International Labour Organization

Skills for Green Jobs in Mauritius

PAGE PARTNERSHIP FOR ACTION ON GREEN ECONOMY

Skills for Green Jobs in **Mauritius**

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Abbreviations and Acronyms

ACP	Africa Carribean and Pacific
AEO	Africa Economic Outlook
AfD	Agence Française de Développement
AGOA	African Growth and Opportunity Act
AREU	Agricultural Research Extension Unit
AHRIM	Association des Hôteliers et Restaurateurs de l'île Maurice
BOI	Board of Investment
BOM	Bank of Mauritius
CDM	Clean Development Mechanism
CEB	Central Electricity of Board
COMESA	Common Market for Eastern and Southern Africa
CSCM	Civil Service College Mauritius
DTAA	Double Taxation Avoidance Agreement
EMO	Energy Management Office
EPA	Economic Partnership Agreement
EU	European Union
FAREI	Food and Agriculture Research Institute
FAREI	Food and Agriculture Research Extension Institute
FTA	Free Trade Agreement
GBCM	Green Building Council of Mauritius
GCCA	Global Climate Change Alliance Plus
GDFCF	Gross Domestic Fixed Capital Formation
GDP	Gross Domestic Product
GHGs	Greenhouse Gases
GLOBALGAP	Global Good Agricultural Practices
GOM	Government of Mauritius
GSP	Generalised Scheme of Preferences
GWh	Gigawatt hour
HDRC	Human Development Resource Council
ILO	International Labour Office
IMF	International Monetary Fund
IOC	Indian Ocean Commission
ISO	International Organization for Standardization
MARENA	Mauritius Renewable Energy Agency
MauriGap	Mauritius Good Agricultural Practices and Food Security
MCCI	Mauritius Chamber of Commerce and Industry
MITD	Mauritius Institute of Technical Development
MITD	Mauritius Institute of Technical Development
MoAIFS	Ministry of Agro Industry and Food Security
MoEHRTESR	Ministry of Education, Human Resource, Tertiary Education and Scientific Research
MoSSNSESD	Ministry of Social Security, National Solidarity, and Environment and Sustainable Development (Environment and Sustainable Development Division).
MQA	Mauritius Qualification Authority
MSB	Mauritius Standards Bureau
MWh	Megawatt hour
NEEP	National Energy Efficiency Programme
NSDP	National Skills Development Programme
OECD	Organisation for Economic Co-operation and Development
PAGE	Partnership for Green Economy
PML	Polytechnics Mauritius Ltd
PV	Photovoltaic
ROM	Republic of Mauritius
SADC	Southern African Development Community
SAG	Switch Africa Green
SME	Small and Medium Enterprise
SSGD	Small-Scale distributed Generation
TEC	Tertiary Education Commission
TVET	Technical and Vocational Education and Training
UNEP	United Nations Environmental Programme
UNOPS	United Nations Office for Project Services
UOM	University of Mauritius
UTM	University of Technology, Mauritius
MCA	Mauritius Chamber of Agriculture

Abstract

The study reviews the key drivers of green skills in relation to green policies, environmental standards, climate change policy and labour market dynamics in the Republic of Mauritius. Using data and information collected through desk research, interviews and focus group discussions, it has been observed that green skills are essential for the growth strategy adopted by Mauritius with reference to the green agriculture practices, sustainable agricultural certification bio-farming zones, resource efficient processes, energy audits, sustainable tourism standards, eco-tourism, nature-based activities, small-scale generation of electricity from photovoltaic, and wind farms for electricity generation, as well as emerging sectors such as smart cities and ocean economy. The study also assesses the institutional set-up for green skills development and concludes that the current skills development framework does indeed provide entry points to promote green skills in Mauritius. There is a general awareness among stakeholders of greening processes and practices in the major economic sectors and several institutions are currently implementing green projects at sectoral level originating both in Government Ministries and departments and in private sector associations and enterprises. However, several initiatives for green skills development are rather ad hoc, oneoff, and constrained by funding limitations. Skills development initiatives are demand-driven mainly by market forces and government policies; the extent to which the supply of green skills would keep pace with demand for them is therefore questionable. There are also significant uncertainties on the number of green jobs, on the types of green processes and practices, and on the types of generic and specific green skills that would be needed. The report therefore recommends a comprehensive assessment of the current and future needs of green skills at sectoral level and formulation of a list of courses and training which are likely to be demanded in the next 5 to 15 years. The assessment should also aim at synchronising and aligning the training and skills development initiatives across the different institutions in Mauritius with current green sectoral growth and future employment trends in existing and emerging economic sectors such as smart cities and ocean economy. A green labour market information system may be an appropriate strategy for providing guidance to education and training institutions.

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1. Introduction

The Republic of Mauritius is a small island developing State which, for a decade or so, has resolved to make the shift towards a low-carbon economy by encouraging sustainable production and consumption. Following consultations with and assistance from institutions at national and international levels (e.g. ILO, UNEP, PAGE)[1], several policies and programmes have been implemented to help make the transition to a green economy and promote green jobs[2]. Economic sectors such as agriculture, manufacturing, energy and tourism, among others, have been identified as drivers of green jobs (ILO 2012). The 2012 ILO report on green jobs assessment for Mauritius estimated that 6.3% of employment could be classified as green as compared to conventional. The report eventually concluded that there were significant opportunities for greening conventional jobs or for creating new green jobs in the Mauritian economy (ILO 2012).

A natural follow-up in the quest to encourage green jobs is the need for green skills, defined as the skills required to adapt services, products and processes to climate change and the associated environmental requirements and regulations (ILO 2014, Rademaekers et al. 2015). The skills gap is recognised as a major bottleneck in respect of creating green jobs and adopting greening processes in a number of economic sectors and sub-sectors (Strietska-Ilina et al. 2011). Therefore a study on skills needs to realise the potential for green jobs in Mauritius was commissioned by the ILO in 2012 which complemented the Green Jobs Assessment Report (Dubois 2012)[3]. According to that study the concept of sustainable development was well-integrated in various educational and training programmes at vocational and tertiary education levels, although they were not well structured.

In recent years there has been more emphasis on greening the Mauritian economy. The Government Programme 2015-2019 laid strong emphasis on 'transforming Mauritius into a truly forward looking, environmentally sustainable, economically vibrant and innovative country with modern infrastructure, global connectivity, high skills and technology' (GOM 2015a). Almost all the major development plans, policies and programmes at both economy-wide and sectoral levels, which are geared to creation of jobs, generation of wealth and reduction of poverty, are guided by the principle of sustainability. Sustainable development is also emphasised for new investment opportunities, especially in emerging sectors such as 'smart cities' and ocean economy[4].

The creation of green jobs is an integral part of the development strategy of Mauritius. Climate change adaptation and mitigation

1 The International Labour Office (ILO) has been supporting the Mauritian government and social partners in designing the strategy and policies towards the creation of green jobs since 2011. Reference is made to the ILO report on green jobs assessment for Mauritius (ILO 2012) where a number of sectors were identified as potential for green jobs. Further to this initiative is the Skills for Green Jobs Report in 2012 commissioned by the ILO and prepared by Roland Dubois (Dubois 2012). The UNEP has also assisted through the development of a Green Economy Model for Mauritius. Following a multi-stakeholder consultation workshop in 2013 organised by the UNEP to define the sectors for transition towards a green economy, seven sectors were identified to drive the green economy: agriculture, energy, waste, water, tourism, manufacturing and transport. Both reports are available respectively at http://www.ilo.org/wcmsp5/groups/public/---ed_emp/---emp_ent/documents/publication/wcms_317238.pdf (accessed on the 9th August 2017) and http://www.un-page.org/files/public/mauritius_green_economy_assessment_2.pdf (accessed on the 9th August 2017)

2 A green economy is one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities (UNEP 2011) while green jobs are defined as any decent job that contributes to preserving or restoring the quality of the environment leading to environmentally, economically and socially sustainable enterprises and economies (ILO/UNEP 2008, ILO 2011).

3 The report was commissioned by the ILO in 2012 and prepared by Roland Dubois. It was among the pioneering studies to assist Mauritius to design and implement a series of strategies for greening the economy and the subsequent creation of green jobs. (See Dubois, R. 2012. Skills for Green Jobs in Mauritius. Unedited background country study. International Labour Office, Geneva. http://www.ilo.org/wcmsp5/groups/public/---ed_emp/---ifp_skills/documents/publication/wcms_190248.pdf)

4 A list of investment opportunities in Mauritius is provided by the Board of Investment (BOI) which includes Agro-Industry, Aquaculture, Hospitality & Property Development, Smart Cities, Life Sciences, Logistics, Manufacturing, Ocean Economy, Renewable Energy, and Seafood. In all these new investment avenues, sustainability is the guiding principle. http://www.investmauritius.com/investment-opportunities.aspx (accessed on 23rd August 2017).

policy and associated projects would further increase the demand for green jobs. Successful implementation of these development plans would undeniably require the appropriate green skills. Green skills development is bringing about new expectations in the role of educational and technical training institutions (CEDEFOP 2012, GIZ 2013).

One main consequent concern is whether an appropriate and efficient institutional framework is in place to ensure continuous and systematic development of green skills – generic and technical - to meet the demand for green jobs in Mauritius. To some extent green skills would depend on how the government's development policies and projects would interact with skills development, taking into account the transformation of Mauritian economy into one with a more diversified base. A related question is how stakeholders in both the public and private sectors, as well as those involved in skills development, educational and vocation training, are involved in green skills development.

Skills development is already a serious concern in Mauritius, given that the island is currently experiencing skills mismatch unemployment among local jobseekers (IMF 2013; OECD 2014; ROM 2014). Increasing attention is being given to the re-skilling of the existing labour force, enhancement of skills among young graduates, and training of the unemployed to enhance their employability. The shortage of green skills is likely to further accentuate skills mismatch unemployment in Mauritius. There are ample examples showing that the lack of labour with green skills is slowing down the transition to green production and consumption in Mauritius with particular reference to the renewable energy sector, industrial waste management, energy auditing, and ecotourism, to mention a few.

This report aims at examining the intersection between government policies and projects with a view to an environmentally sustainable economy and green skills; and it builds on the 'Skills for Green Jobs' ILO report for Mauritius (Dubois 2012)[5]. It reviews the key drivers of green skills in relation to green policies programmes and regulations, environmental standards, and climate change policy, as well as market forces. Through an analysis of green skills development measures and the institutional set-up, it aims at identifying the challenges to development of green skills in Mauritius. Several case studies are provided on programmes, projects and green skills development. The critical success factors and good practices are also revealed throughout the analysis.

A note on the methodology is important at this stage. The report is based primarily on desk research and data collected by Mauritius's statistical agency (Statistics Mauritius). This is supplemented by in-depth qualitative interviews and focus group discussions with representatives of government institutions[6], skills development institutions, and private enterprises to provide a comprehensive assessment of green skills.

The structure of the report is as follows. In Section 2 the report provides an overview of the Mauritian economic and employment landscape for the period 2010-2016. This is followed in Section 3 by a review of the government's green policies and projects at both national and sectoral levels. The vision of the government's national projects and programmes at sectoral level which are driving the greening of economic sectors and green jobs is examined to identify the required green skills. These sectors include agriculture, manufacturing (including textiles), tourism, renewable energy, construction and smart cities, and the ocean economy. Cross-cutting sectors such as energy efficiency and climate change adaptation projects are also covered.

Section 4 dwells on a review of the green skills development initiatives and measures, again at national and sectoral levels, that are being provided by the education and training institutions, public sector departments, and private sector associations; and it attempts to

5 Ibid.

6 It may be appropriate to cite the main institutions at the very outset. These include the (1) Ministry of Education, Human Resource, Tertiary Education and Scientific Research (MoEHRTESR), Human Resource Development Council (HRDC), Mauritius Institute of Technical Development (MITD), Food and Agriculture Research Institute (FAREI), and Mauritius Standards Bureau (MSB).

analyse whether the institutional framework including the Technical and Vocational Education Training (TVET) for skills development allows systematic identification of green skills needs. It also relates government green policies, programmes and projects to green skills needs. Examples of green skills are provided and supported by case studies where appropriate, but a comprehensive list of green skills is far outside the scope of this report. Section 5 further assesses the interaction between government policies and green skills, with the aim of providing lessons learned, best practices and challenges facing the Mauritian economy, while Section 6 provides the conclusions and recommendations.

2. Economic overview and employment trends 2010-2016

Following a decline in the growth of Gross Domestic Product (GDP) between 2010 and 2013, Mauritius' GDP rose modestly in 2014 by 3.7% and 3.6% in 2015. The year 2016 observed a 3.8% growth in GDP and a 3.6% rise in *per capita* GDP (**Table 2.1**). During the last seven years the lowest growth rate was observed in 2013. According to the African Economic Outlook (AEO) for Mauritius, the improvement in economic growth was mainly due to the rise in private investment in the same year (AEO 2017). This is shown by Gross Domestic Fixed Capital Formation (GDFCF) which has picked up significantly in the last three years compared to very low growth rates during the period 2010-2012. However, given a lack of external demand, economic growth was rather constrained.

The low rates of inflation have been crucial to sustaining the performance of the economy. The primary factors underpinning the drop in inflation in 2016 were the decline in food prices (food items account for 27.3% of the Consumer Price Index [CPI] basket) combined with a drop in international oil prices (transport accounts for 15% of the CPI basket in Mauritius) (AOE 2017).

Consumption, which accounts for the lion's share of GDP among aggregate demand components, made a positive contribution to GDP growth in 2015 (BOM 2016). The contribution of investment to GDP growth remains significantly below that needed to boost the economy.

According to the latest report from the Bank of Mauritius, the domestic economy is currently facing several key risk drivers, namely (a) the fallouts from Brexit, (b) prospects in the global business sector stemming from the revisions to the Double Taxation Avoidance Agreement (DTAA) with India, and (c) structural supply-side bottlenecks (BOM 2016). The BOM concludes that the implementation of public and private sector projects – some of which have been announced in the 2016-17 Budget – are important pre-requisites for helping lift the country out of the middle-income trap and allowing it to graduate to high-income status (BOM 2016).

Table 2.2 shows employment and unemployment trends for the period 2010-2016. The unemployment rates for the last seven years averaged 7.8%, reaching a low in 2016

Table 2.1: Basic economic indicators for Mauritius 2010-2016

ECONOMIC INDICATORS	2010	2011	2012	2013	2014	2015	2016
GDP at market prices (RsM)[1]	306829	329482	349401	372397	392062	409893	434243
Real annual growth rate of GDP (%)[1]	4.4	4.1	3.5	3.4	3.7	3.6	3.8
GDFCF (RsM)[1]	74396	77567	79185	77618	73989	71155	74969
Real annual growth rate of GDFCF (%)[1]	0.7	1.4	0.8	3.3	6.0	5.4	3.7
Rate of inflation (%)[1]	2.9	6.5	3.9	3.5	3.2	1.3	1.0
Per capita GDP at current market prices[1]	246089	263645	278844	295591	310862	324570	343616
Per capital GDP growth constant 2010 price[2]	4.13	3.91	3.21	3.13	3.56	3.33	3.63

Source: [1]Digest of National Accounts (Statistics Mauritius, various issues), [2]World Bank Indicators (World Bank)

Table 2.2: Employment trends

EMPLOYMENT TRENDS	2010	2011	2012	2013	2014	2015	2016
Labour force ('000)	573.9	571.6	580.3	597.5	604.0	612.9	609.6
Employment ('000)	531.7	528.9	535.7	552.0	559.2	566.6	567.2
Unemployment rate (%)	7.6	7.8	8.0	8.0	7.8	7.9	7.3
Youth unemployment (16-24 years) ('000)	17.2	16.2	18.5	17.6	19.5	21.2	18.9

Source: Digest of Labour Statistics (Statistics Mauritius, various issues)

of 7.3%. Youth employment rates range from 22.2% to 26.3%. Out of total unemployment youth unemployment stood at 45.6% in 2016 and averaged 41.4% during the period 2010-2016. The unemployment rate was marginally higher in 2015 at 7.9%, compared to 7.8% in 2014. A persistent skills mismatch in the labour market is contributing to a high level of youth and female unemployment (BOM 2016).

Table 2.4 shows the share of the economic sector in GDP. A slight decrease in the value-added of agriculture was observed during the seven-year period from 4.1% in 2010 to 3.6% in 2016. The main reason is the fall in sugar-cane cultivation, a trend emanating from the elimination of sugar preferential treatment under the EU-ACP Sugar Protocol.

The manufacturing sector remains the main contributor to GDP, standing at 13.9% in 2016, followed by financial and insurance activities (12.1%) and the wholesale and retail trade (11.9%). The contribution of the remaining sectors to GDP shows a diversified economic base – an economic strategy which was being implemented decades ago and is still being taken as a guide.

The agricultural, forestry and fishing sector exhibits strongly fluctuating growth rates over the period, averaging 1.8%. As shown in **Figure 2.1**, the sugar-cane sector is a major contributor to the fluctuating growth in the agricultural sector. The performance in the agricultural sector is related to the extent to which the other sub-sectors are able to offset the negative growth in sugar-cane production. In 2014 the food crop sub-sector recorded a growth of 6.5% while sugar-cane production recorded a fall of 3.5%, resulting in final overall growth of 3.7% in the agricultural sector. Mauritius can produce a wide range of crops and livestock because of the variety of micro-climates, although its agriculture is dominated by sugar-case cultivation. Agricultural production activities are undertaken mainly by the corporate sector and a large number of small producers. Around 50% of agricultural production comes from the corporate sector. There are 8,000 small farmers who cultivate food crops on holdings averaging 0.25 ha, and around 5,000 are active in the livestock sector producing milk and meat. According to Seebaluck (2015), an average of 6,280 ha. of land is abandoned annually, this being classified as under cane cultivation but not harvested. These fields have been abandoned by their owners because of low yields, high production costs and the decrease in the sugar price, among other things.

The growth rate in the manufacturing sector is also very alarming, averaging only 1.6%. Again this is explained by the fall in sugar production. The textile sector has also been fluctuating in recent years.

One sector which recorded a significant increase in recent years is the accommodation and food service sector. In fact from 2010 tourism recovered more strongly than expected from the adverse impact of the global financial crisis and economic recession of 2008 and 2009. However a slowdown of growth was witnessed in 2012. The rise in tourist arrivals in recent years has largely contributed to the progressive increase in the value-added of the tourism sector (**Figure 2.3**).

Table 2.3: Contribution of economic sectors to GDP 2010-2016

ECONOMIC SECTORS	2010	2011	2012	2013	2014	2015	2016
Agriculture, forestry and fishing	4.1	4.2	4.1	3.8	3.6	3.5	3.6
Sugarcane	1.1	1.3	1.4	1.1	0.9	0.9	0.8
Other	3.0	2.9	2.8	2.7	2.8	2.7	2.7
Mining and quarrying	0.4	0.4	0.3	0.3	0.3	0.2	0.2
Manufacturing	15.9	15.7	15.5	15.7	15.3	14.7	13.9
Sugar	0.3	0.3	0.3	0.2	0.2	0.2	0.2
Food exc Sugar	5.3	5.2	5.6	5.4	5.4	5.1	4.9
Textiles	5.0	4.9	4.7	4.7	4.6	4.6	4.1
Other	5.3	5.3	4.9	5.2	5.1	4.8	4.7
Electricity, gas, steam and air conditioning supply	1.8	1.6	1.4	1.4	1.6	1.9	2.2
Water supply, sewerage, waste management and remediation activities	0.3	0.3	0.4	0.4	0.4	0.4	0.4
Construction	6.8	6.5	6.1	5.4	4.8	4.4	4.2
Wholesale & retail trade; repair of motor vehicles and motorcycles	11.3	11.3	11.7	11.8	11.9	12.0	11.9
Transportation and storage	6.1	6.2	6.0	6.0	6.1	6.2	6.3
Accommodation and food service activities	6.8	6.9	6.9	6.0	6.2	6.5	6.9
Information and communication	4.9	4.7	4.5	4.4	4.3	4.4	4.3
Financial and insurance activities	11.6	11.7	11.9	11.7	11.9	12.0	12.1
Real estate activities	6.4	6.2	6.1	6.2	6.1	6.0	5.9
Professional, scientific and technical activities	3.8	4.1	4.3	4.4	4.6	4.6	4.6
Administrative and support service activities	2.2	2.4	2.5	2.7	2.8	2.9	2.9
Public administration and defence; compulsory social security	5.7	5.6	5.6	6.1	6.2	6.2	6.4
Education	4.4	4.4	4.5	4.8	4.8	4.9	4.9
Human health and social work activities	3.4	3.5	3.6	4.0	4.1	4.2	4.3
Arts, entertainment and recreation	2.7	2.9	3.1	3.3	3.4	3.4	3.4
Other service activities	1.4	1.4	1.5	1.6	1.6	1.6	1.6
Gross Value Added at current basic prices	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Digest of National Accounts (Statistics Mauritius, various issues)

Table 2.4: Growth of sectoral value-added to GDP 2010-2016

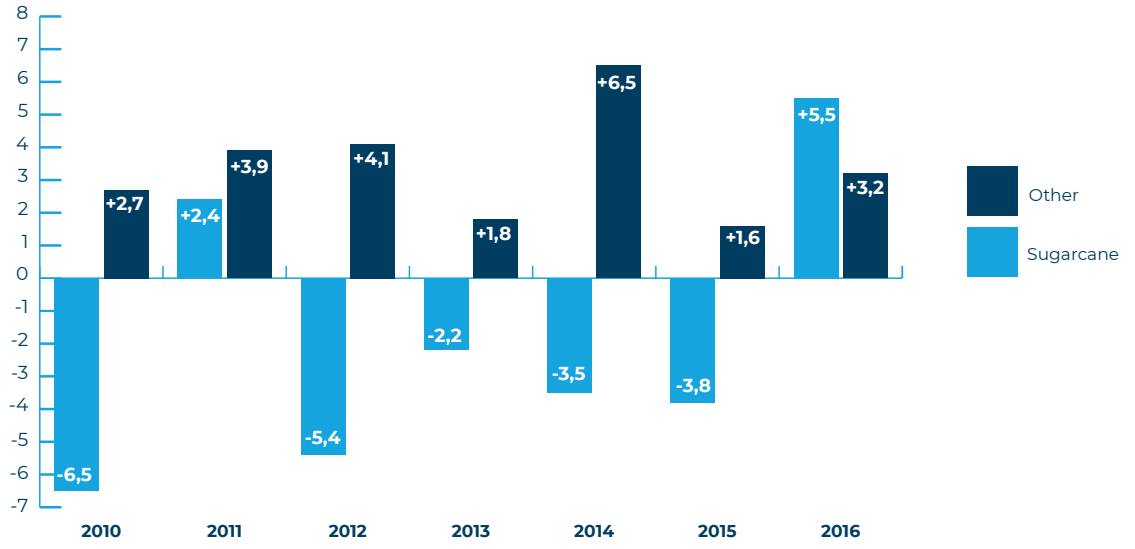
ECONOMIC SECTORS	2010	2011	2012	2013	2014	2015	2016
Agriculture, forestry and fishing	-0.4	+3.5	+1.1	+0.5	+3.7	+0.3	+3.7
Mining and quarrying	+4.4	-19.0	-8.2	-4.6	-2.5	-3.4	+1.0
Manufacturing	+1.9	+0.7	+2.1	+4.7	+1.8	+0.1	+0.3
Electricity, gas, steam and air conditioning supply	+4.6	+4.4	+4.5	+4.4	+4.0	+3.8	+4.2
Water supply, sewerage, waste management and remediation activities	-0.3	+2.5	+2.2	+2.5	+3.0	+3.0	+2.0
Construction	+4.3	-2.0	-3.0	-8.2	-8.5	-4.9	0.0
Wholesale & retail trade; repair of motor vehicles and motorcycles	+3.8	+3.4	+3.5	+2.8	+3.0	+2.8	+3.0
Transportation and storage	+4.3	+3.7	+2.6	+2.4	+2.8	+3.4	+3.9
Accommodation and food service activities	+8.8	+3.1	+0.1	+2.9	+6.1	+8.7	+9.2
Information and communication	+11.1	+9.3	+8.9	+7.1	+6.4	+6.9	+5.9
Financial and insurance activities	+4.5	+5.7	+5.7	+5.5	+5.5	+5.3	+5.7
Real estate activities	+6.2	+7.1	+6.9	+6.1	+5.3	+4.3	+3.9
of which Owner occupied dwellings	+6.1	+7.0	+6.7	+5.9	+4.9	+4.0	+3.6
Professional, scientific and technical activities	+5.8	+6.8	+7.3	+6.9	+5.5	+5.1	+5.7
Administrative and support service activities	+8.2	+9.9	+8.2	+8.1	+7.9	+6.7	+5.9
Public administration and defence; compulsory social security	+3.2	+4.9	+2.6	+0.9	+5.4	+1.3	+2.3
Education	+3.7	+3.7	+4.2	+1.6	+2.6	+3.1	+0.7
Human health and social work activities	+4.9	+5.4	+6.3	+5.3	+6.8	+3.6	+2.1
Arts, entertainment and recreation	+5.5	+6.7	+7.7	+7.7	+6.8	+4.8	+4.7
Other service activities	+6.2	+5.4	+4.5	+4.3	+3.4	+3.0	+3.1
Gross Value Added (GVA) at basic prices	+4.5	+3.9	+3.6	+3.4	+3.6	+3.1	+3.6
Gross Value Added at basic prices excluding sugar	+4.7	+3.9	+3.8	+3.5	+3.7	+3.2	+3.5

Source: Digest of National Accounts (Statistics Mauritius, various issues)

In 2016 total tourist arrivals stood at 1.275 million (Statistics Mauritius 2017). The reasons for this improvement included the successful targeted tourism promotion campaigns and the gradual liberalisation of air access policy through increasing the seat capacity and competition on all routes with high growth potential (BOM 2016).

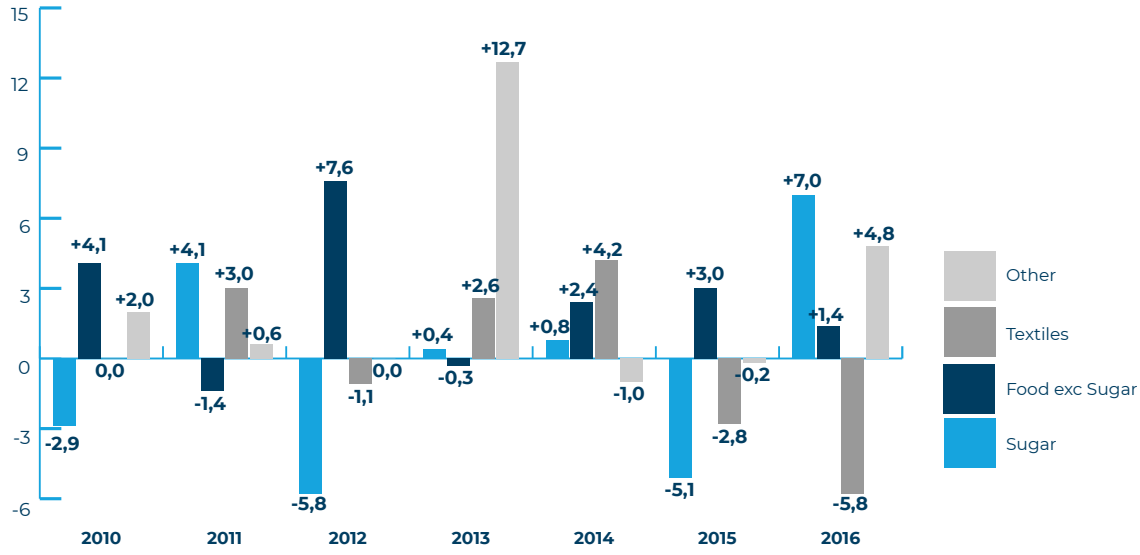
'Information and communication', and 'Wholesale and retail trade' remain the two other drivers of GDP in Mauritius. The construction sector has been struggling for the last six years and indeed contracted for the fifth consecutive year in 2015, stagnating in 2016. From 2011 the sector contracted severely as a result of a significant decrease in "Nonresidential building", partly offset by growth in "Other construction work" and "Residential building" respectively. While the number of building permits for residential buildings rose from 6,124 in 2014 to 6,538 in 2015, those for non-residential buildings fell from 465 to 375 over the same period (BOM

Figure 2.1: Growth of sub-sectors in agricultural, forestry and fishing 2010-2016



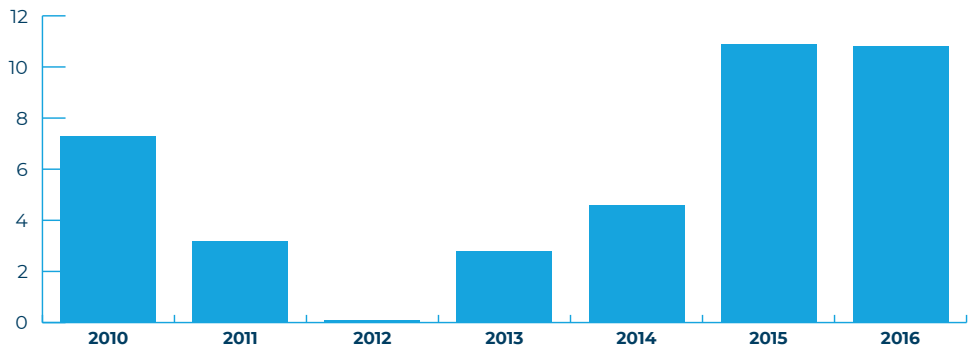
Source: Digest of National Accounts (Statistics Mauritius, various issues)

Figure 2.2: Growth rates of sub-sector in manufacturing



Source: Digest of National Accounts (Statistics Mauritius, various issues)

Figure 2.3: Percentage change of tourist arrivals over previous year (% change over previous year)



Source: Statistics Mauritius (2017)

2016, Statistics Mauritius 2016).

An analysis of sector-wise employment shows that the manufacturing sector, despite the challenges from the emergence of low-cost competitors, accounted for the largest share - 17% - of total employment. 'Wholesale and retail trade, repair of motor vehicles and motorcycles', was the second largest employer with a share of 16.6% in 2016. 'Construction', 'Agriculture', 'Public administration' and 'Accommodation and food service activities' are also important employment sectors, each with a share ranging from 7% to 8% of total employment.

Table 2.5: Share of economic sectors in total employment 2010-2016 (%)

ECONOMIC SECTORS	2010	2011	2012	2013	2014	2015	2016
Agriculture, Forestry and fishing	8.33	8.21	8.06	8.01	8.03	8.00	7.28
Sugarcane	2.71	2.63	2.48	2.39	2.36	2.31	2.19
Non sugar	5.62	5.58	5.58	5.62	5.67	5.68	5.10
Mining and quarrying	0.36	0.36	0.39	0.40	0.41	0.41	0.39
Manufacturing	20.73	20.33	20.05	20.09	20.06	19.71	17.40
Sugar	0.34	0.30	0.28	0.27	0.27	0.26	0.25
Food	2.39	2.48	2.54	2.63	2.70	2.72	3.23
Textiles	10.59	10.04	9.67	9.60	9.59	9.30	8.30
Other	7.41	7.51	7.56	7.59	7.51	7.43	5.62
Electricity, gas, steam and air conditioning supply	0.43	0.43	0.43	0.42	0.39	0.39	0.39
Water supply; sewerage, waste management and remediation activities	0.58	0.59	0.63	0.62	0.61	0.62	0.58
Construction	8.95	9.06	9.00	8.75	8.33	8.17	6.98
Wholesale and retail trade; repair of motor vehicles and motorcycles	17.00	17.05	17.10	17.25	17.27	17.65	16.57
Transportation and storage	5.83	5.79	5.82	5.87	5.90	5.89	6.79
Accomodation and food service activities	7.02	7.15	7.17	7.17	7.22	7.27	7.19
Information and communication	3.16	3.16	3.30	3.35	3.42	3.44	3.07
Financial and insurance activities	2.28	2.34	2.41	2.43	2.47	2.45	2.38
Real estate activities	0.13	0.13	0.15	0.22	0.25	0.26	0.25
Professional, scientific and technical activities	1.64	1.64	1.79	1.92	1.95	1.99	2.13
Administrative and support service activities	4.98	4.95	4.93	4.95	5.08	5.01	4.44
Public administration and defence; compulsory social security	7.62	7.60	7.43	7.36	7.42	7.36	7.30
Education	5.83	5.94	5.95	5.83	5.76	5.79	5.64
Human health and social work activities	3.61	3.72	3.71	3.61	3.58	3.65	3.42
Arts, entertainment and recreation	1.00	1.00	1.03	1.03	1.04	1.06	2.15
Other service activities	0.53	0.55	0.63	0.74	0.80	0.86	5.64
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00

3. Key policy and regulatory framework for green jobs Mauritius

This section reviews the key policy and regulatory framework which has a direct link to sustainability, creation of green jobs and also to where green skills would be crucial in Mauritius. A sectoral approach is adopted under which policies and regulations in specific economic sectors are analysed. The review also includes policies and projects at sectoral level which are likely to enhance opportunities for greening processes and activities. The main economic sectors identified as having green growth opportunities in Mauritius include agriculture, manufacturing, tourism, and energy. Smart cities and ocean economy are two emerging sectors while climate change adaptation projects cut across several economic sectors. Energy efficiency measures implemented at enterprise level are treated separately since projects associated with these measures are implemented across many economic sectors, from manufacturing to construction to tourism.

3.1 Economic-wide green incentives

Several economy-wide fiscal incentives have recently been introduced to promote sustainable business in Mauritius. For instance, as announced in the 2015-2016 Budget, tax incentives for the promotion of Green and Sustainable Development include an accelerated Income Tax Depreciation Provision for Green Investment[7]. Green technology equipment is defined as capital expenditure (excluding passenger cars) in the areas of renewable energy, desalination plants, composting equipment, pollution control equipment, water-efficient plant, energy-efficient equipment, and others. Exceptional accelerated annual allowances, introduced in 2013, were made permanent in 2015 in respect of landscaping and other earthworks for embellishment purposes and green technology equipment. These incentives are used by operators in the manufacturing, tourism, and other economic sectors. Specific training and skills developments are not explicit in the policy documents. However, tertiary institutions and other training institutions are expected to keep pace with Government policies.

3.2 Green development policy in the agricultural sector

The persistent use of agro-chemical inputs in the agricultural sector has been a major issue in Mauritius, challenging policy-makers as well as civil society at large. Water and air pollution, reduction in soil quality and fertility, degradation of biodiversity (pollinators, microorganisms), and threats to human health have been outlined as major consequences of unsustainable agricultural practices (MoSSNSESD 2016)[8]. The fall in agricultural yields from the excessive use of agro-chemical fertilisers is further accentuating the problem of food security given that Mauritius imports almost 77% of its food requirements. The minimisation of the use of agro-chemicals and the adoption of environmentally-friendly production systems that would reconcile farmers' welfare, environment protection, food safety and farm economic viability have been emphasised by all relevant stakeholders (MoAIFS 2016).

One of the weaknesses preventing the shift towards green agriculture in Mauritius was a lack of definition and classification as far as sustainable agricultural practices and standards

7 Lutchmeenaraidoo, S. 2015. At the Crossroad Budget Speech 2015-2016. Ministry of Finance and Economic Development, Government of Mauritius.

8 According to Mrs Ramah, an expert in agricultural science from the FAREI, unsustainable agricultural practices with the use of chemicals lead to a vicious circle between lowering yields in the longer term and the application of more chemicals; the latter reinforces the former and vice versa in an unsustainable manner (Ramah 2017; personal communication).

are concerned. A green agriculture certification mechanism was strongly advocated in the ILO Green Jobs Assessment in 2012 as a means of enhancing the visibility of green agricultural practices and of encouraging green jobs in the agricultural sector (ILO 2012). This has led to a discussion on the establishment of sustainable standards in the agricultural sector. Thus in 2016 the Ministry of Agro-Industry and Food Security (MoAIFS) launched the MauriGap, the acronym for Mauritius Good Agricultural Practices and Food Security, which was prepared and published by the Mauritius Standard Bureau (MSB) in October 2015. The MauriGap Standards cover the efficient use of resources, adoption of environmentally sound practices for natural resources, biodiversity preservation, pre- and post-harvest best practices, workers' health and safety, and agricultural waste recycling. MauriGap has been introduced at Level 1 (Basic) and Level 2 (Advanced) as the necessary prerequisites for Level 3. The latter corresponds to the GLOBALGAP certification.

The implementation of the MauriGap standards would require different types of training so that farmers are equipped with the necessary skills to adopt sustainable agricultural practices. Green skills in the agriculture sector have long been recognised as a major component of the shift towards a sustainable agriculture base. Previously the Agricultural Research Extension Unit (AREU) was responsible for training farmers in the agricultural sector. Recently, the AREU has been restructured into the Food and Agriculture Research Extension Institute (FAREI) and is directly involved in training farmers as soon as the Government decides on and implements a new set of policies and strategies.

It is to be noted that when MSB publishes standards, training sessions are usually organised to facilitate its implementation. However, in the case of MauriGap, given that FAREI has the necessary expertise in the field of sustainable agriculture and has a well-established network with farmers, the latter shoulders the responsibility for the training component. The training session is organized as and when the Institute deems it essential for the farmers. Training is, however, ongoing at the FAREI in other fields such as bio-farming. Several sessions on the Training of Trainers courses have been organised recently in relation to the MauriGap standards.

The **Strategic Plan (2016-2020)** builds on the 2015-2019 Government Programme to enhance the level of food security in Mauritius, together with safe food and better nutrition of the population (MAIFS 2016). The Strategic Plan (2016-2020) also emphasises capacity-building for adaptation to climate change. The need for sustainable development in a climate-friendly mode is clearly highlighted and is part of the mission of the Ministry of Agro-Industry and Food Security (MoAIFS), that is '*to build vibrant non-sugar agriculture and agri-business sectors that utilise natural resources sustainably, contribute significantly to national food security and safety, empower producers to higher productivity*'. A priori the FAREI is responsible for capacity-building in the agricultural sector.

Government policy is aiming at a gradual shift towards bio-farming with a target of achieving 50% of vegetables and fruits produced as per bio-norms by 2020[9]. The MoAIFS, through the Strategic Plan and the Government's vision, is strongly emphasising bio-food and bio-farming, to be achieved through development of bio-production protocols, establishment of bio-farming zones, bio-food production and bio-farming certificates and labelling. These initiatives, although separate, are consistent with the MauriGap certification. Thus, in line with the objective of the Government Programme and Strategic Plan (2016-2020), the MAIFS has launched a Bio-farming Promotion Scheme to encourage development of bio-farming activities on a commercial scale. The scheme include an income tax holiday for the first eight years of operation, Value Added Tax Exemption on production equipment and other inputs acquired for implementation of the project, loan facilities at an annual interest rate of Key Repo less 1% (currently 3.4%) over a period of ten years for a maximum of 90% project financing under the MauBank SME Financing Scheme, along with fasttrack business support solutions from the FAREI. A plot of land of 66 Acres on State

9 FAREI website http://farei.mu/farei/%E2%80%8Bbio-farming-initiative-sensitisation-campaign/

Land at Britannia has been earmarked for the exclusive use of bio-farming projects (GIS 2016, 2017). The FAREI initially started a Bio-farming sensitisation programme and, through its different Units in various part of the islands, it ensures that information regarding application is fully communicated to farmers. Recently the Mauritius Institute of Technical Development (MITD), the institution responsible for vocational training, has also launched a short training course in bio-farming.

Additional fiscal incentives recently introduced in Mauritius are the Compost Subsidy Scheme and Sheltered Farming Scheme (GIS 2016). The Compost Subsidy Scheme encourages farmers to shift from chemical to organic inputs. As at June 2016 some 3,300 farmers have taken advantage of the Scheme. The Sheltered Farming Scheme encourages farmers to undertake crop production under protected structures, especially given the phenomenon of climate change. Again the FAREI ensures that the farmers have the necessary skills for its implementation. So far a one-off sensitization campaign has been launched by FAREI. However, the campaign is likely to continue if there is a demand for it from farmers.

3.3 Greening the manufacturing sector

The manufacturing sector is made up of a diverse set of production activities in which investment opportunities include food processing and packaging, textiles, precision engineering and watchmaking, medical devices and pharmaceuticals, high-end jewellery and diamond processing, among many others[10]. Several policy and regulatory frameworks have been designed to encourage developments in the manufacturing sector, such as the national Export Strategy and the 10-year Plan for the SME sector in Mauritius.

While significant manufacturing promotion activities and incentives are in place, they are not yet related to environmental sustainability. For instance, strategies to increase the manufacturing base include preferential market access through COMESA, SADC, EPA, AGOA, GSP, IOC, Turkey FTA & Pakistan FTA, while a wide of range of incentives exists including the following: an absence of import duties on equipment and raw materials; an absence of export duties; the fact that VAT on raw materials, while payable at customs clearance, is reimbursable on exports; and the possibility of employing expatriates and foreign labour with an 8-year work permit policy. There are also other incentives such as market schemes allowing a 40% refund on air freight costs incurred on exports of textiles and apparel, jewellery, medical devices, fruit, flowers, vegetables and chilled fish, plus tax credits for investment in hightech manufacturing equipment in targeted sectors (including pharmaceuticals, textiles, apparel, etc.).

The Freeport legislation in Mauritius also provides a package of fiscal and non-fiscal incentives to Freeport companies engaged in a manufacturing activity mainly for the African market. New incentives for the manufacturing sector announced in the Budget 2017/2018 include a waiving of registration duty and Land Transfer Tax for the construction of buildings intended for qualifying high-tech manufacturing activities; a 3% corporate tax on profits derived from exports of goods; an 8-year income tax holiday for companies engaged in the manufacturing of pharmaceutical products, medical devices and high tech products; and tax Incentives for Research and Development (R&D) and accelerated depreciation of 50% per annum on capital expenditure on R&D. Companies can also claim a double deduction in respect of qualifying expenditure on R&D up until income year 2021-22. These initiatives are mostly fiscal in nature. Companies operating in the Freeport sector eventually ensure that information is communicated to clients.

Green jobs in the manufacturing sector can be observed in enterprises which adopt low-carbon practices, are resource-efficient and minimise waste. However, an Industrial Waste Assessment project by the Ministry of Industry, Commerce & Consumer Protection, with the collaboration of Business Mauritius and the assistance of UNIDO

10 A list of investment opportunities in the manufacturing sector is provided on the Board of Investment website.

in 2016, has shown that the policy framework does not enable the private sector to carry out integrated management of industrial waste. As of 1 April 2009 the Environment Protection (Industrial Waste Audit) Regulations entered into force to induce industries to optimize resource use, develop waste management systems and comply with the prescribed discharge and emission regulations.

The policy framework for a sustainable manufacturing base includes the National Environment Policy of 2007 with a polluter-pays principle. The Environment Protection Act (EPA), amended in 2008, also establishes a comprehensive enforcement of procedures as well as regulations and standards for environmental protection. The 10-year plan for the SME sector also emphasises green businesses and adoption of environment-friendly practices by SMEs.

Greening of manufacturing is observed through various policy and incentives such as the SME Development Certificate introduced in 2016 ,which provides for an 8-year tax holiday and concessionary loans, for the production of renewable energy, and bio-farming activities. In the 2016-17 budget the SME development certificate was extended to sole traders and cooperatives.

One of the instruments for greening the manufacturing base is ISO 14000 which is managed by the MSB. However, only a small number of firms have implemented formal environmental management systems (MSSNSESD 2016). About 10 enterprises in Mauritius are certified ISO 14001 (Industrial Observatory, 2015). More advanced sustainable production concepts, such as Life Cycle Assessments and Eco-design, are not yet being applied.

In 2016 the Mauritius Standard Bureau implemented the standards for Eco-labelling of Textile products – MS 188:2016. The Eco-labelling in this respect takes into account the minimisation of the use of environmentally harmful substances, reduction of water and air pollutants, reduction of energy consumption and Greenhouse Gas (GHG) emissions, minimisation of waste generation and adoption of sustainable processes. The MSB also ensures that when a standard is adopted, a component of capacity-building is included. The training aims to produce specialists who conduct the assessment, followed by preparation of staff at enterprise level for its implementation. Training is usually a one-off event and can be replicated if there is a demand for it.

3.4 Eco-tourism and green tourism

The Mauritius Standard (MS) 165 for sustainable tourism in Mauritius has been derived from EcoMark Africa and the Global Sustainable Tourism Criteria (GSTC), taking into account the local specificities and context. With a view to facilitating certification of tourism businesses to MS165 standards, the Mauritius Tourism Authority has developed a scheme for provision of support for tourism businesses. The scheme has been operational since 2015 and is managed by a Project Steering Committee set up at the level of the Tourism Authority. It provides a matching grant equivalent to 50% of project costs, but not exceeding Rs.44,000. The response has been poor as operators do not yet see the standard as a marketing tool. MS165 is being reviewed for alignment with the Global Sustainable Tourism Council requirements for recognition and accreditation so as to make it more attractive as a marketing tool. With a view to incentivising companies to be MS165-certified, the ceiling for the grant will be increased to around Rs150 000 to cover certification and consultant costs.

3.5 Towards a green energy sector

The Government's drive to reduce fossil fuel use is reflected in the 2009-2025 Long-Term Energy Strategy to increase the renewable energy (RE) target to at least 35% of electricity production by 2025. The Government Programme (2015-2019) stated that the 'Government will adopt a

responsible and environmentally sustainable policy regarding energy production' and consequently provides the framework in which national strategies, including the Outline Energy Policy, the Long-Term Energy Strategy 2009-2025 and CEB's Integrated Electricity Plan, will be realised.

Mauritius is heavily reliant on fossil fuels for electricity generation. According to the proposed Clean Development Mechanism (CDM) Standardized Baseline[11] prepared by the Government of Mauritius for the UNFCCC in 2013, the grid emission factor of Mauritius is very high at 1.01t CO2/MWh owing to imported coal and fuel oil being sources of electricity generation.

The Third National Communication to the UNFCCC[12] by the Ministry of Environment, Sustainable Development, and Disaster and Beach Management in October 2016 reveals an average annual growth of 4.3% of Gg CO2 over the last 15 years or so in the energy sector.

In 2010 the Government of Mauritius launched, with UNDP support, the Small-Scale Distributed Generation (SSDG) scheme, which has helped 237 households, schools and public institutions install small-scale (less than 50 kW) photovoltaic (PV) panels and wind turbines through provision of a targeted feed-in tariff scheme(GCF 2016). The SSGD Phases 1 and 2 are complete and now Phase 3 is underway.

The Ministry of Energy and Public Utilities (MEPU) has the mandate to formulate policies in the energy, water and wastewater sectors, and to maintain a responsive legal framework for governing these sectors. It hosted the Energy Efficiency Management Office, formulated the Small-Scale Distributed Generation (SSDG) scheme and conducted feasibility studies for renewable energy projects (for example wind farms). The Central Electricity Board (CEB) is a parastatal entity established under the CEB Act (1964). The latter is responsible for the generation (in collaboration with IPPs), transmission and distribution of electricity in Mauritius, and manages the Small-Scale Distributed Generation Department consisting of four staff who manage the SSDG scheme. The CEB is currently executing the GEF-financed 'Removal of Barriers to Solar PV Power Generation in Mauritius, Rodrigues and the Outer Islands' project (2011-16).

11 https://cdm.unfccc.int/methodologies/standard_base/Grid_emission_Mauritius.pdf

12 https://unfccc.int/files/national_reports/non-annex_i_natcom/application/pdf/nc3_republic_of_mauritius_20jan17.pdf

Table 3.1: Source of electricity generation in Mauritius 2010-2016 in GWh

	2010	2011	2012	2013	2014	2015	2016
Primary energy	**103.2**	**62.4**	**96.3**	**121.2**	**140**	**170.80**	**166.5**
Hydro (renewable energy)	100.7	56.5	74.1	94.8	90.8	121.88	99.5
Wind (renewable energy)	2.5	2.8	3.6	3.6	3.2	2.69	18
Landfill gas (renewable energy)	-	3.1	17.8	20	21.3	20.36	18.7
Photovoltaic (renewable energy)			0.9	2.7	24.6	25.87	30.3
Secondary energy	**2,585.40**	**2668**	**2,700.80**	**2,764.10**	**2,797.00**	**2824.78**	**2875.7**
Gas turbine (kerosene)	18.9	11.6	11	1.7	2	2.00	2.1
Fuel oil & Diesel	976.6	1058.7	1,057.00	1,076.10	1,079.30	1131.24	1109.8
Coal	1,039.50	1108.2	1,162.30	1,213.60	1,259.50	1181.69	1266.8
Bagasse (renewable energy)	550.4	489.5	470.5	472.8	456.2	509.84	497
Total	2,688.70	2730.4	2,797.10	2,885.30	2,936.90	2995.58	3042.2
Renewable energy	653.6	551.9	566.8	594	596.2	680.64	663.5

Source: Digest of Energy Statistics (Statistics Mauritius, various issues)

Further details on the SSDG Scheme is provided in **Box 7**.

A new institution, the Mauritius Renewable Energy Agency (MARENA), has also been created for the promotion of Renewable Energy Technologies and to facilitate the implementation of projects. Moreover, the Government of Mauritius is committed to developing the ocean economy as an important industry in order to sustain economic diversification, job creation and wealth generation. Currently, on behalf of the Government the Mauritius Research Council (MRC), an apex body promoting and coordinating national investment in research, invites expressions of interest for the development of Offshore Wind Farms for the Republic of Mauritius[13].

3.6 Energy efficiency measures across economic sectors

The implementation of energy and resource-efficient measures in enterprises across economic sectors is an important aspect of the green jobs. To start with, there is a need for energy auditors who would provide solutions and recommendations on energy efficiency measures. Eventually there would be an implementation phase; in this respect, green skills and green jobs would be required from the energy auditors for technicians who would implement these measures, including the adoption of new techniques and technology in the enterprises.

The Energy Efficiency Management Office (EMO) in this respect is the leading department to energy efficiency development and promotion in Mauritius. It facilitates the management of energy efficiency in all sectors of the economy including transport, buildings, industry and services, as well as in households, and fosters a culture of energy efficiency through awareness, capacity-building and support for initiatives. Among the initiatives which have been undertaken by the EMO are the following: the Voluntary Scheme for Energy Efficiency Labelling of Electrical Appliances (refrigeration appliances, household electric ovens, electric dishwashers, room air conditioners, washing machines, electric lamps, tumble dryers and televisions); the Energy Efficiency Awareness Campaign; energy efficiency competitions; the Energy Observatory report; talks on Energy Efficiency and Energy Saving; mandatory energy efficiency labelling of electrical appliances (refrigeration appliances, electric ovens, electric dishwashers); mandatory Energy Audits; mandatory Registration of Energy Auditors; and monitoring of energy in public sector buildings, among others[14]. The EMO is far from being a training institution. However, given that there was a need to train energy auditors, it established a training course to that end. The training was funded by the AfD. Further details are provided in **Box 9** in the next section.

3.7 Green building and Smart city scheme

Debates and discussion on green building and sustainable construction date back over a decade in Mauritius. For instance, in 2009 the Mauritius Standard Bureau embarked on a pioneering project for rating Mauritian buildings with respect to green design and construction, with respect to the application of the US LEED (Leadership in Energy and Environmental Design) green building rating system developed by the US Green Building Council. As a follow-up activity, the Green Building Council of Mauritius (GBCM) prepared a report in 2012 to review how the Green Star SA – a Green rating system from South Africa - can be applied to Mauritius. Eventually an Energy Efficiency Building Code was implemented in Mauritius. These activities have a direct link with green skills. Skills and

13 Mauritius Research Council (2017) Request for Expressions of Interest EOI/OWF/16-17/01 Expressions of Interest for the Development of Offshore Wind Farms for the Republic of Mauritius, 6th March 2017. http://publicprocurement.govmu.org

14 Hosany, S. (2017) Energy Efficiency Management Office, powerpoint presentation. http://publicutilities.govmu.org/English//DOCUMENTS/ENERGY%20EFFICIENCY%20MANAGEMENT%20OFFICE%20PPT3.PDF, (accessed data 2nd August 2017)

training are required for professionals with responsibilities in the maintenance, execution and management of the buildings energy systems as well as for other people in the supply chain and implementation phase. As mentioned earlier, there is a need for dedicated training of local resource persons in compliance with the Energy Efficiency Building Code.

In 2015 the Government of Mauritius launched the Smart City Scheme as a novel and ambitious economic strategy for development. A document on the 'Environmental Guideline for Smart Cities' was prepared in July 2015 by the then Ministry of Environment, Sustainable Development, and Disaster and Beach Management, which aims at providing general guidance for the planning and design of smart cities from an environmental perspective. Smart cities is expected to be of mixed use, comprising residential, commercial, office and entertainment components. Under the Environmental Protection Act, developers will have to submit an Environment Impact Assessment or a Preliminary Environment Report as applicable. The vision of this programme aims at consolidating the Mauritian International Business and Financial Hub by creating ideal conditions for working, living and spurring investment through the development of smart cities across the island. These smart cities will leverage the latest advances in urban planning and digitalised technologies. The Smart City Scheme has been set up under the Investment Promotion Act 2015 and the Investment Promotion (Smart City Scheme) Regulations 2015.

3.8 Sustainable ocean economy and management

The emerging concept of the 'Ocean Economy' has been embraced by several islands in the Indian Ocean such as the Seychelles. For instance, the Government of Seychelles is seeking the assistance of the Commonwealth Secretariat with the provision of a long-term in-country technical expert to help the Government complete this transition effectively. Mauritius has a total maritime zone of 2.3 million square kilometres with an Exclusive Economic Zone of 1.96 million square kilometres and a continental shelf of 396,000 square kilometres co-managed with the Republic of Seychelles. Further submissions for an Extended Continental Shelf of 303,000 square kilometres on the seabed and subsoil will be made to the Commission on the Limits of the Continental Shelf in respect of Rodrigues and Chagos Archipelago.

The 2015 Government Programme reflects the vision of the Government to transform Mauritius into an ocean state by promoting the ocean economy as one of its main pillars of development. A Ministry of Ocean Economy, Marine Resources, Fisheries, Shipping and Outer Islands dedicated to ocean-related activities has been created. In addition, the legal and regulatory frameworks for monitoring ocean economy operators are currently under review. Key investment opportunities include the following: seabed exploration for hydrocarbons; fishing; seafood processing and aquaculture; deep ocean water application; marine services; seaport-related activities including trans-shipment, cruise travelling, port services and bunkering; marine renewable energies; and ocean knowledge.

More emphasis is being laid on the development of the fisheries sector and the port area. A larger fishing harbour is envisaged which is expected to have 8-10 times its current capacity, and fishermen are being encouraged to move to the off-lagoon area while discussions take place on how to boost local production of seafood in Mauritius. Port activities remain one of the main pillars of the ocean economy. In the meantime skills development in the port areas has taken place on conventional lines, relying on tertiary institutions for courses on port management. However, in relation to port activities the ocean economy would be likely to generate a wide of range of green jobs. But since these skills are still uncertain there is at present no major move to offer a wide range of training in port activities, other than conventional and existing types of skills development.

3.9 Climate change adaptation projects

As a Small Island Developing State the Republic of Mauritius is particularly vulnerable to the adverse effects of climate change, especially along the coast where an accelerating sea level rise and the increasing frequency and intensity of tropical cyclones are likely to result in considerable economic loss, humanitarian stresses, and environmental degradation. Key sectors which are vulnerable to climate change include agriculture, coastal resources and tourism, water resources, marine and terrestrial biodiversity, fisheries, human health and infrastructure. Climate change adaptation and mitigation are among the top priorities in Government's Programme 2015-2019. Some of the key legislative and policy measures set in place include the National Disaster Risk Reduction and Management Act (2016), Master Plan for Energy Efficiency/Demand Side Management and Action Plan for the period 2016 to 2030 (2016), Marshall Plan Against Poverty (2016), Strategic Plan 2016-2020 for the Food Crop, Livestock and Forestry (2016), A Guideline for Climate Change Adaptation Strategy Coastal Setback (2016), Action Plan for the implementation of measures in the Intended Nationally Determined Contribution (2016), National Biodiversity Strategy and Action Plan (2016 – 2020), Climate Change Charter for Local Authorities (2015), National Climate Change Adaptation Policy Framework (2012), Master Plan for "Development of the Water Resources in the Republic of Mauritius (2012), Building Control Act (2012), Energy Efficiency Act (2011), and Long term Energy Strategy 2009 – 2025.

The Climate Change Adaptation Programme in the Coastal Zone of Mauritius is one of the programmes implemented in recent years to help coastal communities fight the adverse effects of climate change through implementation of climate-resilient development measures. The programme was funded by the Adaptation Fund and implemented by the United Nations Development Programme. Adaptation measures along the coastal regions would include preservation of natural landscapes through the establishment of natural parks for eco-tourism; planting of mangroves; building of wave breakers at sea and flood walls on the coastline to protect vulnerable inland infrastructure; and building of elevated roads or relocation of coastal roads more inland. Restoration of wetlands for fisheries, protection of infrastructure from storms and sea level rise, and replenishment of dunes are also part of the adaptation measures.

3.10 Green projects supported by international organisations

Over the last few years, several international organisations have assisted Mauritius in the transition to the green economy, the ILO, UNEP and PAGE having been among the first to have helped the island in its progress towards green growth. Currently, one of the programmes which is financing green projects in Mauritius is Switch Africa Green (SAG) which is a European Union (EU)-funded programme implemented by the United Nations Environmental Programme (UNEP) in collaboration with the United Nations Development Programme (UNDP) and the United Nations Office for Project Services (UNOPS). It is being implemented in six countries - Burkina Faso, Ghana, Kenya, Mauritius, South Africa and Uganda – with the objective of helping them achieve sustainable development through progress towards an inclusive green economy with the potential to generate growth, create jobs and reduce poverty. The overall objective of Switch Africa Green is to support the African countries concerned with achieving sustainable development by engaging in transition to an inclusive green economy, based on sustainable consumption and production patterns, while generating growth, creating decent jobs and reducing poverty. The objective will be achieved through support to private-sector-led inclusive green growth. The specific objective is to support the development of green business and eco-entrepreneurship and to adopt Sustainable Consumption and Production practices. Priority sectors in which green projects are being applied are agriculture, manufacturing, tourism, and integrated waste management systems, along with cross-cutting sectors such as energy

efficiency, labelling and standards, water efficiency, eco-innovation and sustainable trade. **Box 1** further documents the activities under the SAG.

Another project which would create a demand for green skills in the agricultural sector is the 'Climate Smart Agriculture' project. The European Union has allocated to the Government of Mauritius a grant amounting Rs 115 million under the Global Climate Change Alliance Plus (GCCA+) Flagship Initiative to support climate smart agriculture. The objective of the climate smart agriculture project in line with government objectives to promote bio-farming and reduce use of pesticides is to increase the resilience of the non-sugar agriculture sector to climate change and thus contribute to sustainable livelihoods. The financing will support activities pertaining to the adoption of climate smart agricultural and disaster risk reduction practices by small planters. This includes interventions to improve water availability to small planters and increase production of quality products free from diseases with a positive impact on the revenue of small planters.

As a private sector initiative, the Mauritius Chamber of Agriculture (MCA), together with the FAREI, has launched the Smart Agriculture project which also enhances sustainable agriculture in Mauritius. The project is currently being financed by a grant from the 'Agence Française de Développement' (AFD) and assistance from the 'Centre de Coopération International en Recherche Agronomique pour le Développement de La Réunion'. The project potentially uses agricultural practices which optimise yields but at the same time attempts to control use of pesticides, chemical fertilisers and water. The project is being implemented over a period of three years on an island-wide pilot basis with ten small growers.

Box 1: Skills development under the Switch Africa Green project

One of the sustainable initiatives under the Switch Africa Green programme which is being implemented by Empretec Mauritius is capacity-building of eco-entrepreneurs. Empretec Mauritius is a not-for-profit social enterprise which contributes to the development of a dynamic private sector through the creation of vibrant, innovative and internationally competitive small and medium enterprises. Under the SAG, the latter has trained eco-entrepreneurs with particular emphasis on development of behavioural and attitudinal acumen (PECs) and has supported the successful creation and development of green innovative and inclusive businesses. The actions taken as part of this component include (a) benchmarking of SME greening practices, (b) mapping the landscape for SCP Practices and (c) training of eco-entrepreneurs and implementation of Certification Mechanism for Trainers, including Training of Individuals and Service Providers, (d) business creation and eco/social entrepreneurship development (mentoring support), and (e) showcasing of ecoinnovation and green sustainability models for SMEs and the creation of green Business Focus Groups.

The SAG programme also adopts a sectoral capacity-building approach with technical assistance and technology transfers which target SMEs in the agricultural, manufacturing and tourism sector. More specifically, through Empretec Mauritius, training and technical assistance is provided for the implementation of sustainable manufacturing practices, environmental management system model and ISO 14001 in the tourism sector, and energy auditing in SMEs for resource efficiency. Last but not least, there is also a sub-component of clustered support for access to green markets, export development, and business linkages.

Another intervention under the SAG is the use of industrial symbiosis to enhance the resource productivity and environmental performance of SMEs in Mauritius. This is expected to promote a shift to more sustainable consumption and production (SCP) practices and patterns and Integrated Waste Management. Among the different activities include: capacity-building: through the hosting of five workshops (each of batches of 20 organisations) so as to train at least 100 MSMEs on cleaner production and Industrial Symbiosis, training of around 20 companies each year, evaluating the performances of the companies, establishing a Network Hub in the Region, and the development of an Industrial Symbiosis Toolkit.

Materials from Mr I. Bhodeeah – EMPRETEC personal communication

4. Green skills development for the green economy in Mauritius

This section examines green occupations and green skills development challenges in relation to the green policies, programmes and strategies of the Government designed to make Mauritius an environmentally sustainable economy. Emphasis is laid on the interaction between government policies in different areas and the demand for green skills and the institutional framework through which the education and training system responds to green skills needs. To a certain extent a distinction is made between technical and core (generic) skills. The section also examines whether there is a need to upgrade green skills development at sectoral level.

4.1 General skills development mechanism in Mauritius

Green jobs can be created through a restructuring of existing sectors and sub-sectors in the economy, from a resource-intensive to a more resource-efficient, low carbon model. Within a particular sector and at enterprise level, this form of 'green restructuring' is related to production processes, management practices, production techniques, and technologies which turn traditional business operations into green businesses that do not harm the environment, have low carbon impacts and are resource-efficient. Green agriculture, green manufacturing or greening of the tourism sector would fall in this category. Examples of the processes include waste management systems, pollution prevention techniques, green distribution and supply chain management, and energy-efficient management practices, among others.

Green skills in this respect would be related to processes and operations at the level of the enterprise. They would for example include agro-engineers for bio-farming, energy auditors for auditing enterprises, and engineers and technicians for the implementation of efficiency measures.

The types of green restructuring of the economy would eventually shape the demand for green skills, both generic and specific. Across enterprises, understanding of energy auditing reporting and implementation of the measures (managing the team in working towards them) may represent a generic skill for engineers or factory managers, while conducting the energy audit would be classified as a technical skill.

Green jobs will also be created when the restructuring of the economic sectors and sub-sectors leads to new types of green products or services. Examples include eco-tourism where nature-based activities are offered to tourists or PV solar manufacturers, and in which a whole range of green skills from manufacturing, distribution, maintenance and so forth would be required. Recycling, waste management, and water harvesting companies would all require a set of new technical skills. The same applies to emerging sectors such as ocean economy and smart cities in Mauritius which, by definition, have a direct link to sustainability.

In this respect a mixture of generic and specific skills would be needed with new green jobs in some activities, while in other activities existing jobs would be restructured into greener jobs. The educational and vocational institutions would have to cater for the different types of generic and specific skills.

4.2 Skills development in Mauritius – general framework

Skills development in Mauritius falls within the purview of the Ministry of Education and Human Resources, Tertiary Education and Scientific

Research (MoEHRTESR), which is responsible for the areas of education and human resource development[15]. Mauritius has recently implemented the nine-year schooling system which replaces the previous two-tier system of six years' primary education and seven years' secondary education[16]. The nine-year schooling system makes it compulsory for a child to attend classes up to lower secondary education level, after which the latter would be shifted to upper secondary education or vocational education.

Tertiary education in Mauritius falls within the purview of the Tertiary Education Commission (TEC), which is responsible for governing post-secondary education and allocation of funds to Tertiary Education Institutions. The publicly-funded tertiary institutions in Mauritius include the University of Mauritius (UOM), University of Technology, Mauritius (UTM), Mauritius Institute of Education (MIE), Mahatma Gandhi Institute (MGI), Rabindranath Tagore Institute, the Open University of Mauritius, Université des Mascareignes, Mauritius Institute of Training and Development (MITD), Mauritius Institute of Health (MIH), and Fashion and Design Institute.

The Human Resource Development Council (HRDC) established under the Ministry of Education and Human Resources, Tertiary Education and Scientific Research, is the apex body guiding policies on skills development. It was founded by the Human Resource Development (HRD) Act in 2003 based on the recommendations contained within a report on the National Integrated Training Strategy and is a national, multi-stakeholder organisation which manages the National Training Fund (HRDC 2015)[17]. According to the HRD Act of 2003 employers pay a training levy and the fund is used to finance training of employees across economic sectors. Accordingly the HRDC manages the Levy Grant System under which employers can recover up to 75% of course fees depending on their tax rates. Grants awarded by the HRDC are based on a cost-sharing principle.

The main provider of TVET programmes in Mauritius is the Mauritius Institute of Training and Development (MITD). The MITD has about 350 private training institutions in Mauritius and currently provides courses at National Diploma level[18]. Its courses cover the following sectors: agro-industry, automotive industry, beauty care and hairdressing, building construction and civil engineering, electrical and electronics engineering, handicrafts, information and communications technology, jewellery, management, mechanical engineering, printing, textile and apparel, tourism and hospitality, and wood trades[19]. The MITD is regulated by the Mauritius Qualification Authority (MQA) which is responsible for ensuring the quality of all training (government as well as private sector). The MITD operates in close collaboration with the Ministries and HRDC and potentially designs courses at their levels when there is a demand for such training. Further information is provided in section 4.3.1.

During the last decade or so, several studies conducted by national and international institutions have consistently highlighted the skills mismatch unemployment facing Mauritius (IMF 2013; OECD 2014; Government of Mauritius 2015; ECA 2016, World Bank 2016). According to a World Bank report, the labour force skills mismatch grew by 30% between 2001 and 2012, signalling an urgent need for policies to support high-tech and services-oriented sectors (World Bank 2016). Studies on skills needs assessment and labour shortages by the HRDC provide ample evidence of the skills gap in Mauritius at sectoral level[20]. In this respect the government has launched several initiatives to further fill the skills gap in Mauritius, with the HRDC taking the lead on improving training at both national and

15 The recent report entitled, 'Mauritius National Export Strategy Skills Development Cross-Sector 2017-2021', by the Government of Mauritius (GOM 2016) provides a systematic review of the skills development mechanism in Mauritius.

16 METESR 2017. Nine Year Continuous Basic Education. http://ministry-education.govmu.org/English/educationsector/nys/Documents/flyer_Grade6%20(4).pdf/ http://ministryeducation.govmu.org/English/educationsector/nys/Documents/Presentation_PRESS_NN_19August2015pdf.pdf

17 The objectives and functions of the HRDC is provided in the Annual Report HRDC (2005) http://www.hrdc.mu/index.php/downloads/category/5-annual-reports.

18 http://www.mitd.mu/booklet.pdf

19 MITD website at http://www.mitd.mu/courses.php (accessed on the 13th August 2017)

20 A list of the studies and projects to improve training by the HRDC can be found at http://www.hrdc.mu/index.php/press-releases (accessed on the 25th September 2017)

Box 2: National Skills Development Programme

The National Skills Development Programme aims at matching skills for the unemployed youths to integrate the labour market, in view of providing technical skills that are highly in demand in certain priority sectors. Introduced in 2016, the programme initially targeted some 4,000 youths in the age group of 16 years to 30 years as well as unemployed persons up to the age of 35, on ICT, tourism and hospitality, nursing and paramedics and construction and industries. The NSDP is with the strategy of the Government to create job opportunities for the youths and unemployed as announced in Budget 2016-2017. Training courses which will be run over a period of 3 to 12 months will also include a placement component. At the end of the training, trainees will be able to acquire and develop the necessary technical skills associated with the nature of their work, and experience the environment of a real workplace. Trainees are employed as trainees with a payment of a monthly stipend/ allowance Rs 6,000 for the duration of the training and placement not exceeding 1 year.

The governance structure of NSDP is the Steering Committee set up through the MoEHRTESR, co-chaired by the Senior Chief Executive and a representative of Business Mauritius. A Technical Committee has been set up with a view to evaluate all applications which include members from Business Mauritius, MLIRET, MOFED, HRDC, MQA and TEC. There are five modes of modes of training: mode 1 :Courses offered by MITD and other public training institutions as approved by the Sub-committee; Mode 2 :Courses emanating from Industry Associations delivered by an MQA/TEC Registered Training Institution (RTI); Mode 3 :Courses emanating from an enterprise delivered by an MQA/TEC RTI; Mode 4 :Courses existing in the market and delivered by MQA/TEC Training Institutions (through procurement exercise) and Mode 5 :Courses NOT existing in the market; developed by HRDC (through a subject expert) and delivered by an MQA/TEC RTI (through procurement exercise). An enterprise can submit a proposal to run a course by a preferred MQA/ TEC RTI based on its requirements and approval of the Sub-committee. The enterprise shall take on placement all the trainees; The enterprise will pay the stipend of Rs6000 to the trainee and claim for refund from the HRDC, or the HRDC can pay the stipend subject to the timely submission of attendance in the prescribed format.

Source: GIS (2016), (GOM 2017) National Skills Development Programme Manual of Procedures

sectoral levels. The MITD, tertiary institutions, the Civil Service College, Mauritius, and others have all been instructed to focus on improving the skills and employability of the Mauritian labour force. Recently the Polytechnics Mauritius Ltd (PML), a corporate body, was established under the aegis of the Ministry of Education and Human Resources, Tertiary Education and Scientific Research, with the objective of running training programmes to serve Mauritius's emerging need for a qualified and skilled human resource at middle-professional level. Programmes provided by PML will be dynamic and customised to the needs of the world of work. An initiative taken by the Government since 2016 is the National Skills Development Programme (NSDP). Further details are provided in the following section and in **Box 2**.

4.3 Green skills development in Mauritius

4.3.1 Overview of green skills development strategy

Skills development in Mauritius is mostly demand-driven, reflecting the dynamics of the economy and Government policies as well as the needs of the labour market. The Ministry responsible for skills development – the Ministry of Education, Human Resource, Tertiary Education and Scientific Research (MoEHRTESR) - scrutinises the dynamics of the economic sectors and labour markets in a systematic and continuous manner. Potentially it responds to changing labour demand by providing guidance and direction to education and training institutions on implementation of the required courses and training (Bhujun

2017)[21]. The MoEHRTESR operates in consultation with the HRDC and MITD as well as with other stakeholders in the public and private sectors, potentially to guide institutions on training needs. It uses the studies and surveys conducted by the HRDC as well as other employment reports from industry associations (MCCI, Mauritius Commercial Bank economic reviews, Bank of Mauritius reports).

Skills development for graduates and the unemployed is currently being provided by the NSDP under the MoEHRTESR - an initiative by the Government in 2016 to cater for the skills mismatch of youth unemployment and implemented by the HRDC. The MoEHRTESR coordination mechanism for the NSDP in Mauritius follows the National Steering Committee on Skills Development which is co-chaired by the Senior Chief Executive from the MoEHRTESR and a representative of Business Mauritius[22], the association regrouping private sector enterprises in Mauritius. The Committee includes members from the HRDC, Ministry of Labour and Employment, and MQA as well as other relevant stakeholders. The NSDP aims at financing training of young unemployed in technical skills in enterprises. Private operators are allowed to provide training under the NSDP by applying to the Technical Committee at the HRDC. The latter committee, which is established under the Steering Committee with members from both the public and private sectors, scrutinises applications made by enterprises. The HRDC is potentially responsible for the placement of trainees with the assistance of the Ministry of Labour and Employment.

Green skills development would make its way through the NSDP when there is a demand for such skills. Specifically, there is no component on green skills mentioned in the project document but, as outlined by the interviews[23], green skills would also form part of the programme as and when the need is felt, and applications would be made by private enterprises to recruit trainees in green skills in order to benefit from stipend refund under the programme. Reference is made to the five modes through which training courses can be prepared and delivered (**Box 2**).

Schemes established by the HRDC to develop skills in Mauritius also provide an institutional mechanism whereby the demand for green skills may be signalled to the HRDC. Green skills in this respect would make their way to the education and vocational institutions in response to a demand for labour in the market. One example provided by MoEHRTESR during the collection of information is the training of tourist guides by the MITD, when a demand from the labour market was recorded. It is not surprising, however, that during the write-up of this report the interviews held with one eco-tourism operator emphasised the need for tourist guides who were very scarce in the labour market (see **Box 6**).

One of the schemes operationalised by the HRDC is the Sectoral Skills Development Scheme (SSDS), with its main objective of encouraging skills development according to specific sector needs. It is a bottom-up approach, targeting industry associations with a view to meeting the skills development needs of their members by providing them with an opportunity to mount, develop and implement specific skills development programmes based on common needs through a clustering approach[24]. Industry associations may apply to deliver training and courses for skills development (green or conventional) as and when the need arises. Industry associations such as Business Mauritius, Mauritius Chamber of Commerce and Industry (MCCI), Association des Hôteliers et Restaurateurs de l'île Maurice (AHRIM), and the Bankers Association of Mauritius, among others, would respond to training needs by their respective members and through the SSDC, the HRDC helping these associations design training courses for their members' staff. The National Energy Efficiency Programme (NEEP) is an example. More detail on the conceptualisation and implementation of the programme is provided in the energy efficiency section in **Box 8**.

21 Personal Communication on 18th August 2017.

22 Business Mauritius is a merge of Mauritius Employers Federation and Joint Economic Council.

23 Mr Bhujun from the MoEHRTESR, Mr Bantoa – Ministry of Labour, Mr Teemul from the MITD, Mr Neeliah from HRDC.

24 Neeliah, H and Rajiah, T. 2017. Personal Communication. HRDC. 18th August 2017

Box 3: MITD and Green skills

The MITD has taken several initiatives for green skills. The main ones are outline below:

Technicians for Photoviltaic Solar Power: Short training courses for technicians in the field of photovoltaic solar power technology are organised with a view to building capacity in production of renewable energy. These courses are in line with Government's vision to achieve the national target of 35% renewable energy by 2025 are mostly demand-driven and are delivered as soon as there is a critical mass (usually between 10-15 participants). The MITD has invested in equipment which is used during the training session such as Grid-tie type and a stand-alone type PV energy generation system to showcase the production of renewable energy. The system generates around 12 KWh peak of electricity daily and it is also being used for training under the full-time mode as well as to train practising technicians in the industry through part-time mode.

Environment protection sensitization: A module on environment protection has been included in the MITD training programmes with the objective of developing awareness of environment protection and key sustainable development issues such as climate change, biodiversity, and sustainable consumption. Emphasis is also laid on waste reduction and resource efficiency. The module has been incorporated in all training courses. The level to which it is delivered varies from course to course. In training courses where a minimum knowledge of environmental sustainability is needed, the module provides participants with a competence level while in other training courses the module treats the topic on sustainable development and green practices in more detail. The curricula also incorporate competences on safe handling and disposal of hazardous waste such as used engine oils, paint materials and thinners etc. The objective is to bring in a change in work culture at the workplace with regard to use of hazardous materials. Moreover, Occupational, Safety and Health (OSH) is also incorporated in all training courses.

Regional Workshop on Hydrocarbon Refrigerant For Air Conditioning: Mauritius is presently implementing the phasing out of HydroChloroFluoroCarbon (HCFC) refrigerants like R22 in accordance with the provisions of the Montreal Protocol. HCFC refrigerants are harmful to the environment as they cause ozone depletion and global warming. A one-off Regional Workshop on Hydrocarbon Refrigerant For Air Conditioning unit for Africa was held at the MITD on the use of R290 refrigerant which is an ozone-friendly hydrocarbon instead of the R22 refrigerant. A total of 14 participants from various African countries like Kenya, Namibia, Zimbabwe, Lesotho, and Mauritius were invited to follow this important course. The MITD also conducted training for participants in Seychelles. The courses also cover the conversion of existing equipment using CFC and HCFC refrigerants with eco-friendly refrigerants.

Energy auditors: The MITD has organized specific training programmes to build local capacity for energy auditors with the collaboration of the Energy Associates Ltd, UK. In the same vein further training was also organised on Practical Energy Management Audit and Thermal Imaging of Building. The courses aimed to train people from industry on the techniques for carrying out energy audit and measures for increasing energy efficiency of buildings. The course is a one-off event but if there is a sufficient number of candidates it is offered on a regular basis.

Use of smart blocks: The MITD is also collaborating with industry to train builders on the use of smart blocks which has enhanced thermal insulation properties. The training course responds to the needs as and when they arise. Applications are opened.

Bio-farming: Training on bio-farming is being given to trainees following the National Certificate course in Agriculture.

Rain water harvesting: In the landscape maintenance course, MITD trainees learn techniques of rain water harvesting and use and also the reuse of plastic containers and used tyres for embellishment.

Energy efficiency in building: A module on energy sustainability included in the Diploma in Building Services Course which aims at developing capacity in carrying out energy audit.

Source: Teemul, MITD (Personal Communication)

The HRDC has several sectoral committees with representatives of private sector organisations and trade unions with the aim of assessing skills needs in different sectors of the economy. Sectoral committees complement the studies and the labour shortage survey conducted by the HRDC. Representatives of trade unions also form part of the Council.

The MITD operates rather differently in relation to training courses. The courses are available continuously and applicants may apply any time. Once there is sufficient number of students, the MITD makes arrangements to deliver the training courses. Thus delivery of the courses is demand-driven. The MITD is also committed to greening their training courses. A list of initiatives is provided in **Box 3**.

Over the years several tertiary institutions have also mounted courses with a component of environmental sustainability, allowing students to acquire either technical skills or generic skills. The Skills for Green Jobs in Mauritius report prepared in 2012 by Dubois and Juwaheer for the ILO[25] provides a list of undergraduate and post-graduate programmes with a component on sustainable development (page 11-12), covering sustainable energy, renewable technologies, sustainable product design, green urban planning, sustainable tourism, sustainable agriculture, and sustainable natural resource management. The lists were cross-checked and it was observed that almost all the modules are still on offer. No attempt is made to provide the list here. However, in the green skills analysis by sector, some examples are provided to showcase the courses.

4.3.2 Agricultural sector

The Government Programme of 2015, the 2016 Strategic Plan (2016-2020) for Food Crops, Livestock and Forestry sectors and the certification mechanism prepared by the MSB – MauriGap - are the main policies likely to create a demand for green skills in agriculture. Green skills in the agricultural sector are required to meet the MauriGap standard. A brief on the requirements is provided in **Box 4**. The criteria as set out in the standard would therefore require an array of generic green skills to meet the standards, including soil conservation practices, agronomic measures, maintenance of soil health, as well as organisation and management of life-long learning (especially for adaptation to new environmental conditions such as climate change).

Through the Government's vision - the promotion of bio-food and bio-farming, establishment of bio-agricultural zones, sustainable agro-processing, and so forth - a whole array of new specific green skills at different hierarchical levels would be required. An example of these skills is provided in **Box 4**. The development of a bio-farming, agro-industry and food processing sector in Mauritius would also require skilled labour at different managerial hierarchy- skill levels to manage large farms, green supply chains, and so forth, alongside agro-engineers, food technologists, and pesticide residue controllers.

An interview held with an expert operating in the green gardening business reveals that plant species expertise would require a new set of skills for understanding the correct inputs (soil, fertilisers, sunlight) for each species, as well as the growth structure and climate conditions (Rajcoomar-Naiken 2017)[26].

The main institution for skills development in the agricultural sector is the afore-mentioned Food and Agricultural Research and Extension Institute (FAREI) which operates under the aegis of the MoAIFS. The Institute has the responsibility for conducting research on non-sugar crops, livestock, forestry and for providing an extension service to farmers in Mauritius. One example is the 'Le Guide Agricole'[27], a programme design to indicate the most appropriate agricultural practices for related crops in Mauritius. FAREI as part of its mandate to develop sustainable agriculture has launched the 'Bio Farming Initiative Sensitisation Campaign'[28]. FAREI

25 http://www.ilo.org/wcmsp5/groups/public/---ed_emp/---ifp_skills/documents/publication/wcms_190248.pdf

26 Personal Communication, 6th July 2017Renaissance Garden Ltd

27 http://farei.mu/apmis/publications/guide/

28 http://farei.mu/farei/%E2%80%8Bbio-farming-initiative-sensitisation-campaign/

Box 4: Skills for sustainable agriculture in Mauritius – matching demand and supply

Skill needs: MauriGap Standard and Bio-farming

Over the years, the discussion and debates on what constitutes sustainable agriculture has led to the publication of MauriGap – the Mauritian Standard for good agricultural practices (MS 184:2015)- by the Mauritius Standard Bureau[a]. The document specifies good agricultural practices for crop production and define different criteria of agricultural practices which are important for meeting green agriculture. These criteria include soil conversation practices such as minimisation of soil erosion, terracing, etc; agronomic measures such as contour cultivation, controlling soil erosion, other soil management practices, the use of compost and manure, etc; maintaining soil health through crop rotation to minimise soil damage and others; and hydroponic agriculture.

The MauriGap is currently being implemented as 'basic requirements' while the intermediate requirements level is in the process to be published. The advance requirement level will eventually follow and will correspond to the GLOBALGAP certification. GLOBALGAP attempts to harmonize standards and procedures and develop an independent certification system for Good Agricultural Practice (G.A.P.) in the world[b]. The training needs for the MauriGap is being headed by the FAREI. Usually when the MSB establishes an standard, it also caters for the training needs bu delivering training sessions. In the case of MauriGap, since FAREI has the expertise in agriculture science and has an efficient coordination with farmers, it takes the lead for the training component.

What are the skills to achieve MauriGap certification? There are many activities which are required to achieve the certification and eventually farmers would need to acquire green skills in soil management, agronomic measures, appropriate mix of fertilisers with respect to crop species, and other practices to keep soil health. Generic green skills also include organisation skills to keep all kinds of records accurately and regularly such as invoices to certification paperwork, warranties, labour contracts, as well business networking skills given that there is likely to be more transaction with banks and other finance issues (green finance), more opportunities for green marketing. Farmers need to be life-long learners so that practices may be changed and adapted to new environmental conditions such as climate change. Bio-farming and green agro-industry further requires agro-engineers, food technologists with green management skills such as waste minimization, energy efficiency, green supply chain management, among others.

Skill development – Food Agriculture Research Extension Institution (FAREI)

The Institute has the responsibility to conduct research in non-sugar crops, livestock, forestry and to provide an extension service to farmers in Mauritius including its outer islands. FAREI provides a number of training courses on horticulture, agro-processing, agri-business and other agricultural activities. Training include crop production practices, food processing, gardening, hydroponic production and operations, pesticide application, among others. FAREI has developed a R&D programme dedicated to agro-processing. Recognising the need for small entrepreneurs to test their ideas/products before investing heavily in production equipment, FAREI has set up a fully-equipped resource center to service the needs of entrepreneurs interested in the agro processing and value addition sector. The center is also used for conducted tours and serves as a model agro-processing unit. It is operational since July 2009. Currently, it is taking the lead for shift towards bio-farming. In this context, a five module training package was developped by Food and Agricultural Research and Extension Institute (FAREI) on the MauriGap Level 1 Standard which is the basic standard for bio farming. Some 240 planters have so far submitted requests to follow this training programme which will start as from this month itself (GIS 2016). The information gathered through qualitative interviews reveal that a major impediment for green skills in the agricultural sector is the mindset and behaviour of farmers who still implement conventional agricultural practices in many part of the island, a reduction in yield is observed and farmers react to it by increasing chemical fertilisers – a natural reaction to increase yield in the short term at the expense of long term average yield. It implies that the farmers are not interested in green skills for agriculture and therefore, more efforts are needed on sensitisation campaigns.

Food and Agriculture Technical Cooperation Programme Support

The MoAIFS implemented the Technical Cooperation Programme Support for the development of organic farming and institutional capacity-building in Mauritius over two years (2015-2016), with a budget of USD 352,000 from the FAO (GIS 2016b). This is a one-off project implemented by the MoAIFS.

Tertiary education – University of Mauritius

The University of Mauritius is the main institution which provide degree and post-graduate courses on agricultural scence, technology, sustainable agriculture and climate change. Examples of the courses include: BSc (Hons) Agricultural Science and Technology. BSc (Hons) Sustainable Agriculture and Food Security, BSc (Hons) Biotechnology, MSc Climate Change and Sustainable Development and MSc Food Safety and Food Innovation.

[a]*Source: FAREI website at http://farei.mu/farei/maurigap/ accessed on 18th August 2017; Foodun, M. Y., MSB (Personal Communication) and Seeruttun MSB (Personal Communication); GLOBALGAP website http://www.globalgap.org/uk_en/for-producers/ (accessed on 18th August 2017); Isaacs, S. and McAllister; Rama, J, FAREI. Meeting on the 29 July 2017; Le Mauricien 2017. http://www.lemauricien.com/article/chambre-d-agriculture-presentation-du-projet-smart-agriculture; GIS (2016b). Agro-Industry: Workshop focuses on organic agriculture legislation. Government Information System, Government of Mauritius. http://www.govmu.org/English/News/Pages/Agro-Industry-Workshop-focuses-on-organic-agriculture-legislation.aspx (accessed on 25th July 2017)*

currently has different programmes for educating and further developing the skills of farmers, especially in relation to MauriGap (**Box 4**). To avoid repetition, refer to sub-section 3.2 for the involvement of the FAREI in the MauriGap standards

Currently, the main publicly-funded tertiary institution, the University of Mauritius, is offering various courses on agriculture, sustainable development and climate change (see **Box 4**). The Switch Africa Green project by the European Union, Climate Smart Agriculture funded by the European Union, and the Smart Agriculture project by the Mauritius Chamber of Agriculture, are other green skills development initiatives (see section 3.10).

4.3.3 Green skills for a green manufacturing sector

Green skills in the manufacturing sector are motivated by the ISO14000 standard which includes environmental-friendly processes such as adoption of energy-efficiency measures, industrial waste management systems, a shift to renewable energy and others. However, it has been observed that the number of applications is very low. In 2012 a study conducted by Business Mauritius and AFD on industrial waste management system concluded that it was very expensive for enterprises to implement the system.

The recent Mauritian Standard for Eco-Labelling for Textiles by the MSB would bring about a general framework for green skills in the textile sector. Each component of the standard (e.g. minimisation of waste and environmentally harmful substances, reduction of water and air pollution, etc), would require different processes, know-how and practices. Demand for such skills when they arise may be signalled through labour shortages surveys conducted by the HRDC or by industry associations through the SSDS scheme. The MSB ensures two different types of training in relation to standards. First, there is a training component for auditors and certification consultants who require technical skills for the assessment, and secondly there is a specific training component to enable enterprises to implement the criteria of the standards. Training is based on applications from enterprises and is offered when there is sufficient number of applicants.

Green skills development in manufacturing is also a major component of the SAG programme. The latter is encouraging the concepts of industrial symbiosis, sustainable manufacturing practices, and energy audit, among others (see **Box 1**). Again with the implementation of such concept, a variety of skills are required.

Box 5: RT Knits Limited- greening the textile sector

Do green skills matter?

RT Knits Limited is a leading textile manufacturing industry with an annual production capacity of over 1 million units of jersey wear and has three fully-operational production sites in Mauritius. Faced with rising costs of raw materials, labour and transportation, the company had a major concern in keeping pace with economic competitiveness in international markets. The top management realised that Mauritius does not have the conditions which were once available to the textile sector and cannot afford to operate within conventional technologies which were intensive in fossil fuel and water requirements. Moreover, top management also acknowledged that since factories are being regularly audited and evaluated by clients, environmental concerns are likely to play a critical role in marketing textile and clothing products (IPS, 2008).

Some of the green initiatives were: (a) the use of solar power for water heating (150 solar panels have been installed on the roof of the building; (b) the collection and re-cycling of fabric, water, plastic and used oil; (c) the maximum use of natural light in knitting plant and storage areas; (d) the light sensors to switch off lights were not required; (e) the use of wind power to create natural air cooling, keeping the inside of the building comfortable; (f) the use of wind power to operate extractors in knitting plants to achieve an optimally clean environment and reduced electricity consumption; (g) the constant monitoring of all dyeing processes to optimize the lowest possible use of chemicals, water, heavy fuel oil and LPG, among others.

What are the skills required for implementing these processes? According to Mr K. Tang, CEO of the company, there is a need for good engineers. Since RT Knits already employs a team of engineers, the resource-efficient processes were implemented fairly easily. However, one important aspect of employee skills is working in teams for implementation a resource-efficient programme or a renewable energy project inside the company. The team leaders would eventually need to ensure that the team members are all following the guidelines and proper measures are taken at the right moment. Since the technologies are dynamics, the team leader would have also to integrate new green processes into the production line. In this respect, leadership skills, project management skills and continuous learning in relation to green technology, efficient measures and other green processes are important.

Source: Tang, K. 2017. Personal Communication.

One component of green business which relates to resource efficiency and has gained much momentum in the Mauritian manufacturing sector is energy-efficient measures. From a general awareness created in recent years of the benefits of energy efficiency, industry associations (Business Mauritius), educational and vocational training institutions (UOM and MITD), along with government organisations such as the Energy Management Office, have all started training employees on energy-efficient measures. The EMO has trained certified auditors for energy audits. The development of energy-efficiency measures is further described in the sub-section on energy efficiency measures for Mauritius (section 4.2.6). Reference is made to the National Energy Efficiency Programme. Consultations with business leaders conclude that the demand for such green skills would be on the rise especially if these skills help reduce costs. Thus Business Mauritius together with the HRDC has launched the NEEP programme. The conceptualisation, implementation and detail of the project is described in **Box 8**.

There are also examples where enterprises themselves are catering for green skills development in-house. One example which has been shown to showcase green processes and green skills is RT Knits. The interview held with the CEO, Mr Tang, reveals that good engineers are a must for greening the economy. According to Tang (2017), there is a scarcity of engineers in the labour markets and the situation is likely to worsen in the future as more enterprises shift to resource-efficient processes. Green skills are potentially provided through in-house training for engineers. The supplier of PV Solar – GoSolar

- also provides training for the staff. GIBB also caters for training as and when the need arises, especially in relation to skills which are unavailable in Mauritius. In this particular case, a private sector initiative has filled a green skills gap which the public sector training system was too late in addressing.

Greening the manufacturing sector through vocational training is already a topic being discussed by the MITD (see **Box 3**). The latter is in the process of recruiting a consultant to green the courses offered by the MITD. The consultant report is expected in December 2017.

4.3.4 Green skills in the tourism sector – green tourism and eco-tourism

The concept of sustainable development in the tourism sector is well established in the mindset of relevant Mauritian stakeholders. Specific skills and competences may be found in programmes offered by tertiary education institutions such as the UOM, Charles Telfair Institute and UTM, among others.

The Mauritian Standard for Sustainable Tourism MS165 also specifies the requirement that tourism operators should meet to obtain an eco-label for sustainable tourism. Greening of the tourism sector is therefore well-established, but its implementation requires time and commitment. The scope of the standard is applicable to the following: accommodation (hotels, guesthouses, and tourist residences), restaurants, tour operators, tourist attractions (heritage, natural and cultural), pleasure craft and related activities such as boathouses, scuba diving, helmet diving and parasailing. The benefits of MS165 include improved environmental performance, maximisation of efficient use of resources, minimisation of waste, compliance with environmental laws and regulations, and others (enhanced corporate image, competitive advantage, increased business efficiency). With a view to facilitating certification to MS165 of tourism businesses, the Mauritius Tourism Authority (MTA) has developed a scheme for providing support to tourism businesses. The scheme has been operational since 2015 and is managed by a Project Steering Committee set up at the level of the Tourism Authority. It provides a matching grant equivalent to 50% of the project costs, but not exceeding Rs. 44,000. The response has been poor as operators do not yet see the standard as a marketing tool. MS165 is being reviewed so as to be aligned with the Global Sustainable Tourism Council requirements for recognition and accreditation to make it more attractive as a marketing tool. With a view to giving companies incentives to be MS 165 certified, the ceiling for the grant will be increased to around Rs 150,000 to cover the certification and consultant costs (MoSSNSESD 2016).

To supplement skills development for green tourism, the SAG for Mauritius is actively involved in capacity-building. The project operates independently of the MSB standards. Through Empretec Mauritius, the following objectives are being implemented: improved understanding of environmental issues relative to the tourism sector, and dissemination of the Environmental Management System (EMS) Best Practices Manual together with an implementation Guide based on a Do-it-Yourself (DIY) principle, to facilitate implementation of EMS best practices and to reinforce implementation of best practices towards sustainable tourism and coastal zone protection.

Green tourism necessitates a mixture of generic and technical skills which range from academic qualifications (sustainable tourism), to technical and vocational training such as that provided to tourist guides. While greening of the tourism sector may be made through eco-friendly processes with minimum environmental impacts, eco-tourism still represents a different facet of greening and requires different skills. To showcase skills needs and challenges for eco-tourism, **Box 6** describes an eco-tourist operator, Domain De LaGrave. It is observed that green skills would need to be included in artisanal workers' training (for instance artisanal roofs for hotels), tourist guides, trained personnel for hiking, kayaking, and so forth. The interviews reveal that such skills are very scarce in Mauritius.

Box 6: Eco-tourism and skills need

Domain De Lagrave is situated in the vicinity of Midlands and extends over an area of more than 500 acres of land. As an eco-tourist operator, it offers nature-based activities such as kayaking, racing, obstacles courses for team-building, among others. It also caters for events such as weddings, cocktails, etc. The philosophy of the place is that all activities should be 100% green. The roofing, for instance, has been designed with an artisanal touch. According to interviews held with the management team, staff requirements include cooks, maintenance officers, and tourist guides. Maintenance officers are highly scarce since the architectural designs are all based on green practices.

R. Julien Personal communication, Domain De Lagrave.

4.3.5 Skill needs for a renewable electricity sector

Government policy to promote renewable energy and the Small-Scale distributed Generation (SSGD) programme (see **Box 7**) has led to a burgeoning of operators to supply a PV Solar system. This is a clear example of government policy leading to a demand for green jobs and green skills and of how the lack of such skills created a barrier encountered during SSDG Phases 1 and 2, and now in Phase 3. The limited capacity within Mauritius to install and maintain small-scale PV systems was noted. Only 15 Small- and Medium-Sized Enterprises (SMEs) had the trained staff and technical skills to be able to install PV systems, leading to a situation in which they were overwhelmed by demand (MoSSNSESD 2016). At times during Phase 1 there were delays of 12 months between a household requesting a PV system and the system being installed.

As one example of a company supplying PV, the representative of GoSolar Co Ltd stated that training and skills development is currently undertaken in-house. Given the scale of the project so far, the demand for green skills was moderate. However, the future demand for installers and maintenance officers remains an issue.

4.3.6 Energy efficiency development and skills formation

Energy efficiency across economic sectors is an important component of the transition to a green economy. It is one of the channels in which green jobs may be highly demanded since its implementation is meant to be across a diverse set of enterprises operating in different sectors of the economy. In this respect green skills are a necessity. The demand for green skills has been well understood, it would appear, by many organisations in Mauritius. Thus the Energy Management Office initiatives such as mandatory energy efficiency labelling, energy audit management and Energy Building Code Compliance, training and certification of Energy Auditors, Mandatory Registration of Energy Auditors (as per the Energy Efficiency (Registration of Energy Auditor) Regulations 2016), and Mandatory Energy Audits, among others, have all set the scene for a demand for energy auditors in Mauritius and for the implementation of energy efficiency measures.

Box 7: Renewable Energy – the Small-Scale distributed Generation - and skills development

In 2010 the Government of Mauritius launched, with UNDP support, the Small-Scale Distributed Generation (SSDG) scheme, which has assisted 237 households, schools and public institutions in installing small-scale (<50 kW) photovoltaic panels and wind turbines through the provision of a targeted feed-in tariff scheme(GCF 2016). The 2 MW capacity cap (in SSDG Phase 1) was reached in less than one year of the start of the scheme. The 2 MW capacity cap (in SSDG Phase 1) was reached in less than one year after the start of the scheme. The extension of the scheme (SSDG Phase 2) led to an additional 0.94 MW being added within 12 months. Currently, a net-metering scheme (SSDG Phase 3) is ongoing with no special feed-in tariff and is proceeding slowly given the lack of support. The Government has, in its 2015-2016 Budget, stated its desire to scale-up the scheme (SSDG Phase 4) to encompass additional households and larger institutions.

The Small-Scale Distributed Generation (SSDG) scheme (currently in Phase 3) is now capped at 10 MW, partly for grid stability reasons but also partly for financial reasons. According to data collected during Phase 1 (the first 2 MW) and Phase 2 (the subsequent 0.94 MW) of the SSDG scheme, the leveliseda cost of rooftop PV-generated electricity was US$ 0.271/kWh, compared with the levelised cost of residential grid electricity of US$ 0.128/kWh. Moreover, the additional costs of small-scale solar PV are upfront: the US$ 10,000 cost of installation (for a standard 2.5 kW system including PV panels, inverter and meter) is prohibitively expensive for the vast majority of Mauritian households, whose average monthly income is US$ 699.

Supplier of PV Solar system – Go-Solar

GOSOLAR is emerging as one of the active players in the renewable energy sector in Mauritius, with over 2 MW of solar commercial rooftops projects in the pipeline, GOSOLAR is working closely with 2 well-known solar companies, namely Trina Solar and SolarEdge, to supply the local residential market with highly performing Solar PV systems of 3.5 kWp and 5.0 kWp capacity. Trina Solar is one of the world´s foremost manufacturers of PV panels whereas SolarEdge is a leading manufacturer of inverter equipment which lies at the core of any Solar PV system. GOSOLAR, in partnership with leading financing banks, is providing attractive offers to applicants under the CEB 2015 SSDG Scheme.

Training for PV installers are currently being provided by the company itself. Given the limited and early stage of development, the green skills involved mainly the installers. Such skills can be easily transferred to technicians with the required competences in electrical practices. However, demand for maintenance services is still low. Higher demand for PV installers as well as maintenance technicians will be felt as the demand for PV solar increases in Mauritius, a trend which is likely in the very near future.

Short course Photovoltaics for Beginners and at Advanced level – University of Mauritius

As a beginner's level course in Photovoltaics it introduces the concepts, principles, technologies, and measurements related to Photovoltaics. The aim is to enable participants to gain basic knowledge in PV that will allow them implement small-scale DC PV systems. The objectives of the "Photovoltaics for Beginners" course are: to introduce Renewable Energy and Photovoltaics; to introduce fundamentals of Solar Engineering; to introduce the fundamental principles of Photovoltaics and solar cell/module operation; to introduce PV technologies and components; and to perform small-scale PV system design. An advanced level course in Photovoltaics which leverages on the Photovoltaics for Beginners course is also offered.

[a] *Levelised Cost of Electricity (LCOE) is a means of comparing generation technologies, by considering the cost of the electricity that comes out over its lifetime*

Source: http://www.gosolar.mu/; S. Wong, GoSoLar –Personal Communication

http://www.uom.ac.mu/images/shortcourses/2016/PV_Beginners_Brochure_Feb_2016.pdf

Box 8: Private sector of green skills initiative - the National Energy Efficiency Programme project

In 2012 the Joint Economic Council (now Business Mauritius) and the AFD conducted a Mapping Exercise on energy efficiency in different sectors of the economy, including textiles, food and seafood. The study eventually revealed that boilers and steam system, compressed air system, pumps/fans system are industrial processes in the textile, food, and seafood industries, which consumed energy significantly. The Mapping shows that the implementation of energy audits could lead to considerable energy-saving in companies. However, not only was a strong scarcity of specific expertise in energy auditing and energy-efficiency measures observed, there was also a need for companies to train technical personnel such as maintenance managers, production managers, factory managers, among others. In this respect the Association of Mauritian Managers in collaboration with Business Mauritius mounted a training programme and presented a first project proposal in collaboration with the HRDC through the Sectoral Skills Development Scheme.

The 'National Energy Efficiency Programme' is potentially the product of the proposal which is to be implemented in eight sub-sectors of the economy: textiles, hotels, supermarkets; cooling systems, compressed air systems; steam and heating systems; pumps and fans; and hot water production (solar). The implementation of the project is taking place in phases as follows: Phase I: three sub-sectors; Phase II: four sub-sectors; Phase III: one sub-sector with two previous sub-sectors where interest was renewed. 52 enterprises have been audited and about 20 more targeted (MoSSNSESD 2016)

There are three main components: energy audit, training and dissemination information. Companies were invited to express their interest in participating in group audits based on well-defined eligibility criteria in relation to the annual cost of energy (including electricity and fossil fuels). In total, 66 organisations from the eight sub-sectors participated in the programme.

Some salient features of the training are: the training will be done by the same team of consultants who conducted the energy audit for the same sector; the consultant-auditor was selected by Agence Française de Développement through an international procurement system; and a specific training programme has been designed for Energy Officers, encompassing theoretical sessions which are wholly necessary for acquiring the required basis and dissemination of the findings of the audit exercise on energy efficiency potential. The latter is a generic training programme common to all participating firms in each sector. It is followed by on-site training for each organisation with the energy audit report as a true pedagogical tool. Practical application of EE measures are identified in the energy audit report. Under this format, the training becomes a real tool for disseminating best practices and establishing the first steps of an energy management system. The outcomes of the training session are as follows: technicians empowered to become Energy Officers; an Energy Management culture established in organisations; creation of a new post of Energy Officer in identified selected organisations; creation of synergy between Energy Officers in each sub-sector: sharing of information, experience, good practices and evaluation of the benefits in order to replicate the actions in other organisations in the sub-sector.

Source: H. Neeliah and T. V. Rajiah – HRDC (Materials and personal communication 16th August 2017)

Following the mapping exercise of the Joint Economic Council and the ADF, the National Energy Efficiency Programme was conceptualised and implemented. The process of implementation of the programme which relates to the institutional set for skills development is through the 'Sectoral Skills Development Scheme' by the HRDC. The Scheme is aimed at encouraging skills development based on specific sector needs and is a bottom-up approach, challenging industry associations to meet the skills development needs of their members by providing them with an opportunity to mount, develop and implement specific skills development programmes based on common needs through a clustering approach. The selection of beneficiaries and the appointment of resource persons are undertaken by the industry associations. The NEEP was therefore oriented along the above process (see **Box 8** for further details).

Box 9: Training Course & Certification in Energy Auditing – Ministry of Energy and Public Utilities

As one public sector initiative towards green skills development, the Ministry of Energy and Public Utilities organized a training course and certification in energy auditing in 2016. The training is independent of the Business Mauritius/HRDC NEEP training component. The objective of the training course was to train selected applicants to become certified energy auditors. Participants will also be trained in carrying out investment-grade energy audits. Candidates attending the training course took part in an examination set by the International Institute for Energy Training (IIET) of Canada and conducted by the Mauritius Examination Syndicate. Successful candidates were certified as energy auditors and may eventually be registered with the Energy Efficiency Management Office under forthcoming regulations to be made under the Energy Efficiency Act 2011. The course was delivered under the SIDS-DOCK-funded project. The mandatory requirement was a degree in engineering or architecture and a non-engineering science degree of at least three-year duration. Under UNDP/GEF funding, 60 Energy Auditors have been trained, 42 have passed the examination and have been certified by the certifying body. When the relevant regulations are enforced, these certified auditors will carry out mandatory audits in industry and other large consumers as may be decided by EEMO.

Source: Ministry of Energy and Public Utilities, http://publicutilities.govmu.org/English//DOCUMENTS/NOTICE%20-%20ENERGY%20AUDIT%20TRAINING%20FINAL.PDF

4.3.7 Green skills in emerging sector – Smart cities and ocean economy

The Government policy to develop ocean economy as well as smart cities would require employees with a set of generic and core green skills. This is also another area in which government-led demand for green skills has been observed. One example relates to aquaculture development. Following a government drive to award operators for this business activity, the University of Mauritius has recently offered a short course on sustainable aquaculture having as its aim an understanding of the functioning of marine ecosystems, techniques and use of genetics in aquaculture, together with a component of sustainable management of the aquaculture sector and entrepreneurship skills. The ocean economy as outlined in Section 2 of this report would fuel the need for a variety of employees with different qualifications, competences and skills. However, so far skills development remains very slow, somewhat understandably given the time it takes to invest in the sectors.

In contrast with the ocean economy, the smart cities concept has already started to be implemented. A number of skills are required, but no specific skills development schemes have yet been designed. Skills identification in this case is being catered for by the general skills development mechanism as described in Section 4.1. However, associations such as the Institution of Engineers Mauritius has already started reflecting on the engineering opportunities in the Mauritius context (see Seesaram 2016).

4.3.8 Green skills in the public sector

The public sector is also linked to activities which may be regarded as green if the right approach is adopted. The conceptual idea of greening the public sector has been emphasised by the Civil Service College Mauritius (CSCM) (Durbarry 2017)[29]. Examples include green procurement, waste management (especially electronic and high-tech devices), energy management, green IT, and others. Activities in public sector institutions are therefore green when they have minimum ecological risks and environmental impacts. Another set of green jobs relate to those who protect the ecosystem, forests and biodiversity. Sustainable forestry and sustainable fishery management are examples.

Prof Durbarry from the CSCM is developing

29 Durbarry, R. (2017) Personal Communication, Director General Civil Service College Mauritius.

Box 10: Green Building and Smart cities, and Skills development

The thrust of the smart city under the Smart City Scheme in Mauritius will be to enhance and valorise the intrinsic environmental asset of the area such as lake/river/wetlands/forests amongst others, with an socially inclusive development, and working, living and leisure space that is environmental-friendly. The development should cater for clean living environment free from any pollution and nuisances while generating its own resources in terms of energy and water (water harvesting and storage). Energy conservation, climate change adaptation to flood and mitigation and disaster risk also forms part of the scheme, together with modes of sustainable mobility, green agriculture and organic farming. The different components of the Smart City Scheme include (1) a mix of commercial, leisure and residential uses that, as a whole, achieves physical and functional integration and creates a pedestrian-oriented urban environment, (2) a combination of office, light industrial, education, medical and tourism clusters, (3) high technology and innovation cluster, (4) infrastructure to service green-field sites with roads and inspiring landscaping, (5) clean technology aimed at carbon and waste reduction, efficient transport (6) low-energy-consumption buildings, (6) digital solutions, urban sensing technologies and big data analytics, (7) energy production and water management and utilities (8) high-end residential estate and real estate investment management.

To ensure a low carbon, a low water and low ecological footprint with infrastructure designed to adapt to the present and future impacts of climate change, developers need to consider the following at the very design and planning stage of the project: Land Use Planning, Green Buildings and Energy Conservation, Disaster Risk Reduction, Water efficiency, re-use and recycling, Waste Management, Sustainable Transport, Greening and Biodiversity, and Community.

The development of smart cities has a direct link to urbanisation trends and to the 2030 Agenda for Sustainable development. A recent report of the UN Secretary-General elaborates five main challenges encountered in the implementation of smart infrastructure projects as follows: localisation of smart infrastructure, skills gaps, lack of finance, application of suitable governance model and inclusivity. Skills development form an essential component for the success of smart cities.

Green skills

At the conceptual level of a smart city project, there is a need for novel and green skills for infrastructure developers, entrepreneurial and creativity, design and making, computational and system thinking while in the implementation and maintenance phases, green skills are required for eco-designers, green architects, construction companies and contractors, building materials manufacturers, energy management and auditors, engineers. Green skills will include the whole array of energy, water, and sustainable transport management.

One component of green building which is energy efficiency has been the focus of stakeholders in Mauritius. In fact, a legal framework for Energy Efficiency Building Code (EEBC) for new constructions and major refurbishments has being set up. It is expected that the EEBC will become mandatory for constructions to comply to building energy performance standards through a well-regulated 2-stage assessment and certification process with legal provisions including fines and denial of building occupancy for non-compliance. A group of 60 EEBC assessors have been trained though a GEF/ UNDP initiative executed under the Ministry of Public Infrastructure.

[a] *Ramgolam, Y. K., Cunniah, B., and Dhondee, D. 2010. Towards Energy Efficient Building for a Sustainable Mauritius. The Journal of the Institution of Engineers Mauritius, http://www.iemauritius.com/upload/files/towards_energy_efficient_buildings_for_a_sustainable_mauritius.pdf*

Ministry of Environment, Sustainable Development, and Disaster and Beach Management. 2015. Environmental Guidelines for Smart Cities Cleaner, Greener & Safer Mauritius. Republic of Mauritius.

[c] *United Nations Economic and Social Council. 2016. Smart cities and infrastructure Report of the Secretary-General. Commission on Science and Technology for Development Nineteenth session Geneva, 9–13 May 2016 http://unctad.org/meetings/en/SessionalDocuments/ecn162016d2_en.pdf (accessed on the 4th Junel 2017)*

green skills in areas relating to project design and management in the public sector. Accordingly, officers from the Government are often expected to design projects and programmes for the population, vulnerable groups, and so forth. Hence, by training public officials on green projects, many programmes from the Government would also have a green component. To showcase this important idea, the box above provides the case of Poverty Marshall Plan and Green skills in Mauritius.

Climate adaptation projects have already created a demand for different skills such as flood modellers, coastal engineers with skills and expertise on adaptation projects in the coastal regions, dam-break analysts, and so forth. In Government institutions officers are expected to have the skills to monitor and manage adaptation projects. As an example the MoESDDBM requested the University of Mauritius to prepare three courses for engineers and environmental officers in the face of climate change (**Box 12**).

Box 11: The Civil Service College Mauritius and Green skills

Skills development extends much beyond youngsters, fresh graduates, and people in private enterprises. The Government acknowledges that public officers have an instrumental role to play in making Mauritius a high-income economy. Public officers are called upon to act as active drivers and passionate facilitators towards a highly competitive and productive economic environment. There are over 85,000 officers who form part of the training agenda.

The Civil Service College Mauritius (CSCM) aims at enhancing the competences of public officers for service excellence through capacity-building and talent development to transform the public sector[a]. Skills development for the public officers is at the core of the mandate of the CSCM. The CSCM is expected be a catalyst in this transformational process and assist public officers to become creative, effective leaders, passionate and engaged facilitators at all levels of the hierarchy. The list of courses ranges from improving the skills of public officers to assisting customers efficiently (basic communication skills, customer service, handling difficult customers) to improving efficiency and productivity (leadership training, performance, talent and stress management, team-building, and workforce planning) and managing projects in the public sector (tender preparation and quality management ISO 9001:2015)[b]. The CSCM launched its first courses in November 2016.

Green skills development and the CSCM

The CSCM is currently emphasising green skills development in the public sector[b]. The CSCM in collaboration with the Ministry of Civil Service and Administrative Reforms (MCSAR) and the Partnership for Action on Green Economy (PAGE) organised a workshop "Inclusive Green Economy (IGE) in Mauritius: What skills do we need" in April 2017[c]. Resource persons were from the UN Institute for Training and Research (UNITAR), the SWITCH Africa Green Coordinator, Prime Minister's Office. The objectives of the workshop were to increase awareness of the rationale for IGE, highlight the linkages between IGE and the development priorities of Mauritius, facilitate a dialogue and identify capacities and skills needed for IGE in Mauritius, raise awareness of the capacity-building possibilities offered by Civil Service College Mauritius, and discuss the objectives of PAGE and the services it provides[c]. The workshop led to a sensitisation of the green economy, green jobs and green skills in Mauritius among stakeholders with an extensive discussion on green skills in the different sectors of the economy[d].

The Marshall Plan, Poverty, CSCM and Green skills

The Government had announced in January 2015 a medium-to-long-term Marshall Plan to combat poverty and social exclusion in Mauritius and Rodrigues. The Ministry of Social Integration and Economic Empowerment is leading the preparation of the Marshall Plan, while the UNDP is providing technical assistance for its development. The Marshall Plan covers areas such as social protection, social housing, social inclusion and community development, access to education, and development of competences, employment and sustainable livelihoods/economic opportunities for the most vulnerable groups, including people with disabilities, women empowerment, youth economic empowerment, access to services including, electricity, water, sanitation, transportation, ICT facilities and environmental protection and its relationship with social integration.

In order to design and implement projects under the Marshall Plan, the CSCM is currently focusing on the green skills and training of public officers so that environmentally-sustainable projects could improve the income of poor people, taking them out of poverty. Public officers working in the sphere of training for the Marshall Plan are able to cater for developing employment-related projects for the poor such as the social enterprise incubator, encourage inclusive procurement from small vulnerable business enterprises and cooperatives. The decent aspects of the work are an integral component of these projects. Training in green skills is also related to sustainable land management for enhanced livelihoods, mainstreaming biodiversity into the management of the coastal zone for increased socio-economic and ecological benefits, and enhancement of Disaster Risk Reduction and Management Systems for poverty reduction.

[a] *Address of Mr A. Wong, Minister of Civil Service and Administrative Reforms on soft launch of courses in 2016. http://civilservice.govmu.org/English/Documents/Speeches/2015/speech%20CSCM%20161115.pdf*

[b] *CSCM website accessed 9 April 2017.*

[c] *Workshop agenda https://www.unitar.org/sites/default/files/uploads/ige_workshop_3_april_agenda.pdf*

[d] *Personal Communication with the Prof. R. Durbarry Director General CSCM*

Box 12: Training and Capacity-building –Climate Change Adaptation Programme

The MoESDDBM in the context of the Adaptation Fund Project, 'Climate Change Adaptation Programme in the Coastal Zone of Mauritius signed a MoU with the University of Mauritius for the joint implementation of the component 'Training and Capacity-building'. The main objective is to strengthen the institutional capacity to reduce risks associated with climate-induced socioeconomic and environmental losses. Three Training Manuals have been designed and developed and 12 short courses delivered with the collaboration of the University of Mauritius in the field of Coastal Engineering, Coastal and Marine Environment for Engineers and Cost Benefit Analysis for Coastal Zone Management and Adaptation Options to Climate Change in Mauritius under this programme.

Source: Sultan and Sobhee (2016)

5. Analysis and lessons learned

5.1 Demand and scope for green skills development in Mauritius

A major finding emanating from this report is that the creation of green jobs and the development of green skills are both essential for the growth strategy of Mauritius. Development strategies and investment opportunities in almost all economic sectors would require green skills. One example of an economy-wide policy of the Government cutting across different economic sectors is the system of tax incentives for the promotion of Green and Sustainable Development introduced in 2015. In the agricultural sector the 2015-2020 Strategic Plan and the MauriGap (sustainable agriculture standards) and bio-farming development initiative would require skills in soil management, agroeconomic measures, and other sustainable practices to maintain soil health in a sustainable manner. Skills for green supply chain management in the agricultural sector to promote green agro-industry are also expected in the future. Green skills would be highly demanded in the implementation of resource-efficient processes which are being emphasised by many stakeholders in Mauritius at present. Enterprises would require 'skilled energy managers' to implement recommendations from energy audits. Similarly, the path towards a sustainable tourism sector (specifically to meet sustainable tourism standards - MS 165) and eco-tourism would require skills such as waste management, green procurement, nature-based activities (hiking, Tyrolean). Different types of both technical and generic skills would also be required in the electricity sector, especially in relation to the small-scale distribution generation of electricity from photovoltaic sources and the establishment of wind farms, among others. There are also strong opportunities for green jobs and green skills from emerging sectors such as smart cities and ocean economy. Thus a number of policies and projects at economy-wide and sectoral levels in Mauritius are at present creating a demand for green jobs and green skills.

The assessment of green skills reveals that the lack of such skills is already acting as bottlenecks in the successful implementation of many sustainable projects. This is currently being observed in the energy sector (Solar PV installers and energy auditors) and is the cause of a burgeoning of training courses in energy efficiency by several institutions in Mauritius.

5.2 Strong points of the Mauritian economic context to green skills development

One of the main strengths observed in the Mauritian context is that there is a general awareness among stakeholders that greening processes and practices are important for the growth path of economic sectors - agriculture, manufacturing, tourism and other emerging sectors. On the one hand, major development plans of the government, as outlined in the preceding paragraph, have already integrated the concept of sustainability and green processes. This implies that the concept of greening economic sectors is well-established in the decision-making process, signalling significant scope for green jobs in economic sectors such as agriculture, manufacturing, tourism, construction as well as in emerging sectors (smart cities and ocean economy). On the other hand it is observed that stakeholders in both public and private sectors as well as in education and vocational training institutions are generally aware of the importance of capacity-building in green skills. In all the major economic sectors there are signs of training and skills development in green processes. For instance the HDRC has one project initiated by an industry association (Business Mauritius) geared to energy efficiency while the MITD has

a module on environmental protection in all its courses, together with several short courses geared to green skills development. The latter is also finalising the recruitment of a consultant to restructure its training courses on green processes. The CSCM is also training civil servants on greening processes and competences to facilitate the transition to green economy. The CSCM is currently finalizing a project to make an assessment of training needs in green economy in major economic sectors with the collaboration of PAGE.

The degree of awareness among stakeholders in Mauritius may be the outcome of national consultations and discussions with the assistance of ILO, UNEP and PAGE from which Mauritius benefitted some years ago.

The study also reveals that skills for green jobs are currently being implemented by a multitude of institutions and organisations from Government Ministries and departments to training institutions and private sector associations and enterprises. The coordination between government policy and training in green skills differs according to the economic sector. In the agricultural sector FAREI is taking the lead in capacity-building of farmers on good agricultural standards which were designed and published by the Mauritius Standards Bureau. FAREI and MITD also provide training in bio-farming. At tertiary level the University of Mauritius provides degree courses on agro-industry and sustainable agriculture. Again, skills development to improve energy efficiency at enterprise-level has been the centre of attention of several institutions including Ministry of Energy and Public Utilities, University of Mauritius, MITD and Business Mauritius with the aim of training certified energy auditors and energy analysts who are likely to implement the recommendations of the audits. In the tourism sector the MSB provided training to meet sustainable tourism standards while in the electricity sector the MITD and University of Mauritius are training people on photovoltaic and solar energy.

Another strong point observed in the Mauritian context is that the scheme established by the HRDC (Sectoral Skills Development Scheme), the National Skills Development Programme for matching skills for the unemployed, and the framework adopted by the MITD for delivering training courses, provide valuable entry-points for green skills development. Tertiary institutions are also active in green skills development in various study fields. There is also a strong connection between the private sector and training institutions (HRDC, MITD and Ministry responsible for skills development) for green skills development. The private sector representatives (for e.g. Business Mauritius) are actively involved in skills development initiatives (including green initiatives) and work closely in collaboration with the HRDC and the Ministry in the design of skills development schemes.

5.3 Weak points of the skills development mechanism towards greening

An important question is whether the current skills development mechanism is suitable for green jobs. As mentioned earlier in this report, skills development is headed by the HRDC and the latter works closely with private sector institutions (Business Mauritius), collects data on a regular basis to identify the labour shortages and skills gaps and potentially design strategies to facilitate skills development. The schemes that have been established by the HRDC allow enterprises to mount training and skills development initiatives in collaboration with the latter and to recover the training costs through the HRDC grant system. A yet more recent initiative has been the National Skills Development Programme for which training and placement of young graduates is subsidized by the government through the HRDC.

However, the HRDC emphasizes skills development in general, responding to demand from the labour market, not necessarily green skills. The demand for green jobs and green skills is most likely to be channelled and taken into account by the HRDC and vocational institutions as and when they are signalled though the labour market. To that end green skills measures are mostly demand-driven. Indeed, most of the

skills development initiatives have been either demand-driven, resulting either from market forces - that is they are responding to a demand from the labour market - or from government policy. One example is greens skills for energy efficiency measures implemented across different institutions with a focus on generic and technical skills (certified energy auditors). Where the benefits are visible and recognized by enterprises, there is an automatic and rapid demand for green skills, and consequently this leads to development of training courses by relevant institutions. One example is the National Energy Efficiency Programme which emanated from the mapping exercise on energy efficiency conducted by the then JEC (Business Mauritius) and AfD. The study shows that several processes were consuming significant energy and that energy efficiency would reduce costs significantly (**Box 8**). The NEEP potentially caters for the training of energy managers who would implement the efficiency measures in a sample of enterprises. In other situations where the implementation of green processes is costly, green skills measures seem to be lagging behind. Reference is made to the industrial waste management system where the study by the JEC concluded that it would be difficult for enterprises to adopt such practices given their costs. In this respect there has not been any development in skills related to industrial waste management.

One major disadvantage of the current mechanism for green skills development is that it takes time to train the labour force, and therefore it is difficult to ensure that the supply of green skills would keep pace with demand. Therefore, while the channel exists through which green skills would make their way into the current skills development institutional set up in Mauritius, the latter is not efficient in ensuring comprehensive development of green skills across all economic sectors. Moreover, there is always a lag between its identification and development.

It is also observed that many training courses on green skills are one-off in nature. With the exception of tertiary education (undergraduates and post-graduates) and the MITD (where courses are provided when there are a sufficient number of participants), most of the training courses operate on an *ad hoc* basis, subject to funding and the demand for such skills.

A major weakness of the current skills development set-up is that a green skills development plan across economic sectors, with a clear distinction between generic and specific skills, does not so far exist. It may also happen that a set of green skills essential for a transition to a green economy is completely ignored at a later stage of the development process which will impede successful transition to a green economy and creation of green jobs. This weakness is already recognised by some institutions. As a major recommendation, Mauritius currently needs a comprehensive development plan of green skills across economic sectors (existing as well as emerging) for the successful implementation of government projects. As a reaction to this limitation, the MITD is currently recruiting a consultant to prepare a holistic plan for greening its training courses while the CSCM is currently looking into educational and training needs in several economic sectors.

Yet another factor which impedes green skills development is the significant level of uncertainty on the number of green jobs, types of green processes and practices, as well as types of (generic and specific) green skills which would be demanded by the market in the near future. Emerging sectors in Mauritius such as ocean economy, agro-industry and smart cities are overwhelmed by uncertainties on the magnitude of the development, depending among other factors on investors, know-how, and business optimism. The degree of uncertainty is in fact a major impediment to green skills measures.

It also appears that the creation of green jobs and green skills has shifted from a top-down approach where the projects and programmes of green skills and green jobs were designed by one centralized unit of the Government to a bottom-up approach, in a rather *ad hoc* manner, in which several institutions are currently implementing green projects at sectoral level. Capacity-building is one component of these projects. In some cases the same institutions are reacting to market forces and to the general tendencies in the labour market, and in other cases they

are responding to government policies and strategies. Most of the skills development initiatives have been *ad hoc* in nature. Therefore, a main conclusion from the report is that the bottom-up, *ad hoc* approach makes it difficult to ensure that the right generic and technical green skills would be developed by the educational and training system in a timely manner.

The assessment of this report shows that a centralised unit is needed to give a direction to green skills development. Otherwise identical green skills initiatives may be concurrently implemented by several stakeholders. Indeed, this is a second major weakness of the current skills development system. Resources and expertise geared to the same objective may be used by different stakeholders, leading to inefficient duplication of efforts

5.4 Financing green skills development

There are several examples of green skills measures being financed with the assistance of international organisations such as the FAO, AFD, UNDP, and others. Hence, the financing component remains a major issue. However, the schemes of the HRDC which allow private sector institutions to mount and offer courses to employees using benefits from the tax rebate system provide a useful institutional response to a demand for green skills as and when it arises. However, as mentioned before, it does not guarantee that supply will match demand and mismatches may prevail, at least from the short term to the medium term.

6. Conclusion and recommendations

The transition to a green economy, the creation of green jobs and the development of green skills are the path which Mauritius cannot afford not to follow. While there are a number of projects at both national and sectoral levels, with associated policy and strategy frameworks, the report on skills assessment for green jobs concludes that a proper and systematic mechanism which would translate the policy, strategies and projects into greens skills development is still lacking. The report concludes that there has been much progress on projects and policies geared towards greening the economy since the ILO conducted its Green Jobs Assessment and the study on Green Skills for Mauritius in 2012. Many projects which were recommended in these reports are being implemented. However the current study still relates to the previous study on green skills in Mauritius which indicated that, while there is a general awareness on green processes and practices, and several training programmes are being implemented at vocational and tertiary education levels, green skills development is still not well-structured. The report therefore recommends a comprehensive assessment of current and future green skills needs and preparation of a list of training courses which are likely to be demanded in the next 5-15 years. A detailed study on the future trends in green jobs and required green skills would require an analysis of current green sectoral growth and, at the same time, future employment trends in emerging sectors such as smart cities and ocean economy. At institutional level a green labour market information system may be an appropriate strategy. The assessment also includes a comprehensive study on generic and technical green skills.

The current institutional framework for training and skills development in Mauritius, in relation to the MoEHRTESR, HRDC, and MITD, can be readily aligned to prepare the labour force for transition to the green economy. In many cases, skills and training are currently being designed on an *ad hoc* basis at institutional level. The report therefore concludes that there is an urgent need to synchronise and align the training and skills development initiatives across the different institutions and to rationalise the different training programmes to ensure that there is a holistic approach where institutions would be seen to complement each other.

A proper mechanism to involve private sector stakeholders is essential. Such a participatory approach would ensure that the right information is communicated to the authorities in a timely manner. There is also a need for the current institutional set-up to update the skills requirement in a timely manner. A unit or department in the government would have to take the lead in conducting a continuous assessment of green skills or green jobs, taking into account government policies and advising the training institutions accordingly.

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