market gardening - conventional	1.070	3.719	4.907
	Products of agriculture, horticulture and market gardening - green	0.011	0.038	4.914
2	Forestry	0.008	0.182	32.562
3	Sugar plantation -Conventional	1.542	2.491	2.280
	Sugar plantation - towards Green	0.059	0.096	2.279
4	Live animals and animal products	0.865	0.532	0.869
5	Lagoon	0.011	0.377	47.620
	off-lagoon	0.101	0.672	9.428
6	Ores and Minerals	0.025	0.043	2.471
7	Meat, fish, fruit, vegetables, oils and fats, grain mill products, starches and starch products and beverages	8.294	2.329	0.396
8	Sugar - manufacturing phase	2.053	0.340	0.234
9	Yarn and thread; woven and tufted textile fabrics	1.444	1.035	1.012
	Yarn and thread; woven and tufted textile fabrics – green	0.143	0.127	1.250
	Yarn and thread; woven and tufted textile fabrics - towards green	0.042	0.036	1.200
10	Knitted or crocheted fabrics; wearing apparel	6.344	7.453	1.658
	Knitted or crocheted fabrics; wearing apparel – green	0.366	0.303	1.166
	Knitted or crocheted fabrics; wearing apparel - towards green	0.924	0.900	1.375
11	Other manufactured goods	8.756	8.242	1.329
	Recycling industry	0.044	0.023	0.747
12	Constructions and construction services	8.888	9.676	1.536
13	Wholesale and retail trade services	8.121	15.911	2.765
14	Lodging; food and beverage serving services	1.561	2.779	2.513
15	Hotel sector: conventional	5.307	3.323	0.884
	Hotel sector-green	0.061	0.117	2.699
	Hotel sector -Towards green	0.760	0.465	0.863
16	Water, air, supporting and auxiliary transport services	7.027	1.766	0.355

17	Land transport	1.140	5.249	6.497
	Public bus transport	1.512	2.025	1.891
18	Fossil fuel electricity	2.266	0.269	0.167
	Renewable energy	0.568	0.080	0.200
19	Water	0.271	0.188	0.980
20	Financial intermediation, insurance and auxiliary services	7.416	2.365	0.450
21	Real estate services	3.556	0.316	0.125
22	Telecommunications services; information retrieval and supply services	2.272	0.650	0.404
23	Other business services	5.070	5.938	1.653
24	Public administration and other services to the community as a whole; compulsory social security services	4.543	7.006	2.176
25	Education services	2.574	5.519	3.026
26	Health and social services	2.356	3.404	2.039
27	Sewage and refuse disposal, sanitation and other environmental protection services	0.375	0.340	1.279
28	Services of membership organizations	0.083	0.069	1.178
29	Recreational, cultural and sporting services	1.311	1.417	1.526
	Recreational sector –green	0.182	0.319	2.475
30	Other services	0.677	1.868	3.894
		100%	100%	
Source : Authors (2011)				

As explained in section 2, changes in the output or employment level in one industry, lead to subsequent changes in the output and employment levels of other industries. This is due to strong inter-industrial linkages, through supply and demand chains. An essential feature of the green jobs assessment is the analysis of these linkages captured by the output and employment multipliers. Indeed, policy-makers are interested in the total net effect on employment levels and economic output of different policy and investment scenarios. This section, therefore, provides an estimate of the following: (i) direct output multiplier; (ii) indirect output multiplier; (iii) direct employment multiplier; (iv) indirect employment multiplier; and (v) type 1 employment multiplier. It compares the multipliers of the green and conventional industry accounts to examine the effects of investing in green as opposed to conventional industrial activities.

For each industry, the effect of a rise in total aggregate demand of MUR 1 million is analysed. Output multipliers measure the output responsiveness of supplying industries to a unit increase in the output of a particular industry. The direct effect relates to immediate increases in demand in inputs from the industry itself to produce for the MUR 1 million rise in total aggregate demand. Moreover, subsequent demands in inputs through backward linkages amongst the different industries represents the indirect or 'industrial support effect'. Finally, the total output multiplier combines both direct and indirect output multipliers.

The type 1 employment multiplier indicates the number of indirect jobs created given additional direct employment in a particular industry. It is calculated based on the ratio of total employment generated (direct and indirect employment) to the direct employment required to satisfy one unit

rise in total aggregate demand. Accordingly, the type 1 multiplier indicates the number of jobs that are dependent or linked to one direct job created in a particular industry.

In order to contextualise the multiplier analysis, it is important to consider industries' contribution to gross output. An industry that increases its output by 1 per cent but contributes 10 per cent of the economy's gross output will certainly have a much higher impact on output and employment compared to an industry that only contributes 1 per cent, even if the multipliers are higher. As depicted in table 13, industries contributing more than 8 per cent of gross output include the following: the processing and manufacturing of meat, fish, fruit, vegetables and other food products; other manufactured goods; construction; and wholesale and retail trade services.

5.1.1. The Primary Sector

The primary sector analysis reveals that the conventional component of the non-sugar agricultural industry uses around 4 per cent of its own output, 1 per cent of animal product, and around 4 per cent of products from manufacturing industries, as inputs for its own production. Imported inputs are high, especially due to the use of chemicals fertilisers and pesticides.

In contrast, the sustainable components of the sugar and non-sugar agricultural industries were adjusted to reflect their lower use of chemical fertilisers (around 80 per cent less), energy (15 per cent less) and water (10 per cent less). Thus, in comparison with the conventional industry accounts, the green components use 5 per cent of their own output, relatively more animal products and rely less on imported inputs for production.

Examining the multipliers demonstrates that both the total (direct and indirect) output and employment multipliers for the conventional component of the sugar agriculture industry (sugar plantation) are lower in comparison to the green component (table 14 and 15). Likewise, the multipliers of the green component of the non-sugar industry (products of agriculture, horticulture and market gardening) are higher than its conventional counterpart. It can be observed that the multipliers for green agricultural activities slightly exceed those of conventional practices. This is explained by the strong inter-industrial linkages arising from green practices, such as packaging, irrigation systems, organic fertilisers and transportation. Besides, sustainable agriculture tends to rely more on inputs produced domestically, notably organic fertilizers.

Table 12. Output multipliers for the primary sector

	Economic industries	Total output multiplier	Direct multiplier	Indirect multiplier
1	Products of agriculture, horticulture and market gardening - conventional	1,191	0.145	0.046
	Products of agriculture, horticulture and market gardening - green	1,203	0.155	0.048
2	Forestry	1,041	0.031	0.010
3	Sugar plantation -Conventional	1,210	0.162	0.049
	Sugar plantation - towards Green	1,301	0.223	0.078
4	Live animals and animal products	1,482	0.360	0.122
5	Lagoon	1,135	0.097	0.038

	off-lagoon	1,135	0.097	0.038
6	Ores and Minerals	1,179	0.152	0.027
7	Meat, fish, fruit, vegetables, oils and fats, grain mill products, starches and starch products and beverages	1,658	0.447	0.211
Source : Authors (2011)				

For the fishing industry, the output multipliers are identical for the unsustainable and sustainable fisheries (lagoon and off-lagoon). This reflects the fact that data was unavailable to adjust the production structures of the off-lagoon fishery. However, employment data was adjusted and a considerable difference between these two fisheries can be observed. Lagoon fishing displays a much higher employment multiplier. In this particular case, it indicates the over-exploitation of the lagoon fishery and a decreasing fish stock, which has been confirmed by research. In comparison, the off-lagoon fishery, which is considered green due to its healthy fish stock, displays a lower employment multiplier.

The employment multiplier in forestry is strikingly high: increasing final demand for forest products and services by one million creates 33 jobs. The reason is the high labour intensity in forestry activities, notably tree planting. However, it should be highlighted that forestry work is only labour intensive in very specific periods in time, notably during afforestation work. Once trees are planted the labour intensity drops and eventually depends on the forest usage. Indeed, employment multipliers tend to be higher for commercially used forests as opposed to conservation forests.

The third column of table 15 shows the type 1 employment multiplier for the primary sector industries. Overall, the green extensions of the different industries exhibit higher type 1 multipliers compared to their conventional counterparts. To illustrate, for every additional 100 workers within the green component of the sugar plantation industry, this creates employment in other industrial activities by 18 workers compared to 12 arising from the conventional activities.

Table 13. Employment multipliers for the primary sector

	Economic industries	**Total employment multiplier**	**Direct employment**	**Indirect Employment**	**Type 1 Employment Multiplier**
1	Products of agriculture, horticulture and market gardening - conventional	5,351	4,907	0,444	1,090
	Products of agriculture, horticulture and market gardening - green	5,410	4,914	0,496	1,101
2	Forestry	32,612	32,562	0,050	1,002
3	Sugar plantation -Conventional	2,565	2,280	0,285	1,125
	Sugar plantation - towards Green	2,690	2,279	0,411	1,180
4	Live animals and animal products	2,028	0,869	1,159	2,334
5	Lagoon	47,841	47,620	0,221	1,005
	off-lagoon	9,649	9,428	0,221	1,023
6	Ores and Minerals	2,974	2,471	0,503	1,204
7	Meat, fish, fruit, vegetables, oils and fats, grain mill products, starches and starch products and beverages	1,520	0,471	1,049	3,226
Source : Authors (2011)					

5.1.2. The Secondary Sector

The secondary sector displays the highest average output multiplier of 1.63, mainly driven by the sugar, textile, and energy and electricity industries. This is not surprising given that manufacturing significantly contributes to the country's overall economic performance. Therefore, an output increase in one of the secondary industries can generate considerable output increases in other industries and sectors both directly and indirectly.

For instance, if total aggregate demand for recycling were to increase by MUR 1 million, the total output responsiveness for the Mauritian economy would subsequently increase by MUR 1.48 as depicted in table 16.

Table 14. Output multipliers for the secondary sector

	Economic industries	Total output multiplier	Direct multiplier	Indirect multiplier
8	Sugar - manufacturing phase	1,988	0.812	0.176
9	Yarn and thread; woven and tufted textile fabrics	1,577	0.391	0.186
	Yarn and thread; woven and tufted textile fabrics - green	1,539	0.370	0.170
	Yarn and thread; woven and tufted textile fabrics - towards green	1,553	0.378	0.176
10	Knitted or crocheted fabrics; wearing apparel	1,548	0.376	0.173
	Knitted or crocheted fabrics; wearing apparel - green	1,532	0.366	0.166
	Knitted or crocheted fabrics; wearing apparel - towards green	1,538	0.370	0.168
11	Other manufactured goods	1,477	0.344	0.133
	Recycling	1,477	0.344	0.133
12	Constructions and construction services	1,466	0.332	0.134
18	Fossil fuel electricity	1,582	0.394	0.188
	Renewable energy	2,550	0.685	0.864
19	Water	1,410	0.261	0.148

Source : Authors (2011)

In general, no major differences can be identified when comparing the output multipliers for conventional and green industrial activities within the secondary sector, apart for the energy and electricity industry. This is explained by the fact that insufficient data was available to estimate the production functions of greener industrial practices, which are only starting to develop in Mauritius' secondary sector.

For instance, it is challenging to compare conventional and green construction practices. The relatively small number of green construction activities and limited data availability on these ad-hoc initiatives make it difficult to account for such green extensions. Yet, the construction industry offers great potential for greening. It generates a total output multiplier of 1.47 and relies on a significant number of inputs from other domestic industries for its own operations. With the construction industry in Mauritius booming as demand for new buildings is on the rise due to various government policies, it offers great scope for greening and green jobs creation opportunities.

Table 15. Employment multipliers for the secondary sector					
	Economic industries	**Total employment multiplier**	**Direct employment**	**Indirect Employment**	**Type 1 Employment Multiplier**
8	Sugar - manufacturing phase	2,312	0,246	2,066	9,399
9	Yarn and thread; woven and tufted textile fabrics	1,534	0,704	0,830	2,180
	Yarn and thread; woven and tufted textile fabrics – green	2,546	1,735	0,811	1,467
	Yarn and thread; woven and tufted textile fabrics - towards green	18,179	17,361	0,818	1,047
10	Knitted or crocheted fabrics; wearing apparel	2,038	1,259	0,779	1,619
	Knitted or crocheted fabrics; wearing apparel – green	12,597	11,826	0,771	1,065
	Knitted or crocheted fabrics; wearing apparel - towards green	3,073	2,299	0,774	1,337
11	Other manufactured goods	2,025	1,271	0,754	1,593
	Recycling industry	1,501	0,747	0,754	2,009
12	Constructions and construction services	2,251	1,536	0,715	1,465
18	Fossil fuel electricity	0,795	0,167	0,628	4,752
	Renewable energy	1,351	0,200	1,151	6,766
19	Water	1,303	0,980	0,323	1,330
Source : Authors (2011)					

The energy and electricity industry presents significant differences in the output multipliers between its conventional and green industry accounts. Renewable energy generates a stronger total output multiplier effect of 2.55 compared to 1.58 for fossil fuel energy. The underlying reason is that fossil fuel is imported and therefore has a short supply chain that leads to no real output effects across the economy. In contrast, renewable energy which is produced locally using biomass, solar, hydro or wind sources, usually requires outputs from other industries for its production. The 2.55 output multiplier for the renewable energy industry represents the largest total output multiplier effect for the secondary sector, as depicted in table 16.

Looking closely at the employment multipliers in table 17, reveals that the 'towards green' component of the yarn and thread textile industry has the biggest total employment multiplier of 18.179. This is mainly due to the high direct employment multiplier of 17.36. This figure is probably an outlier, reflecting data limitations. The multipliers for the green component of the industry are however more representative i.e. 2.54 and 1.73, but are still higher than the conventional counterpart. This indicates that greener textile manufacturing practices are more labour intensive, which mainly results from recycling, solar heater maintenance, grey water use, and cleaning functions of plants. Besides, it is important to highlight that the industry exhibits strong linkages with other industries such as the water and energy and electricity industries.

The total employment multiplier is almost twice as high in renewable energy in comparison to fossil fuel (1.4 vs. 0.8) as shown in table 17.There is indeed an enormous potential for generating economic growth and employment creation through renewable energy equipment manufacturing, installation, operation and maintenance. Promoting renewable energy seems to have both a positive effect on output but also on employment levels. For instance, the higher type 1 multiplier of 6.8 for renewable energy in comparison to 4.8 for fossil fuel energy of is mainly due to the higher employment intensity requirements for supplying bagasse that is the main renewable energy source in Mauritius. Labour is required for the transportation of inputs (sugarcane), by-firing, the feeding, operation and maintenance of such electricity generating plants. While fossil fuel energy is imported and requires government spending, renewable energy on the contrary contributes to revenue savings, which can in turn facilitate the funding of other green industrial activities and thus accelerate green growth.

5.1.3. The Tertiary Sector

When analysing the employment multipliers in table 19, it can be observed that the highest total employment multiplier for the tertiary sector is 13.68 for the green extension of the hotel industry. To note, the direct employment multiplier of 13.13 is responsible for this high total employment multiplier. It can be considered as an outlier, reflecting data limitations due to the small sample size of the identified green hotels. The total employment multiplier for the 'towards green' component of the hotel industry is more representative i.e. 2.05, but still greater than for its conventional counterpart. Indeed, environmentally friendly hotels seem to be more labour intensive, due to practices such as the frequent change of air-conditioning filters, recycling, grey water use, maintenance of solar water heaters and continuous on the job training. Besides, locally sourced inputs, such as banana leaves for the production of biodegradable plates used in some hotels, create indirect employment in supplying small and medium enterprises (SMEs). Similarly, using cold deep sea waters for cooling purposes can create technical jobs in the marine industry. Greening the hotel industry in Mauritius is certainly promising in terms of its potential for employment creation. Regarding the output multipliers, they are identical for both the conventional and green components as indicated in table 18, which reflects data constraints. However, research tends to indicate that green hotels are more productive given savings from energy and water efficiency.

Table 16. Output multipliers for the tertiary sector

	Economic industries	Total output multiplier	Direct multiplier	Indirect multiplier
13	Wholesale and retail trade services	1,249	0.184	0.065
14	Lodging; food and beverage serving services	1,370	0.260	0.109
15	Hotel: conventional	1,370	0.260	0.109
	Hotel -green	1,370	0.260	0.109
	Hotel -Towards green	1,370	0.260	0.109
16	Water, air, supporting and auxiliary transport services	1,461	0.343	0.118
17	Land transport	1,123	0.089	0.034
	Public bus transport	1,123	0.089	0.034
20	Financial intermediation, insurance and auxiliary services	1,277	0.214	0.063
21	Real estate services	1,152	0.102	0.050

22	Telecommunications services; information retrieval and supply services	1,144	0.108	0.036
23	Other business services	1,295	0.223	0.072
24	Public administration and other services to the community as a whole; compulsory social security services	1,321	0.251	0.070
25	Education services	1,130	0.094	0.037
26	Health and social services	1,279	0.199	0.080
27	Sewage and refuse disposal, sanitation and other environmental protection services	1,085	0.062	0.023
28	Services of membership organizations	1,109	0.083	0.026
29	Recreational, cultural and sporting services	1,312	0.237	0.075
	Recreational sector –green	1,312	0.237	0.075
30	Other services	1,026	0.020	0.006
Source : Authors (2011)				

The financial service industry exhibits relatively low output multipliers. This is not surprising given that the industry has minimal linkages with other economic industries, thereby generating limited direct and indirect impacts. Indeed, service-based industries are unlikely to have high output multipliers in comparison to production-based industries, as the latter require outputs of other industries for their own production processes and activities.

Regarding the recreational service industry in Mauritius, the green extension has a 2.9 total employment multiplier in comparison to 2.0 for the conventional counterpart. Marine watching, game fishing, forest excursions and other nature sports, reveal to be more labour intensive than conventional recreational activities, such as casino and race watching.

When examining the type 1 multiplier for the transport industry, the public bus transport demonstrates a higher multiplier of 1.076 in comparison to conventional transport, which stands at 1.022. This signifies that for every 100 public bus transport job, around 8 others are created in supplying industries, whereas only 2 jobs are created as a result of conventional transport. To illustrate, operating additional public buses provides direct employment opportunities for bus drivers, mechanics, inspectors, and administrative staff. Indirect employment is also generated due to the supply of spear parts, transport, fuelling and washing.

Table 17. Employment multipliers for the tertiary sector

	Economic industries	**Total employment multiplier**	**Direct employment**	**Indirect Employment**	**Type 1 Employment Multiplier**
13	Wholesale and retail trade services	3,031	2,765	0,266	1,096
14	Lodging; food and beverage serving services	3,065	2,513	0,552	1,220
15	Hotel sector: conventional	1,225	0,673	0,552	1,821
	Hotel sector-green	13,68	13,131	0,552	1,042
	Hotel sector -Towards green	2,046	1,494	0,552	1,370
16	Water, air, supporting and auxiliary transport services	0,893	0,355	0,538	2,517
17	Land transport	6,640	6,497	0,143	1,022
	Public bus transport	2,034	1,891	0,143	1,076

18	Fossil fuel electricity	0,795	0,167	0,628	4,752
	Renewable energy	1,351	0,200	1,151	6,766
19	Water	1,303	0,980	0,323	1,330
20	Financial intermediation, insurance and auxiliary services	0,632	0,450	0,182	1,405
21	Real estate services	0,306	0,103	0,203	2,975
22	Telecommunications services; information retrieval and supply services	0,537	0,404	0,133	1,329
23	Other business services	1,516	1,212	0,304	1,251
24	Public administration and other services to the community as a whole; compulsory social security services	2,468	2,176	0,292	1,134
25	Education services	3,208	3,026	0,182	1,060
26	Health and social services	2,411	2,039	0,372	1,182
27	Sewage and refuse disposal, sanitation and other environmental protection services	1,354	1,279	0,075	1,058
28	Services of membership organizations	1,289	1,178	0,111	1,094
29	Recreational, cultural and sporting services	1,978	1,526	0,452	1,297
	Recreational sector –green	2,927	2,475	0,452	1,183
30	Other services	3,179	3,154	0,025	1,008
Source : Authors (2011)					

5.2. "What if" scenario projections

The study undertakes a macro-economic analysis by using the calculated output and employment multipliers to compare a green and conventional growth scenario for Mauritius. A conservative 2.5 per cent GDP growth path is assumed instead of the 4.2 per cent forecast by OECD's African Economic Outlook for 2014. [27] In order to calculate the employment and output effects a 2.5 per cent exogenous increase in final demand is assumed in the conventional industry accounts and then compared to a scenario where it is added to the green extensions.

The three growth poles– sugar agriculture (green versus conventional), textile (green versus conventional), tourism (green versus conventional hotels) - as well as the energy and electricity industry (renewable energy versus fossil fuel) were selected for simulation.

Per year, a total increase of 3,648 new jobs can be expected in the green scenario as opposed to 2,262 new jobs when following a conventional growth path. This results in a net annual gain of 1,386 new jobs from shifting to greener practices in only these four industries. According to the model, economy wide changes towards greener growth will have even larger net employment effects.
The difference between the green and the conventional growth scenario is mainly due to the higher integration of green industrial activities through strong linkages with other value chains of the Mauritian economy.

[27] African Economic Outlook (2014) *Mauritius*. Available at: http://www.africaneconomicoutlook.org/en/countries/southern-africa/mauritius/

6. Policy implications and recommendations

The findings of the green jobs assessment in Mauritius reveal that in 2010-2011 around 6.3 per cent of total employment can be considered as green jobs. Although this figure is quite small, it reflects various green ad-hoc initiatives and strategies implemented by Government authorities, private enterprises and other institutions.

The multiplier analysis and the "what if" scenario projection highlight the significant employment creation potential of greening the Mauritian economy. However, the transition will not happen without appropriate policy measures and investments. Both the private sector and the Government need to provide the necessary enabling policies and the right policy mix to generate higher economic growth and employment levels as a result of a greener economy.

From a labour market perspective, such policies require investments in education and training for employees, employers, managers and the labour force at large. For instance, the inclusion of sustainable business management content in university curricula can help sensitize enterprise managers who are responsible for undertaking strategic and investment decisions on sustainable development principles. A skilled labour force which understands the importance of environmentally friendly business practices and that is capable of implementing green measures is also key. This is probably one of the most important drivers of the green economy given that it is employees themselves who contribute to greening workplaces, notably by increasing material efficiency and energy savings. Therefore, greening technical and vocational training institutions and on the job training are necessary to both skill and retrain workers and thus facilitate the transition.

Social dialogue at all levels is also of utmost importance to ensure a just transition of the workforce. Social protection schemes are essential to encourage and support workers to adapt to new green activities and markets. Likewise, measures that help assist green enterprise development are crucial for current and potential entrepreneurs. Similarly, social security policies and programmes are important to limit the downside effects of employment adjustments and job losses resulting from the transition. Labour market information and employment matching systems can help facilitate the process. Research and development in green technology are also important in driving eco-innovation.

Both sector and industry specific policies are needed to push forward sustainable national development strategies, such as the Maurice Île Durable. Policy options are suggested below to help stimulate green jobs creation across the main industries of the economy. These are based on the analysis provided in section 4 and 5 and the Green Jobs conference held in Mauritius in 2012. They provide insight as to the policy implications of undertaking a green jobs strategy in Mauritius.

6.1. Green agriculture, fishing and forestry

Current employment in the primary sector (non-sugar agriculture, sugar agriculture, fishing and forestry) approximates 46,000 people, which represents 8 per cent of total employment. There is great potential for greening agricultural, fishing and forestry activities to generate additional green jobs opportunities. The below initiatives can further boost green jobs creation and also address key issues in terms of food security, agricultural diversification and reduced import dependency.

6.1.1. Green agriculture certification

Green certification, defined by a specific set of criteria and conditions, enables to enhance the visibility and promotion of green agricultural products in the domestic as well as export market. Certification is indeed a major instrument that can help increase demand for green agricultural products in countries where consumers are willing to pay for certified foods. Yet, in Mauritius there is currently no formal market mechanism established to label and thus help consumers identify goods produced using sustainable farming practices. Efforts undertaken by farmers in adopting such practices therefore often go unrecognised. Without certification labels it is difficult to help stimulate consumer demand for such green agricultural products. The GEF-SGP project 'Conservation Agro-Biodiversity- Organic Medicinal Plants and Vegetables' described in section 4 illustrates an initiative encouraging farmers to adopt sustainable agriculture practices and certifying products as green by *Eco-cert.*

6.1.2. Awareness campaigns for green products

Green certification measures should be accompanied by awareness raising campaigns, highlighting the importance and advantages of pursuing green agricultural practices in Mauritius. These should help change farmers' mind-set and facilitate their adoption of sustainable farming methods. Moreover, sensitizing the population on the economic, social and environmental benefits of consuming organic food products is likewise important.

6.1.3. Agricultural extension training and incentives to planters

Numerous strategies have been implemented to enable farmers to adopt sustainable farming techniques. Agricultural extension services on productive organic farming practices are still however required as there is still widespread belief amongst farmers that conventional practices i.e. chemical fertilisers drive higher yields. Given the current low level of technical knowledge amongst farmers on sustainable farming methods and practices within the industry, training should be provided along with various other incentives. Green loans with preferential interest rates or tax holidays may be considered as options. Loan schemes may be jointly designed by the Government and private sector to help farmers embrace green farming practices

6.1.4. Green public employment schemes in climate change adaptation

Climate change adaptation is one of the Mauritian Government priorities. A Green Public Employment Program could be developed inspired by India's successful Mahatma Gandhi National Rural Employment Guarantee Act (MNREGA), which focuses on natural resource management to address environmental degradation and climate change. Activities include: water conservation and irrigation infrastructure, soil erosion control, tree planting and other green infrastructure measures to enhance agricultural productivity. Projects designed to support the adaptation capabilities of farmers can also promote sustainable farming and green jobs opportunities.

6.1.5. Enhance supply-chain linkages and knowledge

Farmers wishing to apply organic fertilisers and adopt other green farming practices often lack the necessary information on relevant input suppliers. Authorities may, therefore, consider establishing a centralised database on green input suppliers to facilitate supply-chain linkages. In the context of

an increasing green agricultural market, assistance could be provided to link small producers with larger companies, notably through a freely available online database.

6.1.6. Sustainable long-term fishing policy

A holistic long-term sustainable fishing policy is needed to govern the Mauritian fishing industry to both increase its output and employment levels. This will help recover the currently overfished lagoon fishery. It should also contribute to not overexploiting the currently healthy off-lagoon fishery by promoting sustainable fish catch. Such a fishing policy must encompass science-based fishing quotas, regulations on the number of operating vessels and licences delivered, training, and incentives to maximise catch within sustainable yields over the next 30 years. Encouraging fishermen to move to the off-lagoon fishery is already amongst Government initiatives, yet it should be well controlled in order to not result in its overexploitation. With various projects having been implemented in the promotion of sustainable fishing, their documented successes and failures may well help shape future sustainable fishing practices and policies.

6.1.7. Forest conservation for recreational purposes and eco-tourism

The forestry industry offers huge potential to create green jobs, particularly for recreational activities and eco-tourism purposes. Even though employment in the forestry industry is currently low, creating such activities by developing synergies with an eco- tourism strategy remains an untapped potential. Indeed, strategies that boost environmentally friendly recreational and tourism activities within the forestry industry will result in significant job creation opportunities, whilst contribute to conservation efforts.

6.2. Green textile

The greening of the textile industry presents great potential for green jobs creation, given its economic importance and considerable employment levels. The following provides policy options for promoting green jobs in the Mauritian textile industry.

6.2.1. Increased visibility of green businesses

The study reveals that numerous green initiatives have so far been undertaken by the private sector. Notably in textile enterprises, major energy and water savings have been achieved as a result of investments in cleaner technologies. However, such improvements often tend to go unrecognized. Authorities may therefore wish to establish a communication channel through which green initiatives and measures undertaken by enterprises are fully documented and disseminated to the wider public. The media could be used as such an instrument. For instance, the TV programme *100%challenge* that was an initiative of private sector associations could be used as a working model.

6.2.2. Implementing carbon footprint initiatives and eco-labels

MEXA's *Blue Carbon Award* distinguishes attempts made by private entrepreneurs in promoting a low carbon economy. This initiative rewards enterprises that have developed and implemented strategies to reduce their carbon footprints. It helps identify and replicate best business practices.

Eco-labelling and green certification schemes can also help customers differentiate between conventional and green products.

6.2.3. Promoting the business case for going green

Many enterprises do not fully recognize the business case of going green and are thus reluctant to green their workplace practices and invest in new green products and services. Indeed, some businesses still perceive tackling environmental issues as too expensive rather than cost-effective through increased savings from energy and material efficiency and resilience.

Businesses often fear that the green economy transition requires profound modifications to their overall day-to-day processes. However, businesses can undertake a step-by-step approach in greening their operations and processes. Small energy saving measures in terms of behavioural and operational changes, at no initial investment cost, can result in reduced energy bills, which can incentivise enterprises to further green their processes and products. To encourage such efforts, the Government together with the Mauritius Employers Federation (MEF) could develop a strategy to promote green enterprise development. Such a strategy could include a system whereby enterprises are proportionally rewarded to their undertaken initiatives aimed at greening processes and/or products.

6.2.4. Green innovation and Skills development

With technology playing a vital role in almost all industrial activities, notably the textile industry, it is important to promote strategies facilitating the adoption of green and cleaner technologies amongst enterprises. Increased demand for new green products and services will certainly drive innovation and technological development. It is likely that once such technologies demonstrate their economic (cost reduction) and environmental (reduced pollution) benefits they will be applied on a much wider market scale.

Yet, efforts remain to help development and adopt such cleaner technologies. A joint collaboration between the Government and the private sector could be initiated to design a proper framework to upgrade conventional industrial production processes. This should pay attention to research and development, industrial policy, and also help facilitate the import of green technologies.

Most often the adoption of new technologies does not entail significant changes in working structures and practices. However, the use of renewable energy, energy efficiency or recycling technologies, amongst others, can change skills requirements. The application of these technologies can generate new job profiles i.e. integrated pest management (IPM) for organic pest control tasks, or alter existing occupations, i.e. a plumber needing to specialize in solar water heater systems or an electrician getting on the job training to operate and maintain a PV system.

Indeed, environmentally friendly business measures will affect existing occupations as it will increase demand for certain job functions and create new job profiles, particularly in green technologies and management systems. Without a suitably trained workforce the green economy transition will stall as, skill gaps will prohibit further green jobs creation opportunities within industries. Yet, managers and employers often lack the know-how to implement alternative green businesses practices and

strategies. This poses the great challenge of retraining and upgrading the skills of those workers who will lose their jobs and providing the right skills to those entering the changing labour market. Efforts should therefore focus on developing training curricular standards and qualification standards for emerging green occupations. Skills development can include both technical vocational training and higher education, as well as on the jobs enterprise training. Providing clear information on training opportunities for managers and workers to enhance their expertise and skill capacities is crucial.

6.2.5. Green Export Processing Zone

Mauritius as a major export- oriented economy could benefit from increased export of green goods, such as textiles. Being amongst the first countries in creating a Green Export Processing Zone, Mauritius could take advantage of an emerging global green market.

6.3. Green hotels and eco-tourism

Mauritius has identified tourism as a main pillar of its economy. Indeed, it is a main contributor to national GDP and employs a significant percentage of the labour force. The study demonstrates that green hotels are more labour intensive compared to conventional ones. The following measures could help green the hotel industry and promote the creation of green jobs nationally:

6.3.1. Green certification and greening the 'star rating' system

Tourists are increasingly paying attention to environmental issues when choosing their accommodation. It is thus important for tourists to be able to clearly demarcate those hotels pursuing green practices from those using conventional operational processes. Green certification schemes are an effective means of distinguishing and identifying green hotels in the market. The degree to which hotels adopt green processes or products could also be reflected in the current star rating system, through criteria such as energy and water efficiency, recycling and local food supply. Moreover, the creation of a new green stars rating system indicating the extent to which hotel operations are environmental friendly offers a significant strategy for greening the industry.

6.3.2. Green procurement in hotels

Industries, which use agricultural products such as hotels and restaurants, should be encouraged to purchase green products. This can be a strong marketing tool to brand and advertise themselves as offering locally and organically produced foods to tourists. A strategy to encourage green procurement in the hotel industry could help stimulate demand for green products.

6.3.3. Promoting Mauritius as an eco-friendly destination

Promoting eco-tourism in Mauritius could seriously contribute to developing green tourism activities and thereby generate green jobs opportunities. With eco-tourism growing three fold in comparison to conventional tourism globally, Mauritius could design a marketing strategy to position itself as an eco-friendly destination. As an island economy, Mauritius offers great potential for becoming a major tourist attraction for environmentally conscious tourists.

6.4. Recycling and waste management

Solid waste, wastewater and pollution negatively affect all industries in Mauritius but some are more particularly affected due to their dependency on natural resources. Greening industries by reducing, reusing and recycling resources are effective strategies that also create additional employment opportunities. However, waste collection and recycling activities often heavily experience informal and non-decent working conditions. To promote green jobs in these emerging activities it is therefore important to help formalize employment and ensure decent working conditions. The following initiatives are suggested to promote green jobs creation in waste management and recycling:

6.4.1. Enhancing decent work conditions

The case studies presented in section four of this report highlight a growing number of recycling and waste management initiatives in Mauritius. Private sector initiatives include the use of organic waste for compost, the conversion of domestic waste into gas and electricity generation, and the recycling of glass, plastic and paper. However, the majority of solid waste and wastewater in Mauritius is still not being recycled.

As shown in major European economies, the collection, sorting and processing of waste to generate new raw materials for industrial production, opens huge opportunities for job creation. With Mauritius experiencing increasing living standards coupled with a rising population, it is expected that the amount of waste produced will rise in the future. New types of wastes such as electronics are also increasingly being generated. As a result, ample opportunities exist to develop green entrepreneurship in recycling and waste management.

Recycling and waste management activities are an important source of income for poor households. Yet, specific attention should be paid to improve the un-decent working conditions of informal waste collectors to combine poverty reduction strategies with green jobs opportunities. Brazil's recent waste policy has focused on formalizing workers and promoting cooperative development, which has led to significant improvements in the working conditions of waste pickers and has contributed to net job creation. Mauritius could certainly inspire itself from Brazil's policy experience.

6.5. Renewable energy

The energy and electricity industry is probably one of the most important cross-cutting industries in Mauritius, as it generates significant inter-industrial linkages and is key for sustaining growth and economic competitiveness. The multiplier analysis established that developing renewable energy presents great employment potential. The following policy recommendations intend to enhance green jobs creation within the industry:

6.5.1. Good governance

Strategies to develop renewable energy in Mauritius depend to a large extent on effective institutional arrangements, as the promotion of good and strong governance is crucial to enable the industry to shift towards renewables. For instance, there is currently no regulator body for the energy and electricity industry and the lack of regulations present a major barrier to boost

renewable energy. Still to be addressed amongst others are predetermined tariffs, project approval mechanisms, and the low delivery of private operators.

6.5.2. Market based instruments, energy conservation incentives and regulations

Experiences from Germany, US, China and India have demonstrated that predictable and stable feed-in tariffs are a powerful market-based tool to increase investment in renewable energies. Other economic incentives such as tax rebates, import wavers or preferential loans for solar water heater schemes, PV systems and other technologies could also be envisaged. Such schemes can create employment in retail services but also in the installation and maintenance of these technologies. Industrial policy promoting the manufacturing or assembly of renewable energy technologies can also be effective in promoting green jobs. Careful market analysis and modelling is necessary to enable Mauritius to fully tap into the highly competitive global renewable energy market.

Fossil fuels could also be taxed, such as the eco-tax in Germany and revenues could be used to reduce labour costs in the green economy transition process. Research and country experiences point to a double dividend of increased energy efficiency and employment creation. Regulations could therefore help prohibit energy consuming appliances such as electric geysers. Quotas to promote energy conservation for light bulbs or other electric equipment could be implemented.

6.5.3. Green public procurement

Green public procurement favouring renewable over fossil fuel energy is a powerful incentive to promote investment in renewable energy sources. The Government could clearly set the example by generating its own electricity from renewable energy sources by for instance installing solar panels on its building rooftops.

6.6. Green financial services

One of the main barriers for industries to green their operations and products are the high up-front costs involved in initial investments. While the long term economic gains are well proven, there is however a need for new financing strategies to unleash the job creation potential of the green economy. One proposed policy option is to grant preferential loan conditions and financial assistance to enable businesses to access finance. Lowering loan interest rates could provide such an incentive and help companies shift towards greener practices and thus boost employment.

6.6.1. Greener listings on the Stock Exchange

Reducing the level of listing requirements for companies that adhere towards greener technologies whether input-based, process-based or output-based is key to promote greener listings on the Stock Exchange of Mauritius.

6.6.2. Global Green Finance Hub

A growing number of global investment funds for green projects are being established. Mauritius could certainly embark on a strategy to become a green finance hub, notably for Asia, Africa and Europe, given it's a strong financial service industry.

7. Conclusion

The report highlights three main conclusions:

- Firstly, current green jobs within the industries analysed are estimated at 6.3 per cent.
- Secondly, in almost all green industrial activities, the output and employment multipliers are higher than in their comparable conventional counterpart.
- Thirdly, there are already various 'green' initiatives in Mauritius driven by authorities, private enterprises, private sector associations as well as international agencies.

These findings signal clear policy implications for the Government: investing in green economic activities will, in the short to medium term, generate more employment and higher growth as opposed to a conventional development path. The current private and public initiatives, though undertaken on an ad-hoc basis and without major synergies, provide an important foundation from which to draw on and design the way forward for a green jobs policy, which could strengthen the MID project. Indeed, a holistic and visionary framework for the promotion of green jobs is needed within the MID project to make Mauritius a sustainable island.

The input-output table created for the purpose of the green jobs assessment is certainly a first initial step in modelling the links between green activities, output and employment in Mauritius. However, the lack of data on environmental indicators makes the link between negative environmental impacts and labour market indicators hard to measure. Further, the lack of data on production technologies used in green industrial activities, such as construction, textile, renewable energies other than bagasse, and organic certified sugar, makes it difficult to model the differences between the conventional and green industry accounts in terms of output and employment outcomes. Besides, more research is needed to examine legislations and strategies governing working conditions to enhance such conditions in emerging green activities and help existing industries becoming even "greener". Though the multipliers provide a first estimation of the job creation potential follow-up studies are required to (i) refine production functions of green industrial activities, (ii) assess negative feed-back loops of negative environmental impacts and climate change on employment and output and (ii) further apply decent work indicators in the model.

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