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PAGE



Green Economy Learning Assessment: Mauritius

Competencies to Enable a Green Transition

UN environment

ILO

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unitar
United Nations Institute for Training and Research



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List of Acronyms and Abbreviations

BAU	Business as usual
CSCM	Civil Service College, Mauritius
EEZ	Exclusive Economic Zone
EMO	Energy Efficiency Management Office
FAREI	Food and Agricultural Research and Extension Institute
GCCA+	Global Climate Change Alliance Plus
GDFCF	Gross Domestic Fixed Capital Formation
GDP	Gross Domestic Product
GELA	Green Economy Learning Assessment
GHG	Greenhouse gas
GOM	Government of Mauritius
HCFC	HydroChloroFluoroCarbon
ICSTH	International Centre for Sustainable Tourism and Hospitality
IGE	Inclusive Green Economy
ILO	International Labour Office
ISO	International Organization for Standardization
MAIFS	Ministry of Agro-Industry and Food Security
MauriGAP	Mauritian Standard for Good Agricultural Practices
MCA	Mauritius Chamber of Agriculture
MITD	Mauritius Institute Training and Development
MS	Mauritius Standard
PAGE	Partnership for Action on Green Economy
RoM	Republic of Mauritius
RRA	Rodrigues Regional Assembly
SME	Small and Medium Enterprises
SSDG	Small-Scale Distributed Generation
SWIO	South Western Indian Ocean
UNEP	United Nations Environmental Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNWTO	United Nations World Tourism Organization



Executive Summary

Objectives, Scope and Context

Green policies, strategies and initiatives which have been implemented in Mauritius clearly show the determination and commitment of policymakers and stakeholders to make the transition toward a greener economy. A green economy transition for Mauritius involves actions to promote growth in income and employment through public and private investments that reduce carbon emissions and pollution, enhance energy and resources efficiency, and prevent the loss of biodiversity and ecosystem services. It implies more investment shifted into sectors such as green agriculture, energy efficient enterprises, renewable energy, low-carbon transport and improved water management.

The development and implementation of green projects and actions require a range of skills and competencies. Public awareness of green economy issues is essential but not sufficient. Indeed, applied knowledge and capacities for Inclusive Green Economy (IGE) are needed at all levels in the private and public sector. The purpose of this Green Economy Learning Assessment is to evaluate to what extent key stakeholders in Mauritius possess the competences necessary to enable green development of key economic sectors, in accordance with national goals and strategies. Based on the key findings a set of recommendations are distilled that form a tailored response to bridging the gap between learning needs and desired capacities.

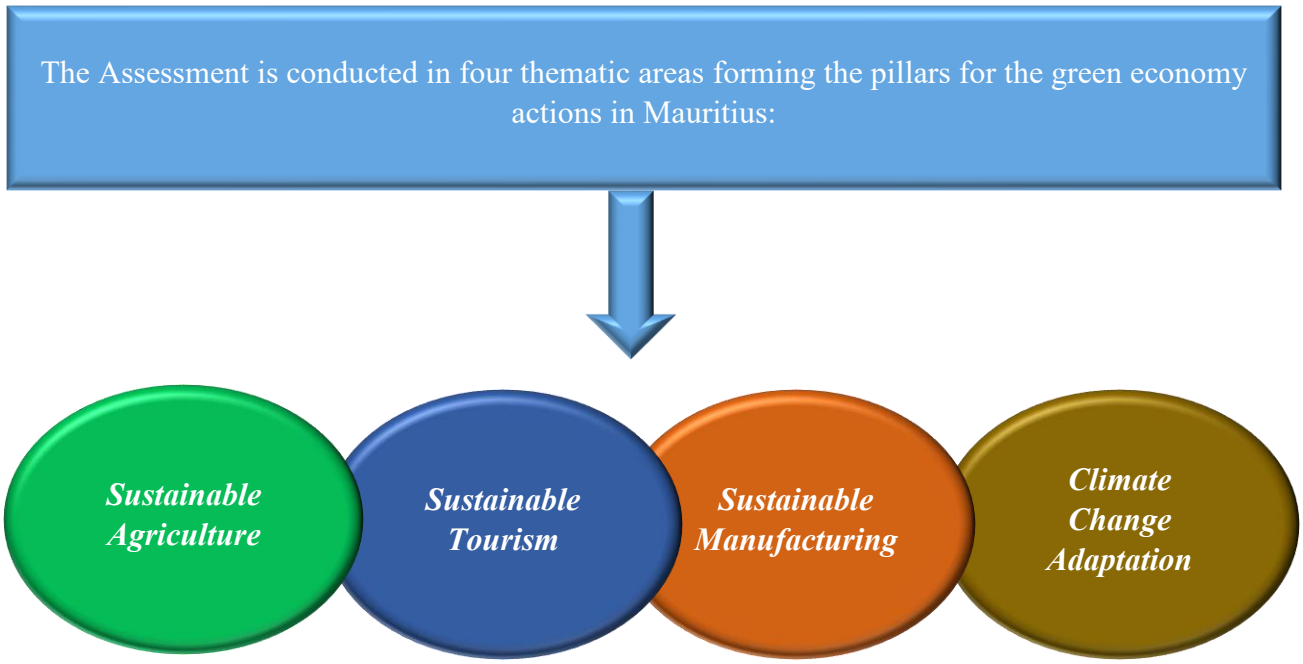
The Assessment has been carried out by Civil Service College Mauritius (CSCM), with the support of the Ministry of Civil Service and Administrative Reform (MCSAR), and within the framework of the Partnership for Action on Green Economy (PAGE). PAGE is a one UN partnership[1] that seeks to supports nations and regions in reframing economic policies and practices around sustainability to foster economic growth, create income and jobs, reduce poverty and inequality, and strengthen the ecological foundations of their economies. The Government of the Mauritius joined PAGE in 2014 to ensure that economic growth in the country is based on the principles of inclusivity, sound environmental management, and progress towards the Sustainable Development Goals.

The Green Economy Learning Assessment sets out three main objectives:

a. Identify learning priorities for advancing a green economy in Mauritius;

b. Review of existing institutional capacities to provide related education and training activities; and

c. Identify opportunities for strengthening and upscaling the delivery of green economy learning through national institutions.



The capacities of two sets of stakeholders are examined vis-à-vis the priority thematic areas:

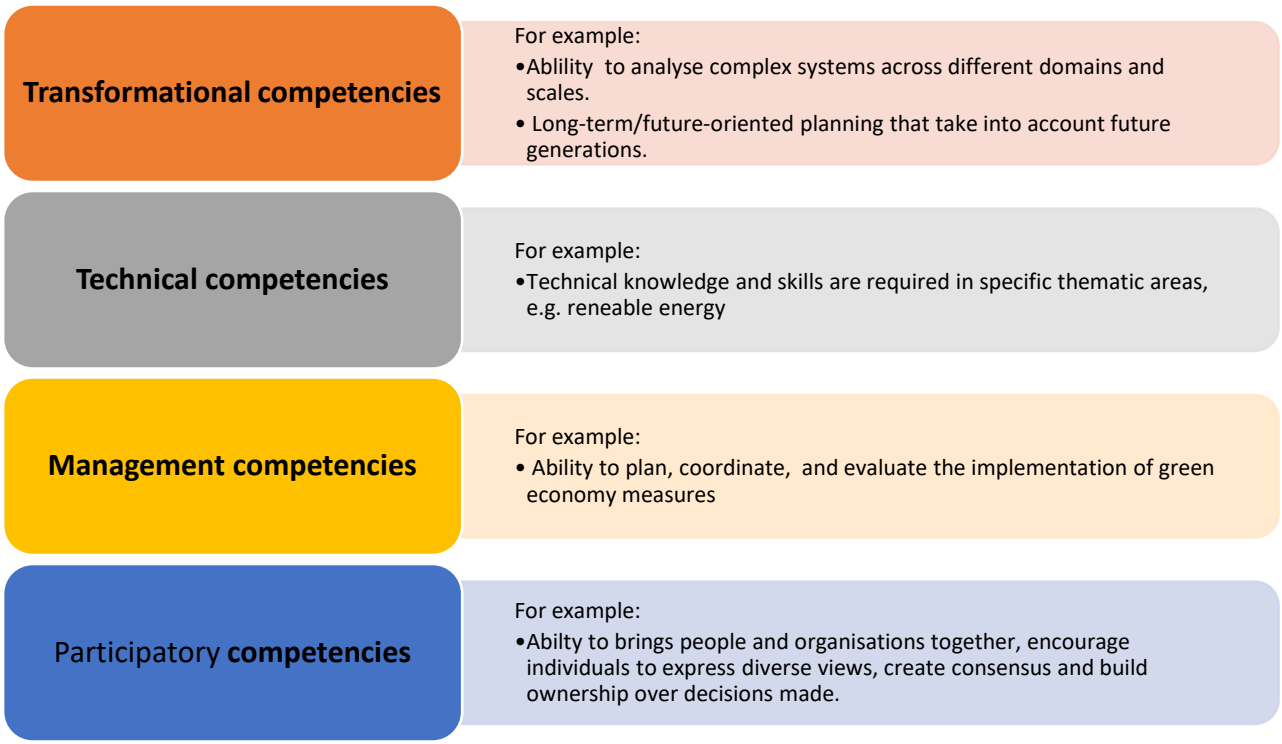
i. Learning needs in the public sector for a green economy; and

ii. Learning needs for green business development.

Critical Competencies: – A Framework for the Assessment

The study adopts the competency framework for a green economy developed by PAGE published in the report: 'Learning for an inclusive Green Economy – Assessing Priorities and Steering Action' (PAGE 2016)[1]. Competencies refer to a combination of knowledge, skills and attitudes that enable successful task performance and problem solving. The framework revolves around four aspects of competencies development, namely transformational competencies, technical competencies, management competencies and participatory competencies and is applied to three level of intervention, namely agenda-setting, organisational and operational. The methodology of the framework is further detailed in section 2 of the report.

[1] The current study also considers climate change issues and learning needs and thus, makes reference to the report entitled, 'Guidance for Developing a National Climate Change Learning Strategy', published by the UN CC Learn initiative in 2013. https://www.uncclearn.org/sites/default/files/inventory/guidance_note_-_eng.pdf



Data collection strategy

Review of green economy policies and actions in Mauritius

An assessment of desired learning needs and competencies depends on Government policies and programmes at sectoral levels. The first step therefore is to review green economy policies and programmes in Mauritius across key economic sectors. The review offers the essential information to identify the desired learning priorities and details the baseline **information** for the assessment (i.e. *what capacities should stakeholders have, vis-à-vis the goals of the Government*?). A comprehensive desk research was conducted and officials from key departments in various Ministries were consulted.

Identification and prioritising of areas of focus

In order to prioritise areas of focus to form part of the assessment, a participatory approach has been adopted. The review assists in identifying several areas where learning needs would be important. Several meetings and focus group discussions were held at the CSCM with officials from Ministries. The competencies assessment looks into the current green policy and programmes of the Government in four areas: **sustainable agriculture, sustainable tourism, green manufacturing (including renewable energy) and climate change adaptation.**

Setting up a competencies framework for IGE

As a next step, the learning needs and competency of stakeholders were assessed relative to the capacities they should have for the successful implementation of the green economy policies and programmes in Mauritius in the four areas. A learning gap has been defined. To complete this task, three instruments of data collection were used. Firstly, interviews were held with key informants, having experience and knowledge in the areas forming part of the assessment.

Secondly, a semi-structured questionnaire was administered to various departments in the Ministries to provide information on the skills and leaning needs they would require for their staff. Thirdly, a national workshop was organized to present the preliminary findings and collect feedback.

Institutional capacities of national learning institutions

Lastly, an inventory of available green economy trainings and learning programmes provided by national learning institutions has been created. The inventory helped evaluate whether national learning institutions possess the institutional capacity and resources (i.e. existing trainings, educational programmes) to bridge the learning gap and help stakeholders develop necessary capacities.

Analysing the results from: 1) the desktop research of policies, 2) analysis of the learning needs of key stakeholders; and 3) inventory of the trainings offered by national learning institutions, a set of key findings and recommendation has been developed.

Findings of the Learning Needs Assessment

The Green Economy Learning Assessment for Mauritius concludes that although some awareness on green economy issues and climate change exist among policy-makers, economic and social partners, this is far from being sufficient to allow a systematic shift towards an inclusive, green, and climate resilient economy.

Strategic vision and planning

The main areas of competencies which are most deficient in Mauritius are the transformational and technical across the four areas. Policy-makers are expected to be fully acquainted with green economy issues and climate change solutions which can be mainstreamed in development policies. At the transformational level *(i.e. ability to set priorities, and define strategic action)*, the desired competencies would include a clear understanding of the economic, social and environment implications of green economy actions, together with the associated challenges and opportunities that they offer. The Assessment found that transformational competencies of policy-makers in the public sector and corporate managers in the private sector on green economy and climate change issues should be enhanced. This applies to all four focus areas of the assessment: - sustainable agriculture, sustainable tourism, green manufacturing and climate change adaptation.

Systematic approach to professional/life-long learning for green economy

Public officers at organisational and operational level are expected to implement green economy measures and policies and assess their economic, social and environmental impacts. The assessment clearly demonstrates that a certain **degree of awareness exists on green economy issues, but it is insufficient for public sector officials to effectively conceptualise, implement and monitor** green programmes and projects. While green economic actions have to contribute and fit in to an overall objective of greening the economy, projects in Mauritius are designed and implemented in disconnect and on a rather ad-hoc basis. A more **systematic approach to develop competencies** of public officials should allow them to continuously and systematically improve their knowledge on best practices around the world, the state-of-the art

solutions to greening and the challenges that could be observed during their implementation. **Workshops, conferences and life-long learning/training opportunities** that could lead to such transformational competencies are warranted in the rather immediate future.

No common understanding/public consensus on green economy

The assessment revealed that **there is currently an absence of a systematic learning initiative for public officials** from Ministries to keep pace with current development in the field of green projects at sectoral level. Officers from the Ministries and related departments have to conduct their own learning and research, which leads to **fragmentation of capacities and disparities in the understanding** of what is green economy, how it is beneficial for Mauritius, and how to achieve it. Universal, foundational training, available for public officials as well as the general public would help develop a common understanding and consensus in government and in society.

Use of analytical tools for modelling and assessment

At the technical level, a strong competency gap is felt at the level of impact assessment in the social, economic and environmental domain. It is highly recommended that the green learning actions caters for the competencies of public officials and private sector operators to assess projects, measure their impacts in a quantitative manner, and monitor progress over time. Public officials have a deficient competency on modelling tools of impacts assessment as well as response measures. In all the four areas, there a strong need to introduce a diverse set of modelling tools, train lead persons within departments, and ensure transfer of knowledge over time. Impact assessment tools at project level such as cost-benefit analysis, life cycle costing, life cycle assessment, carbon footprint, or economy-level such as input-output analysis, system analysis and computable general equilibrium are almost absence in policy analysis.

Capacities for climate resilience

The assessment found that at level of project management and coordination many officers do have no formal experience/training in managing projects. Continuous learning does not exist. In areas that require a lot of cross-ministerial coordination and interdisciplinary approach, such as climate change adaptation and resilience, the lack of adequate skills can pose major threat. **In the field of greening and climate change actions, new set of management competencies are required,** including for vulnerability assessment appraisal, climate budgeting and planning, and urban management. Improving climate awareness and preparedness of local businesses will greatly increase the resilience of Mauritius economy, natural ecosystems and people to climate change and extreme weather.

Capacities for collaborative action

In all focus areas, the assessment reviews that both **businesses and public officials acquire communication skills on the job**. This hampered cross-ministerial collaboration and outreach to the general public and relevant stakeholders to adapt a participatory and inclusive approach to green economy.

Resources of national learning institutions exist but are underutilized and underfunded

The assessment reveals that **education and training institutions, especially universities, in Mauritius, have a pool of resources and human capacities** and are well-versed on green economy issues. However, **the mechanisms, and most importantly, the financial resources to develop training programmes for public officers are very limited**. This is an important gap in the current learning system in Mauritius.

Recommendations and conclusion

The Assessment proposes a number of learning actions and policy initiatives that can support the creation of human capital to advance the transition to an inclusive green economy in Mauritius. The actions are organized in 3 groups according to their time and efforts required to fulfil them.

Short-term actions

- **Create opportunities for foundational learning and training for policy makers, teaches and lecturers, as well as the general public.** One way to promote foundational training is by adapting the PAGE introductory e-course on green economy to the Mauritius context and making it available for free to the general public. Targeted promotion among education professionals, policy makers and business managers can scale up impact. The foundation training can be an entry conditions for specialized trainings on agriculture, tourism, green industry etc.
- **Make available entrepreneurship trainings, manuals and guides** that help corporate managers increase resource efficiency, productivity, and maximize market benefits from the transition to an inclusive green economy. This wok can be linked to effort by SME Mauritius, International Labour Organization and other bodies on Mauritius to promote entrepreneurship trainings for green business development.
- Design and offer on regular basis a training programme on **Strategic Planning for Green Economy**. This training will help develop the transformational competencies of policy makers and foster cross-ministerial and inter-disciplinary approach to policy making with view of advancing sustainable economic development in the country. The training would build on real life situation from key sector for Mauritius, such as agro-systems, climate-resilience, coastal adaptation, energy transition, and waste management.
- Set up **'training of trainers programmes'** for educators and corporate change agents to gradually promote behavioral change and a culture of green entrepreneurship in the public and private sector.
- Design and offer a multi-disciplinary training programme on **"Planning for climate resilience in urban and rural areas"**. The training would be useful for all civil servants working on land planning issues and increase the capacity of the Government to cope with advice effects from climate change through policy planning and budgeting instruments.

Mid-term actions

- Develop **sector specific trainings** for entrepreneurs and business communities, including on: bio-farming and green agricultural certification (as a driver for sustainable

agriculture), on sustainable innovation, energy efficiency and use of renewable energy (to foster a green manufacturing sector), and the development of eco-tourism and sustainable value chain with due recognition of cultural heritage (in the tourism sector). Trainings should be integrated into a coherent system (online platform or catalogue) and promoted accordingly.

- Develop training programmes on **economic modelling, impact assessment, and other evidence-based** policy planning tools (such as cost-benefit analyses, life cycle costing, multi criteria analysis, vulnerability assessments, and others).
- Identify and plan for **learning needs and skill development gaps, when developing new policy** programmes related to green economy.
- Improve **mechanism for collaboration** 1) across learning institutions; 2) between public institutions and learning institutions, and 3) between private sector and learning institutions (universities and TVET centres). This would ensure that universities provide relevant training in line with market demand and government priorities. It would also ensure that potential learners are aware of the existing opportunities. Support the collaborative mechanism with suitable instruments and incentives (i.e. fiscal, regulatory, career development).
- Develop a **strategy for public awareness** and information on inclusive green economy, climate change and the sustainable development agenda, involving the media and key stakeholders.
- Engage key stakeholders from the public and private sector in Mauritius in **South-South Triangular Cooperation** to ensure sharing of best practices, knowledge exchange and collaboration on approaches to advancing green economy.

Long-term actions

- Integrate inclusive green economy in the **educational and training curriculum** of learning institutions (on all levels) in Mauritius. One way to promote systematic integration is by collaborating with regulators (such as the Tertiary Education Commission and Mauritius Qualification Authority) and university administration to integrate IGE principles into the **accreditation/quality control criteria** for existing and new courses and programmes.
- Establish a strategic approach to green economy, and to the building of human capital for the green economy. A **green economy learning strategy** approved by the Government could help structure and guide efforts. A **green economy focal point** institution/person **at the central government level** (e.g. preferably at the Prime Minister's Office) can coordinate, consolidate, and promote work.
- Promote a **culture for life-long learning** for inclusive green economy. This can be achieved by ensuring varied and regular offer of learning opportunities that is available to public and private sector representatives, educators, the media and the public. This may include: formal face-to-facet courses, accredited formal education, public lectures, on-the-job training and mentoring, or e-learning, community workshops, study visits and field trips, and many more.



Chapter 1

1. Objectives, Scope and Context

Green policies, strategies and initiatives implemented in recent years in Mauritius in various sectors and subsectors of the economy clearly show the determination and commitment of policymakers and stakeholders to make the transition towards a greener economy. To a large extent, these actions and initiatives are supported by the Partnership for Action on Green Economy (PAGE)[2], mainly through the United Nations Environmental Programme (UNEP), and International Labour Office (ILO), among others. Following various forms of sensitisation on the importance and role of a green economy by PAGE, and discussion at various levels and across economic sectors, several national reports have assisted policymakers in Mauritius to define the path towards a greener economy. The 'Green Economy Assessment Mauritius' report by the UNEP, and the Green Jobs Assessment for Mauritius by the ILO are key reports which have set the landscape for the Mauritian green economy. The Government Programme in 2015 eventually set a strong vision of the green pathways transition through a range of policies and strategies to be implemented at sectoral levels.

A green economy transition for Mauritius involves actions to promote growth in income and employment through public and private investments that reduce carbon emissions and pollution and enhance energy and resources efficiency and prevent the loss of biodiversity and ecosystem services[3]. It implies more investment shifted into sectors such as green agriculture, energy efficient manufacturing, renewable energy, low-carbon transport and improved water management. Over the last five years or so, a series of green economy actions have been designed and implemented at sectoral level such as the programme to transform 50% of agricultural activities to bio-production by 2020, the establishment of bio-farming zones,[4] the compost subsidy schemes, the introduction of the Mauritian Standard for Good Agricultural Practices (MauriGAP), sustainable tourism standard, and eco-label standard for the textile sector, and the strong drive towards resource and energy efficiency, among others. The promotion of clean energy sources through photovoltaic and other renewable sources of energy are currently the priority in the energy sector.

To ensure an economic strategy with a focus on addressing unemployment, alleviating poverty and fostering sustainable development, green projects and actions must be supported by a well-defined set of skills and competencies. Public awareness of green economy issues is essential

[2] The UNEP has assisted Mauritius through the development of a Green Economy Model for the island. 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. 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. 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

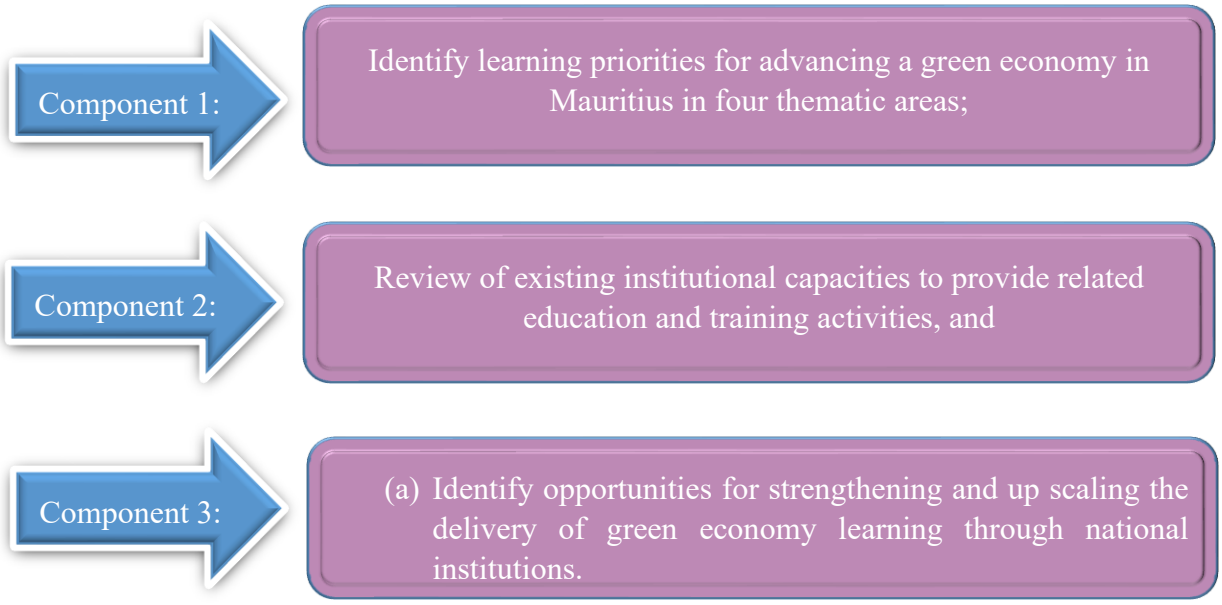
[3] UNEP defines a green economy as "one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities.

[4] MoAIFS. 2016. Strategic Plan (2016-2020) for the Food Crop, Livestock and Forestry Sectors. Ministry of Agro-Industry and Food Safety, Government of Mauritius.

but not sufficient. Applied knowledge and learning are required to drive the transition towards a greener economy. Indeed, relative knowledge and capacities for Inclusive Green Economy (IGE) are needed at all levels in the private and public sector. While awareness, knowledge and skills, which are related to green economy actions, are key determinants for the advancement towards a greener economy, it is observed that required competencies are usually lacking or under-developed. Designing and promoting such competencies require a well-defined framework whereby the existing capabilities are properly understood and the future learning needs and know-how in relation to the green economy policies and strategies are accurately measured. It is observed that without a systematic assessment of the learning needs and competency gap, the implementation of green projects are often delayed or hindered and the achievements are largely undermined with low rates of success. Moreover, education and training institutions are more likely to adopt a reactive rather than a proactive approach to green skills development. This concern was raised in the Green Economy Assessment report for Mauritius (PAGE 2015) as well as the Green Jobs Assessment report 2014 which clearly conclude that the key to the successful transition to a greener economy are skills development, capacity building, training, and education on green technologies, policies and actions.

The lack of green competencies is already showing a sign of bottlenecks in the path of Mauritius towards greener economy. Cases of skills deficiencies are observed in the field of energy auditing, implementation of energy efficient processes, maintenance of clear energy such as photovoltaic, and green agricultural practices. Several years after the introduction of green economy actions, it is of utmost importance to examine gaps in green competencies.

In view of identifying the knowledge gaps and learning needs of key stakeholders in Mauritius and developing a tailored approach to learning for a greener economy, PAGE and the Civil Service College Mauritius (CSCM) have initiated this Green Economy Learning Assessment (GELA). The Green Economy Learning Assessment sets out three main objectives:



The Assessment is conducted in four focus areas forming the pillars for the green economy actions in Mauritius: sustainable agriculture, sustainable tourism, green manufacturing, and climate change adaptation. The green economy learning assessment eventually assesses the competences and learning needs of the following two target groups:

- Public officials to develop policies and actions that advance Green Economy; and
- Green business operators to advance green business development in key thematic areas.

The assessment of the learning needs of public officers has as main objective to assist them to integrate the green paradigm in the formulation of government policies and implement green projects. It also targets the competences of entrepreneurs and employees so as to promote green businesses in relation to the four thematic areas.

The study is based on the premise that a set of complementary competencies is needed to unlock green businesses opportunities as well as to design green policies by policymakers and government officials to create the enabling conditions towards green economy actions. It is therefore key to promote capacity building for a green economy in a holistic manner. In this respect, capacity development goes much beyond technical competencies - knowledge and skills to implement specialised green projects - to include management and participatory competencies. Moreover, a set of transformational competencies in both public and private sector is key to reframe existing policies around sustainability.

In order to conduct the competency and learning needs assessment, this study uses a variant of the competency framework for a green economy developed by PAGE, published in the report entitled, 'Learning for an inclusive Green Economy – Assessing Priorities and Steering Action' (PAGE 2016)[5]. Competencies refer to a combination of knowledge, skills and attitudes that enable successful task performance and problem solving.

The framework revolves around four aspects of competencies development, namely transformational competencies, technical competencies, management competencies and participatory competencies and is applied to three levels of intervention, namely agenda-setting, organisational and operational.

[5] The current study also considers climate change issues and learning needs and thus, makes reference to the report entitled, 'Guidance for Developing a National Climate Change Learning Strategy', published by the UN CC Learn initiative in 2013. https://www.uncclearn.org/sites/default/files/inventory/guidance_note_-_eng.pdf

The assessment relies on three data collection methods.

1. The first one corresponds to a desktop research of policies, programmes and projects which have been initiated and implemented by the Government.

2. The second one relates to interviews of key informants, survey of policymakers, questionnaire and stakeholders' consultations/focus groups.

3. Finally, a mapping exercise of the institutional capacities of education and training institutions is undertaken. The purpose of the mapping exercise is geared towards assessing the capabilities of current education and learning institutions to cater for the competency gap rather than to list the courses and programmes, which are available within their field of expertise.

The GELA for Mauritius provides the emerging green economy learning priorities in the four focus areas, and the opportunities for action to strengthen green economy learning. The report is useful for multiple audience in particular vocational training providers, institutions offering tertiary education, business sector associations, Ministries and public sector departments and the wider civil society.

Chapter 2

2. Assessment Methodology

2.1. The Competency Framework for Inclusive Green Economy (IGE)

An assessment of learning needs and competencies for the successful implementation of the green economy policies and programmes in Mauritius requires a well-defined framework, which takes into account the existing capabilities, assesses the future needs and recommends the types of education and training programmes, which are needed to build up sufficient human capacity for IGE. A competency is defined as a functionally linked complex of knowledge, skills, and attitudes that enable successful task performance and problem solving[6]. Competency relates to what is expected of an employee in the workplace while the learning needs focus on the learning process or time spent in training. PAGE in this respect has developed the competencies framework for green economy published in the report entitled, 'Learning for an inclusive Green Economy – Assessing Priorities and Steering Action' (PAGE 2016). The framework revolves around four aspects of competencies development, namely transformational competencies, technical competencies, management competencies and participatory competencies. A brief description of these aspects are provided below:

Transformational competencies refer to the ability to analyse complex systems across different domains and scales with a long-term/future-orientation. They also aim at anticipating harmful unintended consequences for future generations. They are key for any initiative that aims to reframe existing policies and structures around sustainability.

Technical competencies refer to technical knowledge and skills required to implement specialised policy, where the technical aspects are fully taken into account. They involve using models, which show relative impact assessment of policies and projects while taking into consideration the context within which they are implemented.

[6] Wiek, A., Withycombe, L. and Redman, C. (2011) Key Competencies in Sustainability: A Reference Framework for Academic Program Development. Sustainability Science 6, 203-218

Management competencies include supervisory and delegation skills, which assist in monitoring and oversee the effective implementation of a green policy measure. They are able to build an enabling environment for progress and change, by helping to create the space within which concrete green economy action can take place. They also ensure that deadlines are met and that results are monitored and evaluated.

Participatory competencies are required to promote and sustain cooperation, ownership and action. They involve creating an engaging environment that brings people and organisations together, encourage individuals to express diverse views, create consensus and build ownership over decisions made. In a green economy policy context participatory skills are needed at all levels, from coalition-building around a new development agenda to involving stakeholders in the design of a specific incentive mechanism.

Transformational competencies	•Ability to analyse complex systems across different domains and scales. • Long-term/future-oriented and anticipate harmful unintended consequences for future generations.
Technical competencies	•Technical knowledge and skills are required to implement specialised policy tasks
Management competencies	• Ability to oversee the effective implementation of a green policy measure
Participatory competencies	•Abilty to create a welcoming and engaging environment that brings people and organizations together, encourage individuals to express diverse views, create consensus and build ownership over decisions made.

2.2. Contextualising Competency Assessment and Data Collection Strategy

Review of green economy policies and actions in Mauritius

The current assessment of learning needs and competencies is conducted in relation to the Government policies and programmes and therefore corresponds to a desired set of competencies in the four categories namely transformational, technical, management and participatory. Over the last years or so, Mauritius has observed many policies and programmes geared towards greening the economic sectors, including (i) agriculture, (ii) manufacturing, (iii) tourism, (iv) energy, (v) construction, among others. In order to achieve the objective of the study and to respond to the first objective, the first step involves a review of green economy policies and programmes in Mauritius across main economic sectors. The review offers the essential information to identify the learning priorities. A comprehensive desk research was supplemented by consultations with officials in key departments of various Ministries.

Identification and prioritising of sectors and sub-sectors for the assessment-a participatory approach

In order to prioritise the areas which would form part of the assessment, a participatory approach has been adopted. Based on the review of green economy policies and actions, several key areas were identified where training and learning needs would be strongly required. In this respect, several meetings and focus group discussions were held at the CSCM with officials from the Ministries. The competency assessment is consequently conducted in four focus areas: **sustainable agriculture, sustainable tourism, green manufacturing and climate change adaptation.** The concept of greening as applied to enterprises refers to a set of processes and practices which lead to low carbon-activities and reduces ecological risk and include resource and energy efficiency and cleaner production systems. It eventually covers a number of sectors and subsectors, including textile, chemicals and clean energy production among others.

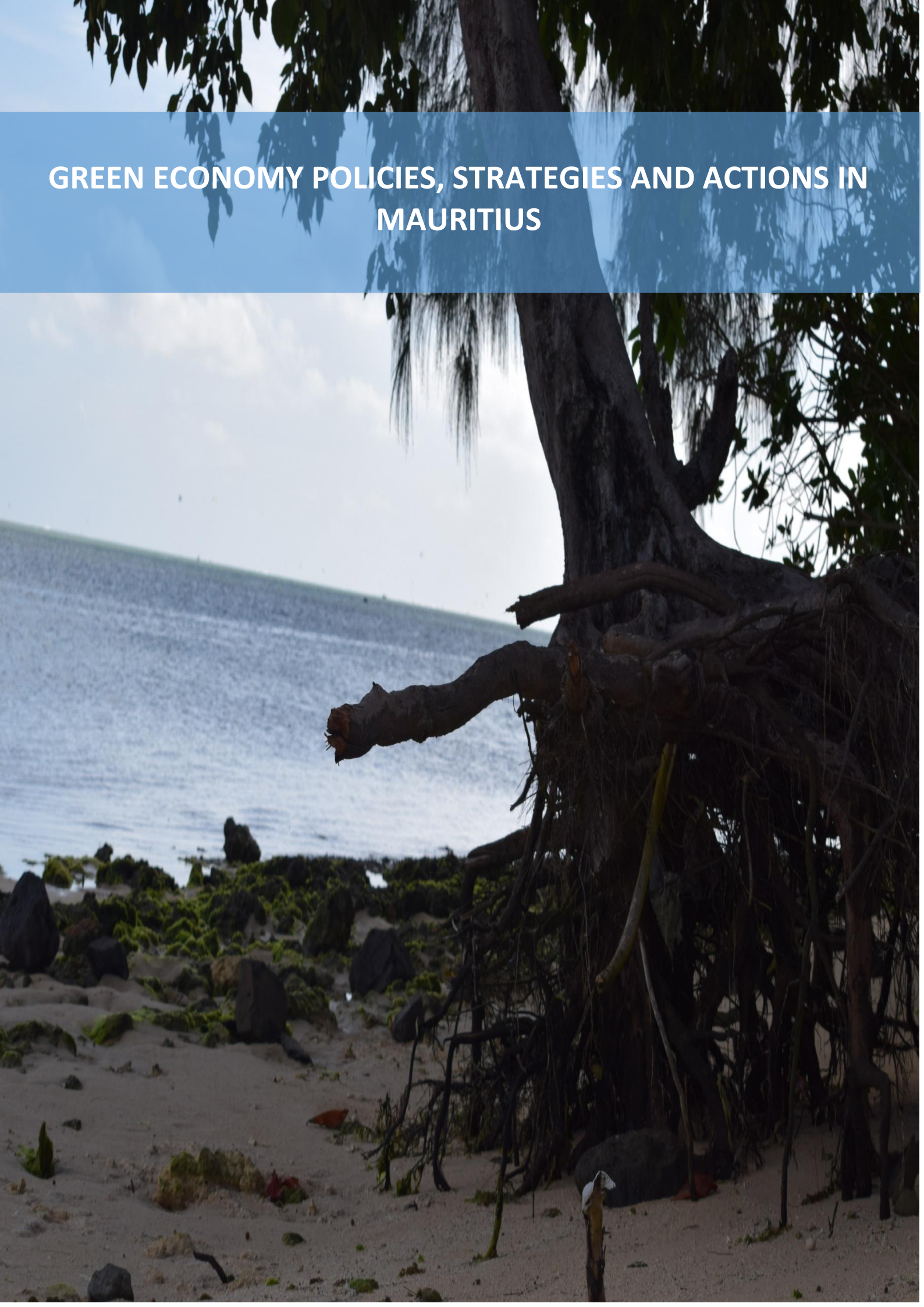
Implementing the competency framework in Mauritius

The next step is to assess the learning needs and competencies for the successful implementation of the green economy policies and programmes in Mauritius. It is important to ask, ***'what types of education and training programmes are needed to build up sufficient human capacity for IGE'***. In this respect, in-depth interviews were held with key informants in both the public and private sectors in relation to the four focus areas. The key informants were identified based on their experience, expertise on the focus areas and their position in the departments. Consequently, a semi-structured questionnaire was prepared and administered to the head of the departments or officers in charge of various departments in the Ministries to provide information on the skills and leaning they would require for their staff for green economy actions. The process was based on the following ethical guidelines:

1. An official letter with the questionnaire were sent to the heads of departments in the Ministries requesting for an interview;

2. Individual meetings were arranged to assist them to fill the questionnaire with a clear objective to identify the existing and desired competencies and the learning needs for their staff to design, implement green economy action; and
3. A stakeholder's workshop was organised to present the preliminary findings and to validate the information.

GREEN ECONOMY POLICIES, STRATEGIES AND ACTIONS IN MAURITIUS



Chapter 3

3. Green Economy Policies, Strategies and Actions in Mauritius

3.1. Social and Economic Indicators

The Republic of Mauritius (RoM), is a small island developing state of about 2 040 km² in area, comprising the mainland Mauritius, Rodrigues, Agalega, Tromelin, Cargados Carajos and the Chagos Archipelago. Its Exclusive Economic Zone (EEZ) is nearly 2.3 million km² as well as an Extended Continental Shelf of 396 000 km² managed jointly by RoM and Seychelles, outside the border of their respective EEZ.

Table 3.1 provides basic social indicators of Mauritius. The life expectancy, crude birth rate and death rate reflect to a large extent the economic progress and investment in the public health service for Mauritius.

Table 3.1. Basic social indicator for Mauritius 2012-2016

Social indicators	2012	2013	2014	2015	2016
Population (mid-year)	1291167	1258653	1260934	1262605	1263473
Life expectancy at birth (years) –Male	70.4	71.2	71.2	71.3	71.4
- Female	77.5	77.8	77.8	77.9	78
Crude birth rate (per 1000 population)	11.5	10.9	10.6	10.1	10.4
Crude death rate (per 1000 population)	7.4	7.5	7.7	7.7	8.1

Source: Population and Vital Statistics (Statistics Mauritius, various issues)

The average growth rate of Gross Domestic Product (GDP) for Mauritius during the last five years stands at 3.6%. It rose modestly in 2014 to 3.7%. The year 2016 observed a 3.8% growth in GDP and 3.6% rise in GDP per capita (Table 3.2).

Table 3.2. Basic economic indicators for Mauritius 2012-2016

Economic indicators	2012	2013	2014	2015	2016
Population (mid-year)	1291167	1258653	1260934	1262605	1263473
Gross Domestic Product at market prices	350644	372397	392062	409893	434765
Rate of inflation (%)	+3.9	+3.5	+3.2	+1.3	+1.0
GDP at market prices (RsM)[1]	349401	372397	392062	409893	434243
Real annual growth rate of GDP (%)[1]	3.5	3.4	3.7	3.6	3.8
GDFCF (RsM)[1]	79185	77618	73989	71155	74969
Real annual growth rate of GDFCF (%)1	0.8	3.3	6.0	5.4	3.7

Rate of inflation (%)[1]	3.9	3.5	3.2	1.3	1.0
Per capita GDP at current market prices[1]	278844	295591	310862	324570	343616
Per capital GDP growth constant 2010 price[2]	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)

According to the Africa Economic Outlook 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 3 years. However, given a lack of external demand (exports), economic growth was rather constrained.

Table 3.3 supplements the economic indicators with the value added of industry groups. The manufacturing sector contributes to 13.9% of GDP in 2016. This is followed by financial and insurance activities (12.1%) and wholesale & retail trade (11.9%). The performance in the accommodation and food service sector over the last five years reflects the rise in tourists in Mauritius.

Table 3.4 shows employment and unemployment trends for the period 2012-2016. The unemployment rates reached the lowest figure in 2016 at 7.3%. Youth employment rates range from 23.2% to 26.3%. Out of the total unemployment, youth unemployment stands at 45.6% in 2016 and averaged 44.72% during the period 2012-2016. The unemployment rate was marginally higher in 2015 at 7.9 per cent, compared to 7.8 per cent in 2014. Persistent skills mismatch in the labour market is contributing to a high level of youth and female unemployment (BOM 2016[7]).

[7] BOM(2016) Annual Report for the year ended 30th June 2016. Bank of Mauritius. https://www.bom.mu/publications-and-statistics/publications/annual-report

Table 3.3. Gross Value Added by industry group at current basic prices, 2012 - 2016

Industry groups	2012	2013	2014	2015	2016
Agriculture, forestry and fishing	12824	12570	12778	12928	13860
Sugarcane	4217	3544	3162	3144	3324
Other	8607	9026	9616	9784	10536
Mining and quarrying	1000	990	1000	893	908
Manufacturing	47855	51787	53274	53436	53906
Sugar	958	810	641	583	805
Food excl. Sugar	17295	18253	18663	18554	19049
Textiles	14529	15517	16118	16700	15887
Other	15073	17207	17852	17599	18165
Electricity, gas, steam and air conditioning supply	4306	4722	5511	7083	8427
Water supply, sewerage, waste management and remediation activities	1220	1294	1340	1442	1490
Construction	19043	17923	16631	16018	16027
Wholesale & retail trade; repair of motor vehicles and motorcycles	36219	38965	41579	43738	45914
Transportation and storage	18656	19779	21160	22613	24332
Accommodation and food service activities	21197	19827	21702	23520	26727
Information and communication	13775	14398	14948	15841	16387
Financial and insurance activities	36735	38336	41322	43599	46614
Real estate activities	18802	20042	21165	21923	22813
Professional, scientific and technical activities	13207	14624	15923	16776	17917
Administrative and support service activities	7820	8754	9752	10391	11118
Public administration and defence; compulsory social security	17327	20196	21543	22419	24878
Education	13804	15725	16562	17636	18944
Human health and social work activities	11179	13123	14431	15199	16501
Arts, entertainment and recreation	9544	10766	11854	12369	13161
Other service activities	4807	5189	5537	5725	5979
Gross Value Added (GVA) at current basic prices	309,319	329,009	348,011	363,547	385,902
Taxes on products (net of subsidies)	41,325	43,388	44,051	46,346	48,864
Gross Domestic Product (GDP) at current market prices	350,644	372,397	392,062	409,893	434,765

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

Table 3.4. Employment indicators

Employment trends	2012	2013	2014	2015	2016
Labour force ('000)	580.3	597.5	604.0	612.9	609.6
Employment ('000)	535.7	552.0	559.2	566.6	567.2
Unemployment rate (%)	8.0	8.0	7.8	7.9	7.3
Youth unemployment (16-24 years) ('000)	18.5	17.6	19.5	21.2	18.9
Youth unemployment rate (%)	24.7	23.2	25.3	26.3	23.9
Unemployment ('000)	44.6	45.5	44.8	46.3	42.4

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

3.2. Assessments and Diagnostic on Green Economy in Mauritius

The Green Economy Assessment Mauritius report published in 2015 identified four priority sectors as key drivers of a green economy transition in Mauritius:

- agriculture;
- energy;
- waste; and
- water.

In addition, sectoral impacts of energy and water green economy interventions on tourism and manufacturing are also examined. The GE assessment demonstrates that a green economy transition offers Mauritius further opportunities for sustained economic growth, energy and water savings, increased agricultural productivity and green jobs. According to the analysis in this report, green economy investments are expected to generate better economic outcomes than a business-as-usual (BAU) investment allocation, with GDP 6 per cent higher in the GE case relative to BAU, by 2035. The cost of such public and private investment will be approximately 0.9 per cent of GDP per year between 2014 and 2035. However, this will generate annual savings of around 3 per cent of GDP. The 2015 report also examines greening initiatives and opportunities in seven key sectors of the Mauritian economy and the impact of implementing various policies against a business-as-usual scenario.

The ILO Green Jobs assessment in Mauritius (2012) analyses the employment impact of the transition in a number of sectors and subsectors including agriculture, fishing, manufacturing (textile), forestry, energy, tourism, and financial services. The report concludes that green jobs were estimated at 6% in 2012 and with the appropriate green strategies, it can reach 10% in 2020. The report complements three other studies entitled, '*Skills for Green Jobs in Mauritius*', '*The Greening of Mauritian Enterprises*' and '*Stocktaking Exercise on Trade Union Involvement/Activities in Green Jobs in Mauritius*'. Sectoral recommendations include green agricultural certification, awareness campaign on green agriculture, incentives to planters, synergy between climate change and green jobs, green supply chain, visibility of green businesses through certification, green procurement, promotion of ecotourism, among others. Almost all of these recommendations have been taken into account by the Government through green actions, policies and strategies.

PAGE has also assisted Mauritius through the Tracking Public Sector Environment Expenditure. A Training Manual was prepared to provide practical support to the officers of the various ministries who are involved in the identification and estimation of environment, climate change adaptation and mitigation expenditures, and the categorisation of the climate level of relevance, based on the Climate Public Expenditure and Institutional Review methodology.

Over the last years or so, Mauritius has observed many policies and programmes geared towards greening the economic sectors, including the agriculture, manufacturing, tourism, energy, construction sector, among others.

3.3. The Government's Greening Programme

The Government's Programme (2015-2019) aims is to 'transform Mauritius into a truly forward looking, environmentally sustainable, economically vibrant and innovative country with modern infrastructure, global connectivity, high skills and technology' (GOM, 2015)[8]. In this respect, a series of policies and strategies have been implemented. There are several economy-wide fiscal incentives which 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. Green technology equipment is defined as capital expenditure (excluding passenger car) on renewable energy, desalination plant, composting equipment, pollution control equipment, water efficient plant, energy efficient equipment, etc. An exceptional accelerated annual allowance, which was introduced in 2013, has been made permanent in 2015 in respect of landscaping and other earth works 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 the policies of the Government.

[8] GOM.2015. Government Programme 2015-2019 Achieving Meaningful Change. Address by the President of the Republic of Mauritius. Government of Mauritius. Port Louis. Tuesday 27 January 2015. First Sitting of 2015 of the First Session of the Sixth National Assembly of Mauritius.

POLICIES FOR SUSTAINABLE AGRICULTURE



3.4. Policies for Sustainable Agriculture

The agricultural sector is guided by different laws that exist in the Republic of Mauritius. The main legislations in this respect include: National Agricultural Products Regulatory Office Act 2013; Food and Agricultural Research and Extension Institute Act 2013; Seeds Act 2013; Plant Protection Act 2016; Chemical Fertilisers Control Act 1980; Dangerous Chemicals Control Act 2004, Genetically Modified Organisms Act 2004, Animal Welfare Act 2013, Animal Diseases Act 1925, Forests and Reserves Act, and the Wildlife and National Parks Act.

The Strategic Plan 2016- 2020

The Strategic Plan (2016-2020) prepared by the Ministry of Agro-Industry and Food Security (MAIFS) for the new development paradigm in the agricultural sector highly emphasises bio-food and bio-farming, which need to be achieved through the development of bio-production protocols, establishment of bio-farming zones, bio-food production and bio-farming certificate/label. The government policy is aiming at the gradual shift to bio-farming with a target of achieving 50% of vegetables and fruits produced as per bio-norms by year 2020.

Bio-farming Promotion Scheme

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 the development of bio-farming activities on a commercial scale. The scheme includes an income tax holiday for the first eight years of operation, Value Added Tax Exemption on production equipment and other inputs acquired for the implementation of the project, loan facilities at an annual interest rate of Key Repo less 1% (presently 3.4 %) over a period of ten years for maximum of 90% project financing under the MauBank SME Financing Scheme; and a Fast track business support solution from the Food and Agricultural Research and Extension Institute (FAREI). A plot of land of an extent of 66 Arpents on State Land at Britannia has been earmarked for the exclusive use of bio farming projects (GIS 2016, 2017).

MauriGap

In 2016, the MAIFS launched the MauriGap, the acronym for Mauritius Standard for Good Agricultural Practices (MauriGAP), which was prepared and published by the Mauritius Standard Bureau in October 2015. MauriGAP covers efficient use of resources; adoption of environmentally sound practices for natural resources; biodiversity preservation; pre and postharvest best practices; workers' health and safety; and agricultural waste recycling. MauriGAP has been introduced with its Level 1 (Basic) and Level 2 (Advanced) to serve as steps towards Level 3 which corresponds to GLOBALGAP certification.

Other green projects

Projects and schemes which are implemented by different institutions include the Compost Subsidy Scheme and the Sheltered Farming Scheme, which encourage planters to shift from the use of chemical inputs to organic ones, the 'Climate Smart Agriculture' project[9] financed by the European Union through a grant amounting Rs 115 million under the Global Climate Change Alliance Plus (GCCA+) Flagship Initiative and the Smart Agriculture project by the

[9] GCCA website at http://www.gcca.eu/climate-smart-agriculture-for-small-holders-in-mauritius (accessed on the 7th July 2017)

Mauritius Chamber of Agriculture (MCA) with the FAREI to enhance sustainable agriculture in Mauritius. The project is currently being financed by a grant from the 'Agence Française de Développement' (AFD) and with the assistance of the 'Centre de Coopération International en Recherche Agronomique pour le Développement de La Réunion'.

Sustainable agriculture in Rodrigues

The agricultural sector is the backbone of the economy in Rodrigues and has traditionally concentrated on the production of staple food, including red beans, lime, chilies, maize, cassava, breadfruits, potatoes and sweet potatoes. Other important food crop such as onions, garlic, cabbage, tomatoes and creepers, including chayote (chouchou), zucchini, cucumber and pumpkins are produced on a small scale mainly for local consumption. The production of coffee has also started on a pilot basis since 2015. It is noted that many visitors appreciate the quality of the Rodriguan Arabica coffee.

The Rodrigues Regional Assembly (RRA) emphasises the revilisation, modernisation and professionalization of the sector. The financial budget of the RRA during the couple of years has highlighted the necessity to developing the agricultural sector for the farmers given that many people in Rodrigues are involved in some forms of agricultural activities. Areas of intervention include (Statistics Mauritius 2016):

(i) Provision of professional and applied agricultural training for the youth
(ii) Allocation of starter package to encourage the youth to invest in agricultural activities;
(iii) Support packages to boost production of high value cash crops;
(iv) Promote off season production of selected food crops;
(v) Backing water use efficiency in agriculture; and
(vi) Encourage development of organic farming for bio products

GREEN MANUFACTURING



3.5. Green Manufacturing

A green manufacturing sector involves two main dimensions: the first one is to deliver a green output while the second one is to increase resource efficiency, and adopt practices which have low ecological risk. Since there are many activities which are involved in the manufacturing sector from food processing and packaging, textiles, precision engineering and watchmaking, medical devices and pharmaceuticals, to high-end jewellery and diamond processing,[10] the green processes are currently emphasised by the Government. The two main recent policies and strategies to encourage development in the manufacturing sector are the National Export Strategy 2017-2021[11] and the 10 year Master Plan for the SME sector in Mauritius.

National Export Strategy 2017-2021

The report outline that the skills mismatch between industry and the education infrastructure, and the lack of entrepreneurship and incubator programmes for new entrants as supply-side issues which are currently competitiveness constraint in the economy including the manufacturing sector. Some issues raised in the report are as follows:

- There is a lack of know-how and expertise in the production of new and differentiated products at the industry level due to absence of tailor-made, specialized technical university courses;
- A strong mechanism to bridge the demand side (industry) and supply side (education providers) is lacking
- Courses by TVET institutions must be geared towards the market demand for vocational jobs
- Infrastructural difficulties by the main universities in Mauritius, including the University of Mauritius and University of Technology, Mauritius.
- Change management is also needed to bring about the necessary change in the business culture and
- A lack of entrepreneurial culture is observed

The 10 year plan for SME Sector

The 10 year plan for the SME sector emphasises green businesses and adoption of environment- friendly practices by SMEs.

SME Development Certificate

Greening of the manufacturing is observed through different 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 budget 2016-17, the SME development certificate was extended to sole traders and cooperatives.

[10] BOI website

[11] Government of Mauritius 2017. Mauritius National Export Strategy 2017-2021. http://sourcemauritius.com/wp-content/uploads/2017/04/1_Mauritius-National-Export-Strategy_web-reduced.pdf

ISO 14001

One of the main instruments of greening the manufacturing base is the ISO 14001. However, only a small number of firms have implemented formal environmental management systems. About 10 enterprises in Mauritius are certified ISO 14001 (Industrial Observatory, 2015). The cost involved in adopting ISO 14001 is likely to be the main impediment for its implementation.

Eco-labelling for textile product

In 2016, the Mauritius Standard Bureau has implemented the standards for Eco Labelling for Textile products – MS 188:2016. The Eco labelling in this respect takes into account the minimisation of the use of environmental harmful substances, reduction of water and air pollutants, reduction of energy consumption and GHGs emissions, minimisation of waste generation and the adoption of sustainable forms of processes.

Energy efficiency

Energy efficiency has gained increasing emphasis in recent years in Mauritius. In fact, one of the ways that enterprises may embark on the green transition is through an energy audit and implementing energy efficient measures.

The Energy Efficiency Management Office (EMO) 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 of initiatives.

Among the initiatives which have been undertaken by the EMO include:

- Voluntary Scheme for Energy Efficiency Labelling of Electrical Appliances (refrigerating appliances, household electric ovens, electric dishwashers, room air conditioners, washing machines, electric lamps, tumble dryers, and television);
- Energy Efficiency Awareness Campaign including talks on Energy Efficiency and Energy Saving)
- Energy efficiency competitions,
- Energy Observatory report,
- Mandatory Energy Efficiency Labelling of Electrical Appliances (refrigerating appliances, electric ovens, electric dishwashers Appliances)
- Mandatory Energy Audits,
- Mandatory Registration of Energy Auditors, and
- Monitoring of Energy in public sector buildings among others[12].

[12] 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)

ECO-TOURISM AND SUSTAINABLE TOURISM



3.6. Eco-tourism and Sustainable Tourism

Over the recent years, the tourism industry has experienced a rise on initiatives from both the private and public sectors to make it more sustainable. The drive for resource and energy efficient tourism industry is well-established in the mind-set of many business operators. The green loans which were provided by the two main banks (Mauritius Commercial Banks and State Bank of Mauritius) with the support of the Agence Francaise De Development, have fuelled many projects in the hotel sector to reduce fossil fuel energy. The National Energy Efficiency Programme by Business Mauritius has also encouraged many operators in the business sector to adopt efficient practices following energy audits.

It may be pointed out at this stage that green economy investment scenario from the Green Economy Assessment Report for Mauritius concludes that investment in green tourism makes larger contribution to GDP growth with significant environmental benefits including reduction in water consumption (18%), energy use (44%) and CO2 emissions (52%) compared to business as usual.

Greening of the tourism industry is connected to the following policies and programmes which are being promoted by the government: energy and resource efficient practices; eco-labelling; greening the tourism market intelligence; MS165 Sustainable Tourism and the drive towards eco-tourism. There is a rise in awareness that energy efficient and renewable energy technologies can reduce operational costs while resource efficiency assists in fostering economic growth and creates green jobs.

Mauritius Standard (MS) 165

The Mauritius Standard (MS) 165 for sustainable tourism in Mauritius has been inspired from EcoMark Africa and the Global Sustainable Tourism Criteria (GSTC), taking into account the local specificities and context. The Standard specifies the minimum requirements for a sustainable tourism and is based around four themes: sustainable management, social and economic benefits to the community, cultural heritage values[13] and environmental respect. With a view to facilitating certification to MS165 of tourism businesses, the Mauritius Tourism Authority has developed a scheme to provide support to tourism businesses. The scheme is 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. MS 165 is competing with Green Globe and Green Key. MS165 is being reviewed 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 incentivise companies to be MS 165 certified, the ceiling for the grant will be increased to around Rs150 000 to cover the certification and consultant cost.

Tax incentives

The tax incentives for the promotion of Green and Sustainable Development are: accelerated Income Tax Depreciation Provision for Green Investment, Exceptional accelerated annual

[13] Ministry of Tourism and Leisure 2016. Together towards a greener and a more sustainable tourism industry. http://tourism.govmu.org/English/Documents/A5_Brochure.pdf

allowances were introduced in 2013 and made permanent in 2015 in respect of: landscaping and other earth works for embellishment purposes (50% straight line) and, green technology equipment (50% straight line). Green technology equipment is defined as capital expenditure (excluding passenger car) on renewable energy, desalination plant, composting equipment, pollution control equipment, water efficient plant, energy efficient equipment, and manufacturing etc.

Eco-labelling

The Ministry of Tourism and Leisure is also promoting the concept of eco-labeling which is a voluntary method performance certification and labelling that is practiced around the world. The characteristics of an eco-labelled tourist enterprise are (i) respect of socio-cultural authenticity, (ii) efficient use of energy and water, (iii) efficient waste management, (iv) judicious use of scare and non-renewable resources and (v) greater material recyclability.

Local Government Act 2011

Local Authorities have also a major role to play in greening the economy. The following items have been included in the Local Government Act 2011: Sound rain water harvesting system to be incorporated in the development project; plantation of trees in case any mature trees were removed; avoid impervious floor on the premise to allow for ground water infiltration; use of photovoltaic cells as well as efficient energy efficient bulbs; composting and segregation of household waste

3.7. Renewable Energy Sector

The Third National Communication Mauritius provides vital information on the future of energy sector of the island. The main technologies envisaged to reach these targets comprise energy efficiency and renewable energy technologies (e.g. solar PV, wind, renewable biomass, and waste-to-energy). A baseline emissions analysis has been carried out using the system dynamics model that simulate electricity generation using a 3.8% GDP growth rate (the 10-year average GDP growth rate). The mitigation scenarios propose to achieve 35% renewable energy target in 2025 and maintain up to 2030. The implementation of all the proposed measures could result in reduction of 1.23 million tonnes CO^2eq in 2030 to reach 2.61 million tonnes CO^2eq in 2050 compared to the BAU pathway.

Mauritius is heavily reliant on fossil fuels for electricity generation. The grid emission factor of Mauritius is very high at 1.01 tCO_2/MWh due to imported coal and fuel oil as sources of electricity generation. An average annual growth of 4.3% of Gg CO_{2e} over the last 15 years or so in the energy sector[14].

Over the recent years, the Government has emphasised investment in renewable energy sources. There are several policies and programmes which have been initiated and implemented in this respect. The drive to reduce fossil fuel use is reflected in the **Long-Term Energy Strategy 2009-2025** to increase renewable energy (RE) target of 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 of several national strategies, including the **Outline**

[14]https://unfccc.int/files/national_reports/non- annex_i_natcom/application/pdf/nc3_republic_of_mauritius_20jan17.pdf

Energy Policy, the Long-Term Energy Strategy 2009-2025 and **CEB's Integrated Electricity Plan**. In 2016, the Government publishes the **Master Plan for Energy Efficiency/Demand Side Management and Action Plan for the period 2016 to 2030**.

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 to install small-scale (<50 kW) photovoltaic (PV) 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 scheme. The 2 MW capacity cap (in SSDG Phase 1) was reached in less than one year 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 technical and financial 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 levelised 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.

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. Currently, on behalf of the Government of Mauritius, the Mauritius Research Council (MRC), an apex body to promote and co-ordinate national investment in research, invites Expressions of Interest for the development of Offshore Wind Farms for the Republic of Mauritius[15].

[15] 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

CLIMATE CHANGE ADAPTATION PROJECTS



3.8. 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 accelerating sea level rise and increasing frequency and intensity of tropical cyclones will likely result in considerable economic loss, humanitarian stresses, and environmental degradation. Key sectors that are vulnerable to climate change include agriculture, coastal resources and tourism, water resources, marine and terrestrial biodiversity, fisheries, human health and infrastructure. Adaptation measures along the coastal regions would include the preservation natural landscapes through the establishment of natural parks for eco-tourism; plant mangroves, build wave breakers at sea and flood wall on the coastline to protect vulnerable on-land infrastructure and build elevated roads or relocate coastal roads more inland. Restore wetlands for fisheries and protection of infrastructure from storms and sea level rise and replenish dunes are also part of the adaptation measures.

Mauritius has developed a number of policies and taken several measures to enhance the resilience of the country and progress towards a low emission pathway. 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 following: i) National Disaster Risk Reduction and Management Act (2016); ii)Master Plan for Energy Efficiency/Demand Side Management and Action Plan for the period 2016 to 2030 (2016); iii) Marshall Plan Against Poverty (2016); (iv) Strategic Plan 2016-2020 for the Food Crop, Livestock and Forestry (2016); v) A Guideline for Climate Change Adaptation Strategy Coastal Setback (2016); vi) Action Plan for the implementation of measures in the Intended Nationally Determined Contribution (2016); vii) National Biodiversity Strategy and Action Plan (2016 – 2020); viii) Climate Change Charter for Local Authorities (2015); ix) National Climate Change Adaptation Policy Framework (2012); x) The Master Plan for "Development of the Water Resources in the Republic of Mauritius" (2012); xi) Building Control Act (2012); xii) Energy Efficiency Act (2011); and xiii) Long term Energy Strategy 2009 – 2025.

The Government is also formulating a Climate Change Bill to establish a consolidated framework for climate change measures as well as the setting up of a National Climate Change Committee to strengthen coordination among key stakeholders.

The Climate Change Adaptation Programme in the Coastal Zone of Mauritius is one of the programmes which have been implemented in recent years to help coastal communities fight the adverse effects of climate change through the implementation of climate-resilient development measures. The programme was funded by the Adaptation Fund and implemented by the United Nations Development Programme. The Programme also has a capacity building component on climate-proofed planning, design and location guidelines. It also targeted capacity building for ongoing replication of effective coastal adaptive measures by both the Government and private sector. 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[16].

[16] Sultan, R. and Sobhee, S. K. (2016) Training Manual for Cost Benefit Analysis for Climate Change Adaptation Project in Mauritius. Government of Mauritius.

EMERGING GREEN ECONOMY LEARNING PROFILES



Chapter 4

4. Emerging Green Economy Learning Profiles

This section provides the findings from the Green Economy Learning Assessment on the four focus areas in Mauritius: sustainable agriculture, sustainable tourism, green enterprises and climate change adaptation. In this respect, the four aspects of competencies, namely transformational, technical, management and participatory, are examined relative to the government green policies and the trends of adopting greening processes and practices by enterprises in Mauritius. The desired competency needs of the people in both the public and private sectors are analysed. Particular emphasis is laid on public officials who are involved in the design, implementation and monitoring of green projects and policies.

4.1. Learning needs for Sustainable Agriculture

The Concept of Sustainable Agriculture

The concept of sustainable agriculture is well-established in agricultural science. From an article published in *Nature Education Knowledge*, Sonja Brodt and her team gave a key definition of the concept by pointing out that sustainable agriculture gives equal weight to environmental, social and economic systems and rests on the principle that the needs of the present generation are met without compromising the ability of future generation to meet their own needs[17]. Accordingly, a sustainable agriculture approach refers to the use of natural resources in such a way that it helps to regenerate the natural productive capacity and also minimises harmful impacts on ecosystems. The approach stresses that sustainability is embedded in the agro-ecosystems and food systems. Agro-ecosystems, on one hand, refer to components from individual fields, farms, to eco-zones. Food systems, on the other hand, include agro-ecosystems together with the distribution and food consumption components, and involve the human dimension as well- from farmers to local community to global population. Sustainable agriculture is, therefore, expected to green the components of the agro-ecosystems and food systems. The sustainable food system is gaining increasingly attention as a response to global warming, failing harvests, falling water tables and fossil fuels shortages and offers many synergistic benefits for tackling climate change, improving health, environment and reducing poverty and inequality[18]

From a policy perspective, sustainable agriculture involves actions which establish an agricultural system which is resilient, adaptive and highly diversified. Constructing a resilient agricultural system is critical because most agro-ecosystems face conditions (including climate, pest populations, political contexts, and others) that are often highly unpredictable and mostly unstable in the long run. Adaptability, in this respect, is a key component of resilience,

[17] Brodt, S., Six, J., Feenstra, G., Ingels, C. & Campbell, D. (2011) Sustainable Agriculture. Nature Education Knowledge 3(10):1 https://www.nature.com/scitable/knowledge/library/sustainable-agriculture-23562787

[18] Mae-Wan Ho, Burcher, Ching, L. L., et al. Food Futures Now. Organic, Sustainable, Fossil fuel free. Institute of Science in Society Third World Network. P.O. Box 51885, London, NW2 9DH ISBN 0-9544923-4-X

an agro-ecosystem does not necessarily regain its initial form and function after the occurrence of a disturbance or shock. However, it may always be able to adjust itself and take a new form in the face of changing conditions, with the right parameters. Diversity strengthens adaptability - the more variety that exists within a food system, whether in terms of types of crops or cultural knowledge, the more the system is able to adapt to change

According to Brodt et al. (2011), scientific knowledge on sustainable agriculture, in relation to environmental, social, and economic terms, is continuously evolving when taking into account contemporary issues, perspectives, and values. Thus, there are many stakeholders who have a stake in contributing towards sustainable agriculture.

Agro-ecosystems can scarcely be sustainable in the long run without knowledge creation and skilled labour with the right competencies. Sustainability requires a diverse and adaptive knowledge-base, taking into account both formal, experimental science and farmers' own on-the-ground local knowledge. Social institutions that promote education of both farmers and scientists, encourage innovation, and promote farmer-researcher partnerships can increase agricultural productivity as well as long-term sustainability. Only by creating policies that integrate social, environmental, and economic interests can societies promote more sustainable agricultural systems.

Situational analysis

The Republic of Mauritius is an island country of 2,040 km^2 with 111,000 ha of agricultural land[19]. The two main islands are Mauritius and Rodrigues. The agricultural sector contributes 3.6% to GDP in 2016[20] (Statistics Mauritius 2017). While its share has declined consistently over the years, it currently employs 7.3% of the labour force.

Table 4.1: Basic statistics agricultural sector

	2012	2013	2014	2015	2016
Value added agriculture at basic prices	10494	12570	12778	12928	13706
Share of agriculture in gross value added at basic prices	3.5	3.8	3.7	3.5	3.6
Share of sugar cane in agriculture	35.2	28.2	24.7	24.3	23.1
Employment in agriculture (000)	43.2	44.2	44.9	41.5	41.3
Share of agriculture in total employment (	8.1	8.0	7.4	7.3	7.3
Gross formation fixed capital in agriculture	2129	5048	2854	1941	1828
Share of investment in agriculture in total GFCF	2.7	6.5	3.9	2.7	2.4
Annual growth rate of agriculture	-0.2	+0.5	+3.7	0.3	3.7
Annual growth rate of sugar cane	-7.3	-2.2	-3.5	-3.8	5.5

Source: Digest of Agricultural Statistics, various issues

Sugar cane represents some 90 percent of the cultivated area. In view of the importance of the sugar industry, the agriculture in Mauritius has often been referred to as the Sugar Sector and the Non-Sugar Sector, the latter being represented by fisheries, livestock, horticulture, and forestry. The sugar sector faced the hard reality of the EU sugar reforms, with the consequence

[19] FAO (2014) Country Programming Framework for Mauritius. http://www.fao.org/3/a-bp618e.pdf. Accessed on 3rd April 2018.

[20] Statistics Mauritius 2017 Digest of Agricultural Statistics.

of a reduction in the price obtained for exports to the European Union (EU). The sector is however striving to increase its competitiveness to ensure its viability and sustainability. Several measures and schemes are being implemented, with accompanying support from the European Union, to sustain the sector. The Government is emphasising a shift towards an agro-industrial landscape through investments in technology-based production and high-value activities[21]. According to the Board of Investment, there are several key business activities which would shape the future of the agricultural sector such as agricultural biotechnology, food processing, dairy, bio-farming and technology-based farming.

Table 4.2. Area harvested (hectares)

	2012	2013	2014	2015	2016
Sugar cane	54140	53464	50694	52387	51476
Tea (green leaves)	669	672	672	574	622
Food crops	8124	8189	8459	8077	7766

Source: Digest of Agricultural Statistics, various issues

The review of key policies and projects show that the Government is currently emphasising the gradual shift to bio-farming with a target of achieving 50% of vegetables and fruits produced as per bio-norms by year 2020. In this respect, competencies for green agriculture in Mauritius relate to the promotion of bio-food, bio-farming practices, the establishment of bio-farming zones, smart agricultural practices, the introduction and implementation of bio production protocols, bio-farming certification, bio-farming promotion scheme and the Mauritian standard for good agriculture (MauriGap). The MauriGap is currently being implemented as 'basic requirements' while the intermediate requirements level is in the process of being published. The advance requirement level would 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. The Mauritius Agricultural Certification Body under the aegis of MAIFS is a certification body set up in June 2016 for the certification of agricultural systems (Gooria 2017[22]). It provides third party certification services for sustainable agricultural production practices. MACB perform audits on sustainable agricultural production systems. It provides assurance that agricultural commodities are produced, packed, handled and stored according to specific agricultural standards.

Competencies for green agricultural business

Greening the agricultural sector would lead to both opportunities and challenges for farmers and entrepreneurs in the agro-industry. Farmers consequently are expected to involve in life-long learning given that the concept of sustainable agriculture is dynamic in nature and many new practices would make their way to the systems specially to adapt to new environmental conditions such as climate change. Business operators are expected to have the competencies to exploit opportunities that may offer a green agricultural sector. In the following sub-section,

[21] Board of Investment 2016. http://www.investmauritius.com/media/398286/Agro_dec16.pdf. Accessed on 20th January 2018.

[22] Gooria, C.(2017) Mauritius Agricultural Certification Body. Ministry of Agro Industry and Food Security. http://environment.govmu.org/English/Documents/switch%20africa%20green%20project/day2/MauriGAP%20Certfication%20and%20Application.pdf

the competency needs are documented following the responses of key informants who are involved with green agricultural business. The learning needs were also endorsed in the national stakeholder's workshop. The specific desired competencies that would be required include the following.

Transformational competencies

The most important transformational competencies which have been highlighted during the interviews are related to an in-depth knowledge of the greening processes in the agricultural sector. The concepts of smart climate agriculture, bio-farming, etc., must be properly understood by private operators. Such transformational competencies are most needed, according to respondents, at the agenda-setting level. Participants in the survey mention there is no platform to share best practices and to understand critical success factors.

Another type of transformational competencies which has been strongly advocated by business operators is the analysis of market opportunities of greening. Green marketing is a concept which is popular but many managers in the agricultural sectors are not well-versed of its different facets. In order to seize the opportunities from greening, managers should be able to analyse market trends and design a green market strategy accordingly. The responses reveal that business managers should be able to understand the gain of going green. At transformational level, green market analysis assists in bringing a paradigm shift within the enterprises. Such transformational competencies are emphasised at the organisational and operational level.

Management competencies

While bio-farming and green agro-industry would further require agro-engineers and food technologists, green management competencies would need to accompany their technical abilities. Waste minimisation, energy efficiency (energy auditing), green supply chain management, among others, are examples of management competencies. The survey of key informants reveals that managers should have the ability to manage green actions within the enterprises, to implement and monitor the same. Management competencies are required for organisational and operational level workers.

Participatory competencies

Again the survey shows that business operators need the ability to develop important networking skills in the green supply chain, including financial institutions. Respondents stress on the question, 'How to involve the community and civil society in their greening strategy?' Competency development must be geared towards bringing a holistic approach to greening at the level of enterprises. This type of competencies would be most needed at the organisational level in an enterprise.

Technical competencies

A range of green competencies would make their way in relation to a sustainable agricultural sector, especially at the operational level of an enterprise. Soil management, agronomic measures, appropriate mix of fertilisers with respect to crop species, and other practices to keep soil health are examples. Competencies would include the following (i) enhance agro ecological resilience such as integrated seed systems, soil and water management, conservation agriculture, etc.; (ii) pest management in view of new environmental conditions (iii) crop

diversity, (iv) nutrient management, (v) soil conservation, and (vi) agroforestry Skills related to green certification. As the concept of green certification is likely to make its way to the supply chain, farmers and operators require competencies in keeping records accurately and regularly such as invoices to certification paperwork, warranties, labour contracts.

Ministries and public sector departments

The survey and stakeholders' workshop provided essential information in relation to the weaknesses facing public officials towards the greening of the agricultural sector in all the four aspects of competencies at various levels.

Transformational competencies

The interviews and survey revealed that one key weakness which is witnessed in the public sector. While the notion of sustainable agriculture may be familiar, an in-depth comprehension so that projects can be conceptualised and implemented, does not exist at all level of the decision-making process. An urgent need of transformational competencies is being felt which relates to the conceptualisation of green agriculture projects within the complexity of socio-economic and environmental setting in Mauritius. The interviews held with public officials in the agricultural departments outlined the following components of sustainable agriculture where capacity building for officers is required in the immediate future (1 to 5 years): agro-ecology, organic farming, integrated pest and disease management, climate change resilience and adaptation, organic processing, and agro forestry(a summary is presented in the next figure).

Participants during the stakeholders' workshop pointed out that while the above-mentioned fields were currently being emphasised in the agricultural landscape for Mauritius, there was an urgent prerequisite for decision makers, at the **agenda setting level,** to fully understand these concepts and associated projects so that timely decision can be taken with the proper considerations of economic, environmental and social factors. At the agenda setting, many projects and policies are delayed because of their complexities or the complex interaction between economy, social and environment dimensions. At **the organisational level**, public officers are expected to be able to convert the abovementioned priorities into sustainable projects, schemes and green economy actions, with a clear indication of the outcome after being implemented. At the level of various ministries and departments, there is a prerequisite that officers are sensitised on aspects relating to sustainable agriculture. It is observed that public officers in some departments do not have the opportunities to keep pace with recent development in the field of sustainable agriculture.

Transformational competency development in the agricultural sector for public and private sector

Agro-ecology

- The science of sustainable agriculture
- Sustainability of agricultural systems balanced in all spheres.
- Complex interection between the socio-economic and the ecological or environmental aspects

Organic farming: promote the use of crop cultivation which is sustainable

- promote the use of crop cultivation practices which are sustainable
- practices which enhance soil fertility and biological diversity
- prohibiting synthetic pesticides, antibiotics, synthetic fertilizers, genetically modified organisms, and growth hormones

Integrated pest & disease management

- The careful consideration of all available pest control techniques

Climate change resilience and adaptation

- Skills in climate resilient adaptation practices

Organic processing

- Marketing and Branding
- conceptualisation of projects
- green supply chain management

Sustainable and Integrated Water Management Systems

- Conceptualisation, implementation and moniroting of projects

Integrated Plant Nutrient System

- Eembraces soil, nutrient, water, crop, and vegetation management practices, tailored to a particular cropping and farming system, undertaken with the aim of improving and sustaining soil fertility and land productivity and reducing environmental degradation[1]

Climate Smart Agriculture

- Climate-smart agriculture (CSA) is an approach that helps to guide actions needed to transform and reorient agricultural systems to effectively support development and ensure food security in a changing climate. CSA aims to tackle three main objectives: sustainably increasing agricultural productivity and incomes; adapting and building resilience to climate change; and reducing and/or removing greenhouse gas emissions, where possible.

[1]FAO at http://www.fao.org/agriculture/crops/thematic-sitemap/theme/spi/scpi-home/managing-ecosystems/integrated-plant-nutrient-management/ipnm-what/en/
FAO http://www.fao.org/climate-smart-agriculture/en/

Source: Interviews with key informants

Participatory competencies

At **operational level**, respondents from the Ministries and public sector departments clearly pointed out that the transition to the green agricultural base for Mauritius would involve many stakeholders in Mauritius, including the various Ministries, farmers and business associations, and private operators. Stakeholders' involvement in the design of green policies and programmes is essential as well. It appears that the mechanisms to consider the views of stakeholders – private operators, farmers, and employees- are very limited. The use of survey questionnaire, interviews, and ICT-based technologies to involve stakeholders are not well-established in the agricultural sector.

Management competencies

Management competencies necessitate a management structure to facilitate the development of green agriculture policies and projects and involve the ability of a mid-level manager/supervisor to manage agricultural projects. Many green economy actions are decided without a careful analysis of the resources which are required, the costs that would be involved and the benefits which would be observed in the short- to long-term horizon. Bottlenecks at the implementation arise since many of the milestone to successfully achieve the project are not given proper attention. Officers at both the organisational and operational level require improvement in such form of competencies. The lack of coordination between departments within Ministries and across Ministries are also creating strong impediment to implement green economy action in the public sector.

Technical competencies

One of the main management skills which was highlighted by respondents during the interviews and in the workshop is the ability of public officials to set targets, monitor progress and assess impact in a measurable manner of green agricultural policies. The interviews reveal that there is an urgent need on technical competency development for public officers to assess the impacts (social, economic, environmental) of government policies, programmes and projects. There are many different tools that exist which relate to impact assessment but these tools have not been exploited at the level of Ministries. An urgent need is to develop these technical competencies to employees at the operational level in relation to green projects in agriculture. Tools such as cost and benefit analysis, monetizing environmental services, life-cycle assessment, environmental accounting, economy-wide impacts (input/output analysis, CGE modelling) are priorities as revealed through the discussion.

It is also observed that officers at organisational level would require to understand complex reports on impact assessment. For example, quantifying and monetizing intangible benefits is gaining increasing importance for green economy actions.

At the agenda-setting level, decision-makers are more likely to attract attention of a green project if a proper cost and benefit analysis has been undertaken. Officers at the operational and organisational level are expected to be fully acquainted with different types of impact modelling approaches and using communication skills, they are expected to translate technical reports into policy documents for a wider audience.

Sustainable agriculture and competences in Rodrigues

The desired competencies outlined in the section 4.1 are also relevant for Rodrigues. However, it is also recommended that a tailor-made approach be used to train officials in the Commission of Agricultural which are mostly suited for agricultural development in Rodrigues. As such, technical competencies which are very relevant to Rodrigues include sustainable agricultural practices in the context of Rodrigues, pre- and post-harvest management practice, improvement in sustainable water management (water harvesting, promoting irrigation), green supply chain management, and value addition and marketing. Moreover, given the size of the population in Rodrigues, a participatory approach is very essential, especially to involve the local farmers' community. Management competencies are also a prerequisite. These competencies are required at the agenda-setting, organisational level, and operational level.

COMPETENCIES FOR SUSTAINABLE TOURISM



4.2. Competencies for Sustainable Tourism

Sustainable tourism

The United Nations 70th General Assembly has designated the year 2017 as the 'International Year of Sustainable Tourism for Development' (United Nations 2016)[23] with the objective of promoting and raising awareness of the contribution of sustainable tourism to development in the context of the 2030 Agenda for Sustainable Development. Accordingly, the 2030 Agenda supports 17 Sustainable Development Goals (SDGs) and tourism is specifically featured in the Goals 8 (Decent Work and Economic Growth), 12 (Responsible Consumption and Production) and 14 (Life Below Water) of the SDGs.

The World Tourism Organisation defines sustainable tourism as "tourism that meets the needs of present tourists and host regions while protecting and enhancing opportunity for the future."[24] (UNEP/UNWTO 2005). According to the UNEP/UNWTO report in 2012, tourism in the green economy refers to tourism activities that can be maintained, or sustained, indefinitely in their social, economic, cultural and environmental context[25]. In fact, all forms of tourism may strive to be more sustainable. The UNEP/UNWTO (2005) report states that sustainable tourism should make optimal use of environmental resources that constitute a key element in tourism development, maintain essential ecological processes and help to conserve natural resources and biodiversity. It should respect the socio-cultural authenticity of host communities, conserve their built and living cultural heritage and traditional values, and contribute to inter-cultural understanding and tolerance. Finally, it must ensure viable, long-term economic operations, providing socio-economic benefits to all stakeholders that are fairly distributed, including stable employment and income-earning opportunities and social services to host communities, and contributing to poverty alleviation.

There is however a difference between sustainable tourism and eco-tourism. The term ecotourism refers to a segment within the tourism sector with a focus on environmental sustainability, while the sustainability principles should apply to all types of tourism activities, operations, establishments and projects, including conventional and alternative forms. It is a form of tourism involving visiting fragile, pristine, and relatively undisturbed natural areas, intended as a low-impact and often small scale alternative to standard commercial (mass) tourism. Its purpose may be to enhance awareness among travellers, provide funds for ecological conservation, contribute to economic development, empower local communities, or foster respect for different cultures and human rights. This type of green tourism can generate fund to support wild-life, biodiversity, natural parks, among others.

The greening of the tourism industry involves a reduction in energy and greenhouse gas (GHG) emissions and water consumption, waste management, preventing a loss of biological diversity, effective management of built and cultural heritage; and promoting governance. The tourism

[23] United Nations (2016) General Assembly. Resolution adopted by the General Assembly on 22 December 2015,70/193.
http://www.un.org/en/ga/search/view_doc.asp?symbol=A/RES/70/193&referer=/english/&Lang=E

[24] UNEP/UNWTO (2005) Making Tourism More Sustainable - A Guide for Policy Makers, UNEP and UNWTO, p.11-12. http://sdt.unwto.org/content/about-us-5.

[25] United Nations Environment Programme and World Tourism Organization (2012), Tourism in the Green Economy – Background Report, UNWTO, Madrid.

sector is involved in a wide of range of activities from visit attractions to participation in a wide range of activities Energy and GHG emissions in the tourism sector are observed in three sub-sectors: transport to and from the destination, accommodation, and tourism activities. Recently, emphasis is being laid on the sustainable supply chain whereby greening does not only occur in the industry and but also in its linkages to other industries and sectors.

Situational analysis

Mauritius is a holiday destination for beach-resort tourism with a wide range of natural and man-made attractions for tourists. It enjoys a sub-tropical climate with clear warm sea waters, attractive beaches, tropical fauna and flora complemented by a multi-ethnic and cultural population that is friendly and welcoming. Table 4.3 shows several basic indicators of tourism in Mauritius. The statistical definition of a tourist is 'a non-resident staying overnight but less than a year, and who has no employer-employee relationship with a resident'. Tourism earnings are compiled on the basis of monthly statements of Inward and Outward Remittances of Commercial Banks, including as from 2015 Money changers and Foreign Exchange dealers.

The basic indicators in the tourist sectors are provided in table 4.3. Tourist arrivals have increased significantly during the last couple of years representing a rise of 34.8% from 2012 to 2016. The value-added of the tourist sector stands at 7.7% of GDP in 2016, reflecting the diversified economic structure of Mauritius. Employment stands at 40800 in 2016, representing 7.2% of total employment.

Table 4.3. Basic indicators of the tourism industry in Mauritius

	2012	2013	2014	2015	2016
Tourist arrivals	945441	992503	1038334	1151252	1275227
Tourism nights	10043.6	10675.6	11266.8	12049.9	13117.9
Number of hotels	117	107	112	115	111
Tourism Earnings (RsMillion)	4378	40557	44304	50191	55867
Value added (RsMillion)	24644	22309	24495	27070	29846
Value added as % of GDP	8.0	6.8	7.0	7.5	7.7
Total employment	37000	38200	39000	39000	40800

Source: Digest of Travel and Tourism (Statistics Mauritius, various issues)

Greening the tourism and business development

Greening the tourism sector consequently offers many benefits and market opportunities for the tourism sector. Many operators from the survey, who have realised such facet of greening, have emphasised that a different set of competencies are needed to facilitate the transition.

Transformational competencies

The responses from the survey reveal that there is a need for transformational competencies in relation to sustainable tourism and eco-tourism. From the agenda setting, to organisational and operational level, executive officers, managers and administrators in the tourism sector should be aware of the wide arrays of measures which can be implemented to green the tourism sector. The competencies should allow them to identify priorities and design a road map for its implementation.

It is also observed from the interviews that the transformational competencies to develop eco-tourism are very limited. Business strategies on eco-tourism are rather ad-hoc. There is a lack of understanding of the various parameters which can lead to an effective eco-tourism business.

One dimension in the tourism sector which has not been fully exploited in Mauritius is heritage and cultural tourism. Accordingly, participants in the stakeholders' workshop pointed out that there were many sites in Mauritius which have a strong link to cultural heritage such as the two UNESCO world heritage sites: Aapravasi Ghat and Le Morne. There are a number of buildings in Mauritius, as well, especially in Port-Louis which have a historical connection to the French period of colonization and can be used to encourage cultural heritage tourism. Transformational competencies are required, especially, at the level of agenda setting in enterprises to allow a paradigm shift towards green economy thinking.

Another field where transformational competencies are required is sustainable value chain development. The suggestion for competency development in this field relates to a project entitled, 'Transforming tourism value chains for sustainable development', which emphasises the reduction of GHG emissions and improvement of resource efficiency in key tourism sector value chains with high resource use. Transforming the sector to low carbon, resource efficient operations, requires an increase in sustainable consumption and production (SCP) practices by businesses and tourists through more coherent actions. Managing the value chain eventually brings a new philosophy in driving a green tourism sector which takes into account the supply chain, such as energy, food and beverage, among others.

Management competencies

Sustainable tourism, ecotourism, cultural heritage and sustainable value chain development would all require a strong coordination between the department and functional areas within the tourism enterprises. Management competencies in the above mentioned fields at the organisational level has been identified by stakeholders for Mauritius as the basis for competency development.

Demand for greening competencies is likely to be observed in relation to main tourism functional areas such as tourist product development, sales and marketing, office administration and venue maintenance, tour operations and guiding, attraction and theme parks and supervision and management[26]. In each of the functional areas, a different set of competencies is required. Participants in the workshop reflect on the need of learning needs to green the functional areas and recommend competency development for the current labour force employed in the tourism sector.

In an era where the tourism sector is moving towards greening practices, there is also a need for competency development for human resource managers to effectively align the greening practices of recruitment, selection, training and performance evaluation with environmental protection practices of the hotels. In fact, there is a need to understand and predict employee's green involvement and green competencies. This would enable effective integration of green

[26] The core tourism functional areas refer to the ILO report, entitled, 'Regional Model Competency Standard: Tourism Industry, published in 2006. http://www.ilo.org/wcmsp5/groups/public/---asia/---ro-bangkok/documents /publication/ wcms_bk_pb_233_en.pdf.

issues with human resource management practices and to achieve effective Green Human Resource Management.

Participatory competencies

Participants reflected on the need for business operators to be able to engage effectively with the community to construct sustainable projects in the tourism sector. Operators in the tourism sector is increasingly engaging with stakeholders for sustainable projects. Stakeholder engagement is the process in which the enterprise maintains constructive and sustainable relationships with stakeholders. Stakeholders include governments, civil societies, employees, suppliers, and others who have an interest in the project.

Technical competencies

The survey reveals that there is a need for technical competencies in the field of resource and energy efficient practices, including integrated waste management. Operational managers are expected to be fully aware of the different types of technologies and practices which may be adopted. The technical aspects, their implementation processes and monitoring systems are essential competencies which are highly needed in the tourism sector.

Responses from the data collection methods also emphasised that the Mauritian Standard for Sustainable Tourism (MS 165) would require a new set of competencies for administrators at organisational and operational level. Such competencies would cover many subsectors which are linked to the tourism sectors since the scope of the standard is applicable to the accommodation sector (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 as well as others (enhanced corporate image, competitive advantage, increased business efficiency).

Interviews from private operators reveal that a strong need is being felt on the need for managers to assess the economic impact of greening strategies on the performance of business mainly in relation to competitive edge, consumer satisfaction and employee's motivation of the business. Training on tools and methods in order to justify green strategies at enterprise level would highly enhance the transformational competencies to drive green industry. The need for such competencies arises at the operational level of the enterprise.

Again the survey reveals that operators in the tourism sector are expected to mount projects with clear benefits and cost structure so as to benefits from green schemes such as green loans. Such projects refer to a different format of application. Technical competencies are therefore needed at the level of organisational and operational level.

The tourism sector is prone to the effect of climate change, especially with extreme weather events and environmental degradation in the coastal regions. Adaptation is essential for tourism sector. However, it appears that such consideration is not taken into account by the tourism sector at present in Mauritius. Technical competencies in this field in needed at all the three level: agenda setting, organisational and operational. One opportunity according to participants which has not been exploited in Mauritius is public private partnership (PPP in coastal adaptation projects between tourist operators and the Government.

Competency Development in Ministries/Departments

Transformational competencies

Respondents from the survey reveal that there is an urgent need for transformational competencies on sustainable tourism and to conceptualise sustainable tourism projects at all levels: agenda-setting, organisational and operational level. The same weaknesses are revealed in the field of ecotourism. Key informants, interviews and participants in workshops have identified transformational competencies in eco-tourism for Mauritius, from the agenda setting level, organisational and operational level, as a priority. While the concept of eco-tourism is becoming popular, there is no framework, guidelines, parameters which would define eco-tourism. Still public officers are expected to conceptualise, encourage, and implement eco-tourism over the island. From optional level, organisational to agenda setting level, competencies on eco-tourism should be given priority by training institutions.

There is increasingly recognition that sustainable tourism projects would be more successfully implemented with the involvement of both public and private sectors. Public private partnership offers a range of benefits where many facilities and infrastructures are government-owned and investments come from the private operators. Key informant interviews reveal that public officials should be trained to conceptualise PPP in the tourism sector.

Management competencies

Communication skills have been outlined to be a major issue among the key informants and participants in workshop at the organisational level. Formal and informal types of communication, across and within departments, and towards the community remain a weakness of the current training systems. According to the responses, management competencies in this field would highly promote the greening of tourism sector.

At the organisational level, participants also recommend an improvement on project management skills of officers at the organisational and operational level.

One field where competency development has been unanimous is related to legislations. Officers at both the organisational and operational level mentioned that there were several legal frameworks for tourism operations but the competencies for interpretation were particularly missing. With the introduction of sustainable tourism and eco-tourism, there may be additional clauses which would be added to existing laws. Competency development is likely to be highly essential. Participants in the stakeholders' workshop pointed out that the lack of such competencies is seriously impeding many projects in the tourism sector.

Participatory competencies

Respondents from the survey emphasised improvement of participatory competencies at the organisational level in order to encourage a holistic approach to sustainable tourism. Public officers are expected to involve stakeholders in tourism planning. Training needs to involve stakeholders have been proposed especially on the different tools and mechanisms which can be used to tap the views and opinions. Such competency development is also relevant at the agenda-setting level.

Technical competencies

Technical competencies to understand, design and evaluate sustainable tourism projects at all levels, agenda-setting, organisational, and operational level, have been mentioned a priority in the stakeholders' workshop. While there are many initiatives which are currently driving sustainable tourism projects in Mauritius, officials at operational level reveals a weak link to capacity building. The criteria, practices as well as the guidelines are not properly understood. There are currently several frameworks which are guiding the concept of sustainable tourism. The MSB standard, or the sustainable value chain project, as well as the green tourism paradigm, in one way or the other, are defining this concept in the Mauritian context. However, the technical competencies are very lacking. Public officials do not have any support for a systematic and continuous learning of these concepts.

At the organisational and operational level, there is a need of competencies to analyse the impact of programmes and policies on employment while technical competencies are required for assessing both eco-tourism and sustainable tourism at the operational level. Participants reveal that they are interested with impact assessment tools including the following:

- Assessment of green actions in the tourism sector;
- Economy-wide effects (the Input-Output model, Computable Equilibrium model or system analysis);
- Models which focuses on a partial impact assessment on green economy actions (at sectoral level);
- Socio-economic analysis and social impact assessment of green projects;
- Training on specific impacts assessment tool such as cost-benefits analysis, life cycle costing, economic assessment of sustainability projects, natural capital accounting; and
- Defining measurement and targets of green economy actions.

4.3. Competencies for Green Manufacturing

Resource efficiency, low carbon and climate change mitigation

'Low carbon future is the only one available and it is a very exciting growth story. Any attempt to follow high-carbon growth will eventually be self-destructive due to the very hostile environment it creates' Lord Nicholas Stern [27]

Technically, a green economy is based on low-carbon, resource-efficient and socially inclusive production and consumption patterns. Resource efficient productions involve producing more with less through a change in practices, technologies or techniques of production among others. In this respect, green economy actions and climate change policies have strong synergies. One of the synergies is observed with climate change mitigation through a reduction in fossil fuel energy, enhancing resource efficiency, and minimising and managing waste at enterprise, community and economy levels. Climate change is arguable to be the greatest challenge of our time. The impacts of climate change from rising temperatures to changes in precipitation,

[27] The Guardian 2016 '10 years on from the Stern report: a low-carbon future is the 'only one available'. https://www.theguardian.com/environment/2016/oct/27/10-years-on-from-the-stern-report-a-low-carbon-future-is-the-only-one-available, accessed date 20th April 2018

glacial melt and rising sea levels threaten the livelihoods of many people in the world. The need to mitigate global warming by reducing GHGs emissions has received much emphasis in recent years. However, climate change solutions require a balance model among growth, resource use and equity. This more balanced model is offered by the green economy. Green economy actions include resource efficient and cleaner patterns of production which reduce pollution, environmental degradation and ecological risk. Climate change initiatives are inevitably green.

Yet, an additional benefit of green economy actions and climate change mitigation is reflected in terms of business opportunity. Renewable energy sources, energy efficient processes, and integrated waste management systems offer a win-win situation when these actions minimise ecological risk and translate into business' gain. They eventually enhance the competitive edge of enterprises. Enterprises and production units in all sectors of the economy are likely to gain when they switch to a more resource efficient base and as such they cannot afford to ignore the benefits of switching to a Green Economy[28]. In fact, resource efficiency and clean energy is likely to bring an unprecedented competitive edge to enterprises. At national and aggregated level, it helps to decouple economic growth from GHGs.

The shift to a resource efficient industrial base is therefore a pre-requisite among green economic actions. From a perspective of resource efficiency, any enterprise can embrace the green paradigm and helps to mitigate climate change. However, in order for this to happen, there is a need for an appropriate framework from government to encourage investment in green processes as well as promote financing opportunities from financial institutions.

Situational analysis

The promotion of resource efficiency and the development of renewable energy sources create important synergies between climate change mitigation and green economy. Businesses in Mauritius are showing more interest in resource efficiency initiatives to reduce cost of production. The survey further reveals that a number of new competencies are likely to be demanded at the operational, organisational, agenda-setting level.

The landscape for the industrial sector offers the opportunities for green economy actions and therefore leads to challenges to get the right skills and competences. The Mauritian industrial sector is classified into micro enterprises, small enterprises, medium and large enterprises. The definitions are as follows[29]:

- Micro enterprises include all production units operating with one to five persons and generating a gross output (proxy for turnover) of not more than Rs 2 million.
- Small enterprises are those generating an annual gross output of not more than Rs 10 million except those classified as micro enterprises.
- Medium enterprises are those generating a gross output of more than Rs 10 million but not more than Rs 50 million.

[28] UNEP, 2012, The Business Case for the Green Economy. Sustainable Return on Investment.http://www.unep.fr/shared/publications/pdf/DTIx1553xPA-BusinessCaseforGreenEconomy.pdf accessed date 18th April 2018.

[29] http://statsmauritius.govmu.org/English/StatsbySubj/Documents/SME/SMEs_2007-2015.pdf

In 2013, the number of SMEs (enterprises with annual gross output of not more than Rs 50 million) operating in all sectors of the economy in the Islands of Mauritius and Rodrigues was estimated at 172,200 of which 'micro' enterprises constituted 81%, 'small' enterprises represented 18% and 'medium' ones 1%. Around 60% of SMEs were mainly engaged in service activities, led by 'Wholesale and retail trade, repair of motor vehicles and motorcycles', 'Transportation and storage', 'Accommodation and food service activities' and 'Other service activities'. Other important sectors for SMEs were: 'Agriculture, forestry and fishing', 'Manufacturing' and 'Construction.

Table 4.4. Characteristics of SMEs in Mauritius 2007-2013

Characteristics	2007	2013
Employment in SMEs	229700	264900
Total employment	505400	552000
Share of SMEs in total employment %	46	48
Value added of SMEs (Rs million)	72647	114094

Source: Digest of SMEs, Statistics Mauritius

The characteristics of large establishment are shown in Table 4.5

Table 4.5. Characteristics of large establishment in Mauritius

	2012	2013	2014	2015	2016
Share of value added of the industrial sector in the economy	17.6	17.8	17.6	17.2	16.7
Real annual growth rate of the industrial sector (%)	+2.0	+4.1	+2.0	+0.4	+0.8
Number of large establishments	692	675	657	647	630
Employment	79127	79486	79565	78363	76472

Source: Digest of Industrial Statistics, 2017

Competencies for green business development

Transformational competencies

Sustainable innovation has been emphasised as the main field for transformational competency development in Mauritius from the stakeholders' workshop. Sustainable or green innovation can be defined as an enterprise's practices related to green products or processes and consists of technical improvements or new administrative practices that improve the environmental performance and the competitive advantage of the enterprise. It may reflect the new or modified products and processes, including technology, managerial, and organisational innovations, which help sustain the surrounding environment[30]. The competency for enterprises include the ability to generate new ideas in the design and management of entrepreneurial activities. Transformational competencies at the agenda setting level would include the ability of CEOs

[30] Chen, Y.-S. 2008. The driver of green innovation and green image—Green core competence. Journal of Business Ethics, 81, 531–543; Schiederig, T.; Tietze, F.; Herstatt, C. 2012. Green innovation in technology and innovation management—An exploratory literature review. R&D Management, 42, 180–192; Weng, H., Chen, J., and Chen, P. 2015. Effects of Green Innovation on Environmental and Corporate Performance: A Stakeholder Perspective. Sustainable, 7,4997-5026.

to integrated green paradigm in the business plans of their enterprises, defining green projects with a proper assessment of risk, benefits, and costs.

Management competencies

Respondents from the survey pointed out that businesses were expected to be better equipped in order to implement sustainability programmes within their enterprises. Interviews held with business leaders reveal that there is likely to be a demand for **sustainability skilled managers** who are well-versed with emerging environmental and social trends, and the risks and opportunities they create for business.

Technical competencies

Participants in the stakeholders' workshop concluded that managers at the operational and organisational level are expected to be equipped with tools to assess green projects. Competencies on environmental and social cost accounting, or tools which provide for scenario planning, back-casting, hot spot and material analyses, investment appraisal, environmental and social impact assessment, life-cycle management, among others, are important to drive technical competencies.

At the organisational level, technical competencies are required for the different green initiatives, which may be implemented. Examples include the green supply chain management, sustainable goods and services, engagement and reporting, sustainable innovation as well as green marketing.

One main competency need which has been outlined during the survey is the technical competencies of engineers and technicians with cross disciplinary understanding and skills in relation to ICT applications for energy and carbon management, smart electricity networks, automated energy monitoring, and energy and environmental management software applications.

The interviews reveal that competencies for energy auditing practices and implementing energy efficient measures are already creating a bottleneck in the business environment in Mauritius. The same is witnessed in the field of water and waste water treatment, waste management, and material recovery and recycling. Accordingly, there is likely to be an increase in the demand for competencies relating to the design, planning installation and use of modern technology in the operation and maintenance of water and waste water treatment facilities. Waste and energy audits are likely to form part of enterprise strategy to become more sustainable and hence, competencies for managers in these fields have to be developed.

Energy Management/Efficiency Services

- Residential, commercial, industrial energy auditor, field energy consultant, conservation representative, energy manager and analyst, compliance specialist.

Eco-Construction

- Air sealing technician, insulation installer, machinist, welder, carpenter, electrical system installer, plumber and pipe fitter, service technician, roofing and skylight installer, refrigeration engineer, lighting engineer, architect & designer, structural design engineer.

Waste processing equipment.

- Collections driver, hazardous materials removal specialist, materials regulation specialist, welding technology manager, hazardous waste project manager, recycling centre operator, operations maintenance worker, wastewater plant civil engineer, solid waste energy engineer

Renewable energy

Interviews with experts in the field of renewable energy provide further insights on the competencies which would be required for the promotion of renewable energy sources. Additional technical competencies would be required in emerging areas such as wind, solar, geothermal, biomass, tidal and wave energy, installation, servicing and maintenance of renewable energy infrastructure, expertise in distributed grid connection system incorporating small-scale renewable electricity supplies, among others. Engineering skills are also needed with emphasis on electrical engineering, with combination of green business opportunities and ICT systems skills. Wind turbines, solar energy, marine, and other renewable technologies would create an increasing demand for engineering and technical skills (combination of electrical, mechanical and electronic skill sets) to support their operation and maintenance. Moreover, the growth in electric vehicle charging points will give rise to demand for technician and skilled workers with a combination of electrical/electronic and mechanical skills.

There is a requirement for the upgrading of workers for the external and internal insulation of existing buildings and new build construction. Skilled workers require systems knowledge of efficient energy heating and lighting appliances to ensure their optimal usage by householders.

A list of competencies is listed in the next figure.

Renewables and ICT

- Software development engineer, market data analysis, IT controller, hardware developer, turbine monitoring and diagnostic engineer, smart grid engineer, power systems software engineer.

Marine (Wave and Tidal Energy)

- Electrical engineer, process engineer, marine energy engineer, site development manager, marine operations manager, structural engineer, mechanical design engineer, wave scientist.

Wind Energy

- Turbine machinist, turbine sheet metal worker, turbine electrical engineer, farm electrical systems designer, turbine mechanical engineer, wind generating installer, operations manager, field service technician, power plant project engineer, environmental engineer.

Solar Energy

- Fabrication technician, lab technician, hot water heater manufacturing technician, Photovoltaic (PV) fabrication and testing technician, energy system installer, solar and PV installation roofer, installation electrician, engineering technician, PV solar cell designer, energy engineer, electrical engineer, electrician, welder, metal fabricator.

Eco-Construction

- Air sealing technician, insulation installer, machinist, welder, carpenter, electrical system installer, plumber and pipe fitter, service technician, roofing and skylight installer, refrigeration engineer, lighting engineer, architect & designer, structural design engineer.

Managers and professional engineers and technicians comprise the main occupational groups within the sub-sector. The survey reveals a demand for high-level technical skills combined with **commercial awareness**, **marketing, finance, communications, and project management skills**. Engineers eventually would require management competencies to drive the renewable energy sector.

Competencies and learning needs in the public sector

Transformational competencies

Participants highlighted the need to develop transformational competencies in the public sector to encourage sustainable industry development and to develop sustainable concepts such as industrial ecology or eco-park within the development strategy of industries in Mauritius. Such competencies are mainly required at the agenda setting but they are relevant at the organisational and operational level as well.

Respondents revealed that transformational competencies are not only needed in departments who are specialised in energy management but also to policy-makers in other Ministries who design economic and social policies for Mauritius. In many cases, the concepts are not properly understood. Departments who are directly linked energy efficiency, such as the Energy Efficiency Management Office, would require advanced and specialised instruments which can be integrated in energy policies. An improvement in competencies related to translating energy-efficiency based concepts into projects with the right incentives is also being felt in the energy efficiency sector. This includes the ability to create a vision or a business model which integrates energy and resource efficiency. Recent measures on energy efficiency in Mauritius have created awareness on the way to proceed within these departments. Transformational competencies at the agenda-setting may be obtained through a sharing of successful case studies in the world through policy-based conferences/seminars

Technical competencies

The Energy Efficiency / Demand Side Management Master Plan and Action Plan pointed out the limited capacities in energy planning and the need to undertake integrated energy planning activity of the country that includes the interactions of the electricity, hydrocarbons, renewables and Energy Efficient subsectors and consumers. The survey also reveals that there is a need for capacity building in energy planning. Such technical competencies at all level –agenda setting, organisational and operational level- have been highlighted to be most important in the near future.

The interviews also reveal that modelling tools must be made available to officers at the operational level and therefore a need for technical competencies on energy modelling and planning. At the organisational level, the outcome of the energy analysis must be translated into concrete measures which can be communicated effectively to other stakeholders. At the highest hierarchy, i.e., agenda setting, the ability to translate these projects and programmes into a clear vision and policy document is missing.

Management competencies

Project management and administration is mentioned as a pre-requisite in the public sector. Respondents pointed out that skills and competencies in this field are usually obtained from the on-the-job training, or learning-by doing basis. However, while experiences contribute to learning, a systematic approach to manage projects is missing.

Communication skills are also required to remedy the lack of coordination between administration and technical officers in Ministries. The ability to translate technical information to decision makers and to create an element of trust between the public sector and relevant stakeholders for industrial development.

Participatory competencies

The Energy Master Plan emphasises the strong communication and co-operation with stakeholders on a regular basis in the design of energy efficient policies, especially with private sector consumers and financing organisations. This assists in identifying needs and gaps and to introduce appropriate measures accordingly. Participatory competences in this respect are weak. The provision of information is crucial to stimulate private sector interest in EE activities. A mechanism to create a general awareness is valuable but is not enough to implement EE measures. Deeper, more analytical, concrete and tailored information is necessary as the next stage to cater for the needs of each sector, subsector or group.

COMPETENCY DEVELOPMENT FOR CLIMATE CHANGE ADAPTATION



4.4. Competency Development for Climate Change Adaptation

With the impacts of climate change on the livelihood of the population, climate change adaptation is the ultimate objective of the government in many countries. Adaptation policies and programmes require a different set of competencies ranging from an understanding of the climate change impacts, to a systematic analysis of the options and the implementation and monitoring of adaptation projects. Hard adaptation measures require large financial resources and public officials are expected to be equipped with the necessary competences such as the preparation of tender documents of adaptation projects, evaluation, budgeting and the use of impact assessment tools including cost-benefit analysis of adaptation options.

Yet one of the aspects which is complements government adaptation programme is climate change adaptation by the business communities. Climate hazards are expected to have consequences for many businesses, especially those whose activities are much dependent on natural environment. Companies, large and small, are turning greater attention to the implications of climate change on their businesses and are more and more concerned in rising costs for inputs and raw materials due to climate change impacts, disruptions in their supply chains, threats to their labour force, and changing customer demand towards green products. There is increased awareness of the nature and potential impact of these climate change threats and the implications of community vulnerability for their own business activities.

When enterprises aim at introducing adaptation, a number of competencies become relevant. Managers are more likely to be concerned with the identification and implementing adaptation measures with regards to climate change impacts such as extreme weather events or preventing the degradation of ecosystem services. Businesses can therefore mitigate the impacts from unexpected events both locally and globally, thus ensuring a security of the supply of goods and services in the face of climate change, and creating a sustainable and resilient business.

Situational analysis

Mauritius is extremely vulnerable for the adverse impacts of climate change terms of temperature rise, decrease in rainfall amount, sea level rise, accentuated beach erosion and increase in frequency and intensity of extreme weather events such as flash floods. The changes in temperature and precipitation for the last 10 years are clearly visible.

According to the Third National Communication on Climate Change, the period 1951-2014 witnessed a significant warming trend of about 1.2°C[31]. The observed rate of temperature change is on average 0.020°C/yr and 0.023°C/yr for Mauritius for the period 1951-2014 and for the period 1961-2014 for Rodrigues respectively. Projections made on the basis of RCP 4.5 and RCP 8.5 (the business-as-usual scenario and the worst case scenario respectively) indicate an increase in temperature of up to 2 °C over both Mauritius and Rodrigues for the period 2051-2070.

Over the same period, the central plateau has witnessed a decrease in annual precipitation from a maximum of 4000 mm/year to 3800 mm/year with drying being more pronounced to the north and west of the island. Analysis of rainfall over the period 1951 -2014 showed a

[31] Republic of Mauritius (2016). Third National Communication: Report to the United Nations Framework Convention on Climate Change. Republic of Mauritius, Port Louis

decreasing trend in rainfall amount of about 8% for Mauritius. For Rodrigues which is a water scarce island, a downward trend has also been observed in the rainfall. However, projections for RCP 4.5 and RCP 8.5 scenarios, does not show significant variation with respect to the present rainfall pattern. The precipitation seasonal cycle for Mauritius shows an increase in monthly precipitation during the period from May to October.

Sea level rise is also observable in Mauritius. The rise is accelerating at an average rate of 5.6 mm/year in the last decade.

Mauritius is also situated in the tropical cyclone belt of the South Western Indian Ocean (SWIO) where rapid formations of high intensity tropical cyclones and super cyclones have been observed. It is therefore highly exposed to such extreme climatic phenomenon with serious risks to life, basic amenities and properties.

Sectors such as agriculture, coastal resources and tourism, water resources, marine and terrestrial biodiversity, fisheries, human health and infrastructure are highly vulnerable to climate change. Hence, the need of climate change adaptation is highly essential for a small island state like Mauritius.

Climate change adaptation and business resilience

Managers and administrators are expected to have the competencies to integrate adaptation measures in business plans, estimate their impacts and monitor their implementation. Climate change adaptations reflect a wide range of new competencies which would be required. Including the ability to understand the contribution of nature to production activities, the impacts of climate change and the role of adaptation. Moreover, environmental resources and ecosystem services are valuable and have to be used efficiently. Environmental accounting, natural capital accounting, impacts assessment of climate change are important competencies which would be demanded by business enterprises.

The survey reveals that a set of competencies at the organisational and operational level as follows:

Transformational competencies

(1) Ability to develop, implement, evaluation, and reporting on climate change adaptation within the company (the Integrated Risk Management Process, Resilience Teams responsible for ensuring security of supply, and Organisational Strategy and Planning functions).
(2) Ability to create branding of the enterprise with climate change concern.
(3) Ability to develop products and services that help vulnerable countries and communities to adapt to climate risks and impacts (for example, water-harvesting technologies).

Management competencies

(1) Ability to mitigate and better manage climate change risk such as assured continuity of operations.
(2) Ability to ensure delivery of coordinated, timely weather and climate information within the company.
(3) Ability to introduce new management practices to manage climate risks and impacts.
(4) Ability to work out adaptation programme for the enterprises, by identifying the costs, projects and assessing the benefits.

Participatory competencies

(1) Ability to engage with stakeholders to formulate communitywide programmes to enhance long-term resilience.

Technical competencies

(1) Ability to define and quantify weather, climate variability, and other long-term impacts of climate change the business.
(2) Ability to establish and incorporate cost-benefit analysis on climate change adaptation into decision making to support identification, control, and treatment of risk across the supply chain.
(3) Ability to access new financing streams.

Competencies for Climate Adaptation in the Public Sector

Transformational competencies

It is ultimately the responsibility of the public sector to meet the climate change adaptation needs of vulnerable communities. Many critical adaptation interventions would start with the government intervention. The survey reveals that there is a need to create greater awareness of climate change science, adaptation options among policy makers in Mauritius. Policy makers in the agriculture, fisheries, finance, planning, business development (including SMEs), etc,

should be trained on the impacts of climate change as well as the soft and hard measures that can be mainstreamed in the policy decision.

Participatory competencies

There is an important need to involve the business communities on climate change adaptation projects. Policymakers need competences to inspire companies to anticipate and adapt to climate change. At the same time, at the level of corporate responsibility, businesses must factor in community vulnerabilities into their analysis and decision-making processes. Thus, policymakers must have the ability to act as a catalyst and support business contributions to climate change adaptation for more resilient communities and societies.

Finally, climate change adaptation involve civil society, universities and research institutes, and other non-governmental actors to see companies as key partners and allies in helping vulnerable communities cope with climate change risks and impacts. At the organisational and operational level, officers must have the ability to conceptualise programmes to involve stakeholders in adaptation projects.

Management competencies

Interviews at the level of the Ministries reveal that project development is an area where competency development requires improvement. This includes the development of bankable project proposals, project implementation strategies, ability to work with measuring, reporting and verification systems, ability to conduct cost-benefit analyses for adaptation and mitigation measures and the use of multi-criteria process in mitigation. Management competencies are also needed on conducting research, data collection, information sharing and dissemination of results, coordination mechanisms and consultative processes.

Technical competencies

At the organisational and operational level, technical competencies to assess and implement response measures are required, including climate change risk assessments. At sectoral level, technical competencies to seek solutions to climate change impacts in the agricultural sector, fisheries and health sector have been emphasised by Ministries.

Climate change adaptation in Rodrigues

The competencies, which have been discussed in the previous section, are equally applicable to Rodrigues. However, Rodrigues has its own specificities as far as climate change is concerned which should be taken into account in competency development.

Technical competencies for climate change

Modelling, Risk and Vulnerability Assessment and Adaptation

- Downscaling and Vulnerability assessment and modelling
- Advanced IT skills for application of GIS
- Formulation of preparedness plan to better address natural catastrophes

GHG emissions and inventories

- Calculation of GHG emissions as footprint assessment
- GHG inventories using specialized tools and knowhow for assessing the carbon sink potential
- Calculation of emission from waste

Technologies

- Identification, assessment and promotion of adaptation and mitigation technologies including endogenous ones to accelerate adaptation and mitigation

Energy

- Training to personnel on the new equipment and Automatic Generation Control (AGC) software in Smart Grid System
- Household energy efficiency-institutional capacity
- Capacity building to energy auditors and development of skills of installer

Water resources - To improve forecasting, management, protection and quality of water resource

- Build national capacity on the use of a hydrological model
- Additional capacity building and equipment are required

Agriculture – To strengthen capacity to develop biological control techniques (sugarcane and non-sugarcane production) as part of the Integrated Pest Management (IPM) Strategy

- Increase capacity for pest and disease surveillance and early detection
- Strengthen c apacity to produce sugar cane variety diseases resistant

Climate change adaptation measures to improve marine and terrestrial biodiversity resilience

- Capacity building in biodiversity assessment, management and monitoring
- Additional support will be required for coral rehabilitation in terms of capacity building and appropriate techniques, research on climate change impacts on biodiversity and for the implementation of the National Biodiversity Strategy and Action Plan (NBSAP) 2015-2020.

Critical coastal infrastructure

- Additional support will be required for capacity building in coastal engineering field

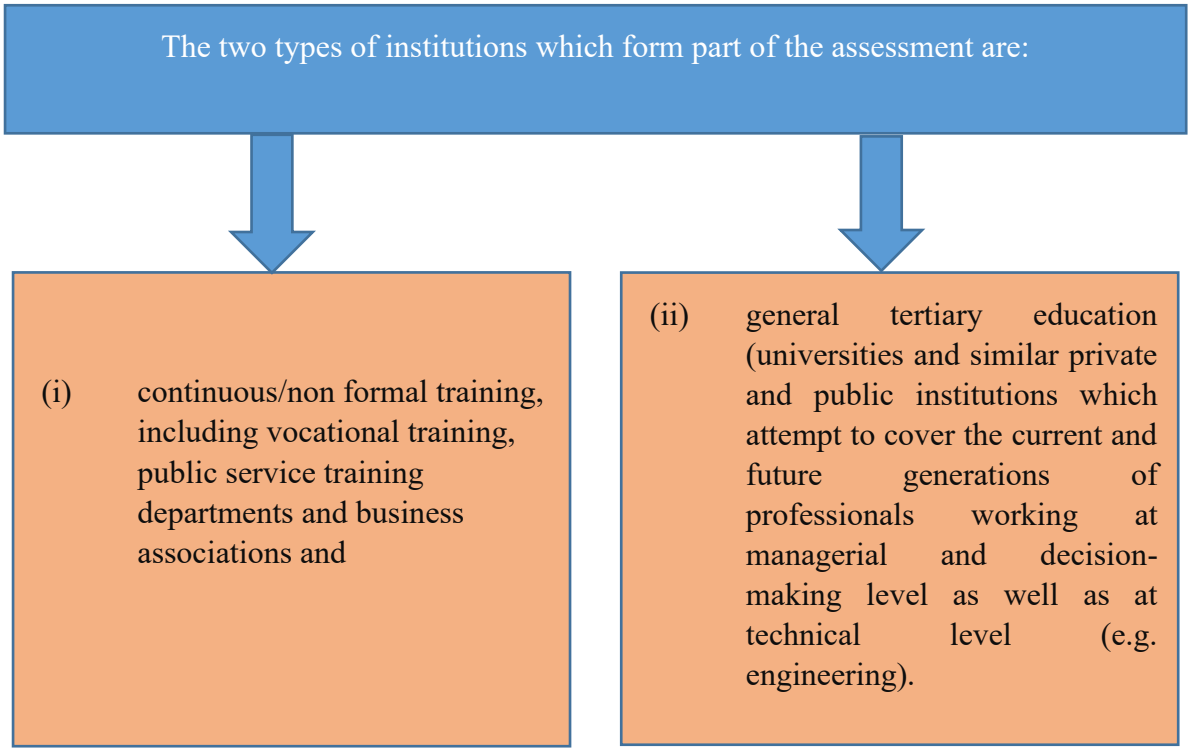
INSTITUTIONAL CAPACITIES TO PROVIDE LEARNING OPPORTUNITIES ON GREEN ECONOMY



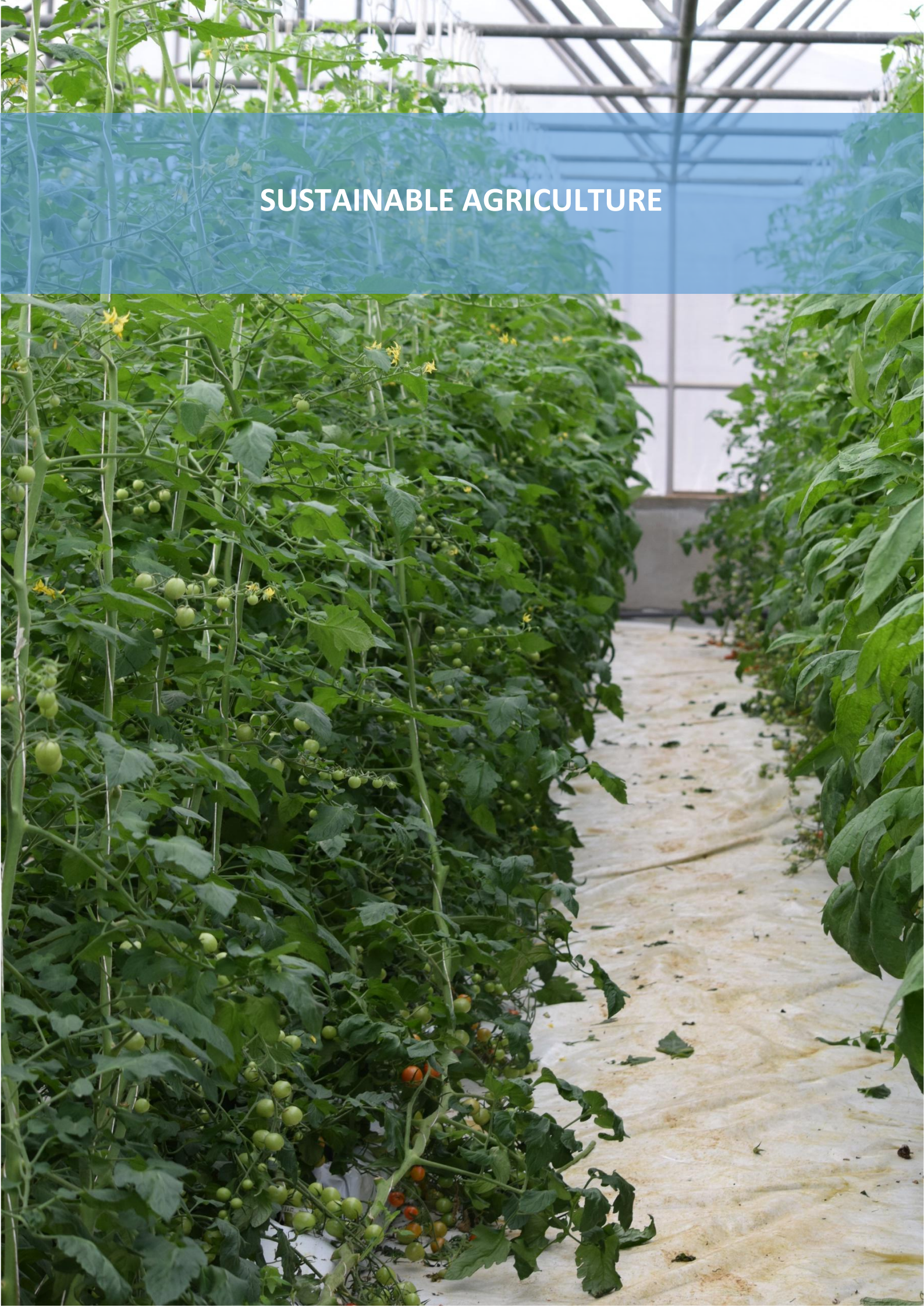
Chapter 5

5. Institutional Capacities to Provide Learning Opportunities on Green Economy

This section responds to the second component of the assessment, which is to review existing capacities in the Mauritius providing training and learning on green economy matters. The review targets institutions that are already engaged in or might play a role in green economy learning.



SUSTAINABLE AGRICULTURE



5.1. Sustainable agriculture

The two main institutions which are responsible and relevant for capacity building on sustainable agriculture are: the Food and Agricultural Research and Extension Institute (FAREI) and the Faculty of Agriculture at the University of Mauritius.

Faculty of Agriculture, University of Mauritius

The Faculty of Agriculture at the University of Mauritius, originally founded as the School of Agriculture in 1914, has played a critical role in training for both the public and private sectors in Mauritius as well as in the region for the development of agriculture and related fields. The standard and quality of the degrees are maintained to an internationally accepted level by a system of moderation by external examiners from the University of Reading, United Kingdom and elsewhere. Some of undergraduates and postgraduates programmes that are offered in this respect are:

- BSc (Hons) Agricultural Science and Technology (Minor: Animal Production and Health/Agribusiness Management)
- BSc (Hons) Sustainable Agriculture and Food Security
- BSc (Hons) Food Hygiene and Environmental Health
- MSc Climate Change and Sustainable Development
- MSc Food Safety and Food Innovation

(Sustainable issues are treated in the various modules within the above mentioned programmes)

The Faculty has also several high calibre researchers who have the ability and experience to develop the transformational competencies as well as technical competencies to the public sector officials and private enterprises. The interviews reveal that there are many completed and ongoing research projects which can be used to contextualise the concept of sustainable agro and food system in Mauritius.[32] The findings can assist to mainstream sustainable agriculture in main policy decision. The Faculty has the capacities to develop transformational, management as well as technical competencies to professionals on sustainable agriculture.

Food and Agriculture Research and Extension Institute (FAREI)

The Food and Agricultural Research and Extension Institute (FAREI) was created in 2014 as per the FAREI Act 2013 to take over the functions of the Food and Agricultural Research Council (FARC) and the Agricultural Research and Extension Unit (AREU). It operates under the aegis of the Ministry of Agro Industry and Food Security. 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. The objectives of the institute is to develop and promote novel technologies in the food and non-sugar agricultural sector within a sustainable framework; co-ordinate, promote, and harmonise priority research activities in the non-sugar agricultural, food production and forestry; promote and encourage agricultural and agri-business development through the setting up of agricultural youth clubs,

[32] Examples of several recent projects and reports which are relevant for capacity building include: Proceedings of Climate Smart Agriculture national Policy Dialogue, University of Mauritius. Facknath, S., Lalljee, B., Boodia, N. 2014. A Comprehensive Scoping And Assessment Study Of Climate Smart Agriculture Policies In Mauritius. Hardowar, S., Facknath, S., Boodia, N., Chhoonea, M., Ramhit, K. S. 201. A study of Climate Smart Agriculture Practices and Technologies Adopted by Small Farmers in response to Climate Change in Mauritius", Faculty of Agriculture, Research Project. University of Mauritius, Reduit.

agricultural women clubs and agricultural entrepreneur clubs; and promote dissemination and practical application of research results.

Training at FAREI is principally meant to enhance transfer of knowledge derived from research locally and from other research institutions and observation of current practices. The training is organised through different methods and a particular attention is given to formal courses covering specific disciplines.

A wide range of courses are provided on horticulture, livestock, agro-processing, and agri-business. Components on sustainable agriculture are provided through out the modules as well as through structured courses such as such as the 'Green Agricultural Practices (horticulture) and Foundation Sustainable Farming. FAREI remains one of the main institutions for technical competency development on sustainable agriculture geared toward farmers and business operators. The resource persons from the institution have significant knowledge and experience in practically all the concepts related to sustainable agriculture which can be used to develop transformational competencies as well. Moreover, FAREI has always been working with farmers and has established an effective network on training.

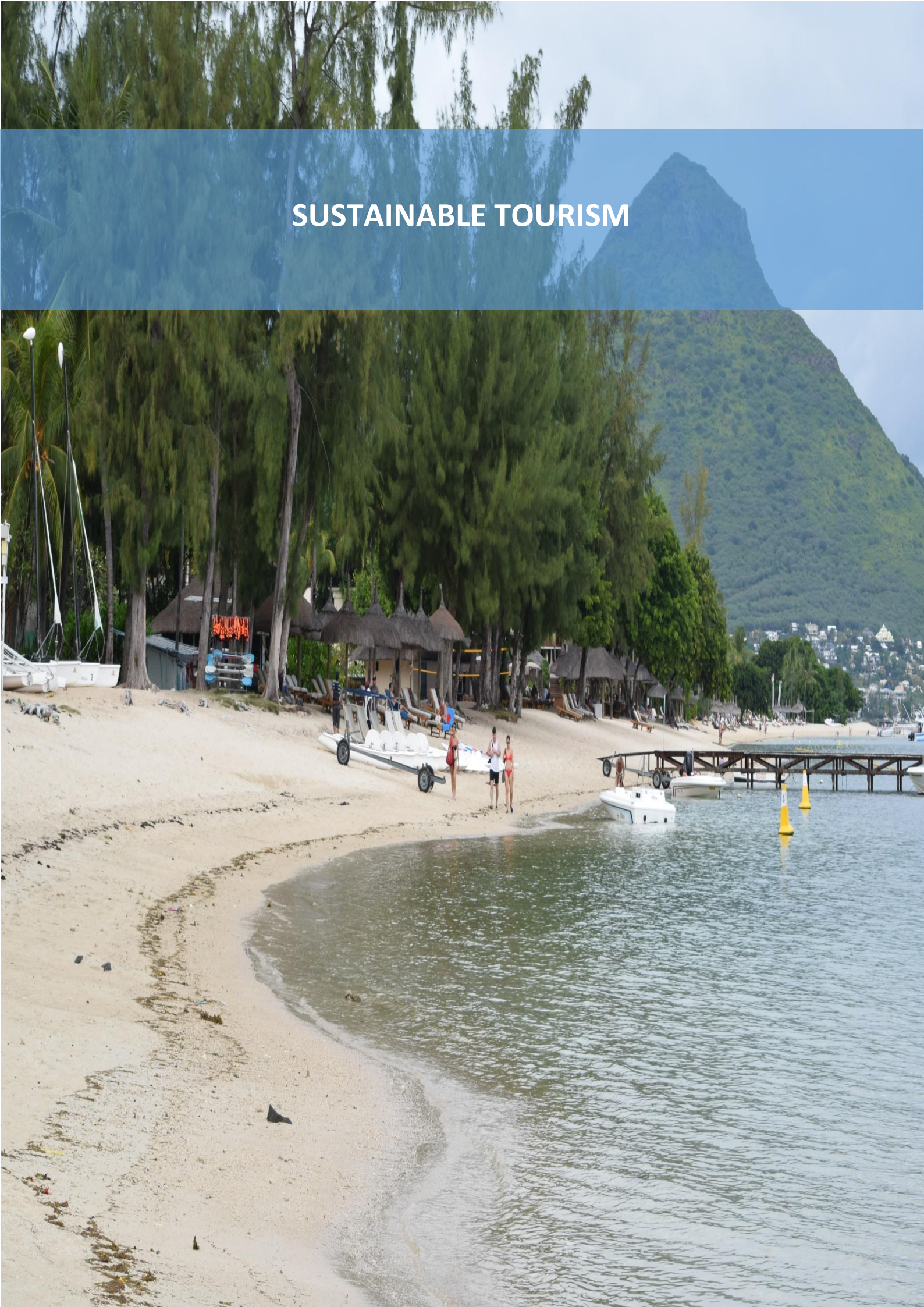
Mauritius Institute Training and Development (MITD) and other training initiatives

The Mauritius Institute Training and Development (MITD) also provides training on bio-farming and rain water harvesting. The MITD caters for technical competencies to workers in the enterprises. Training on bio-farming is being given to trainees following the National Certificate course in Agriculture while in the landscape maintenance course, MITD trainees learn techniques of rain water harvesting.

The Ministry of Agro Industry and Food Security is also involved in training on a project basis. Among the recent initiative was a five-day Training of Trainees module in Organic Crop Production which trained a total of 53 trainees under the programme 'Support for the development of organic farming and institutional capacity building in Mauritius'[33].

[33] Government Information System 2016. Organic Crop Production: Award of Certificates for Training of Trainers. http://www.govmu.org/English/News/Pages/Organic-Crop-Production-Award-of-Certificates-for-Training-of-Trainers--.aspx

SUSTAINABLE TOURISM



5.2. Sustainable Tourism

Training courses on the concept of eco-tourism and sustainable tourism are well offered in Mauritius. Main institutions include the Faculty of Law and Management and the International Centre for Sustainable Tourism and Hospitality of the University of Mauritius, and the School of Sustainable Development and Tourism at the University of Technology, Mauritius.

Faculty of Law and Management, University of Mauritius

The Faculty of Law and Management was created in 1992 and hosts the Department of Management. The latter offers a BSc (Hons) Tourism, Leisure and Recreation Management which has a strong component of sustainable tourism[34].

International Centre for Sustainable Tourism and Hospitality

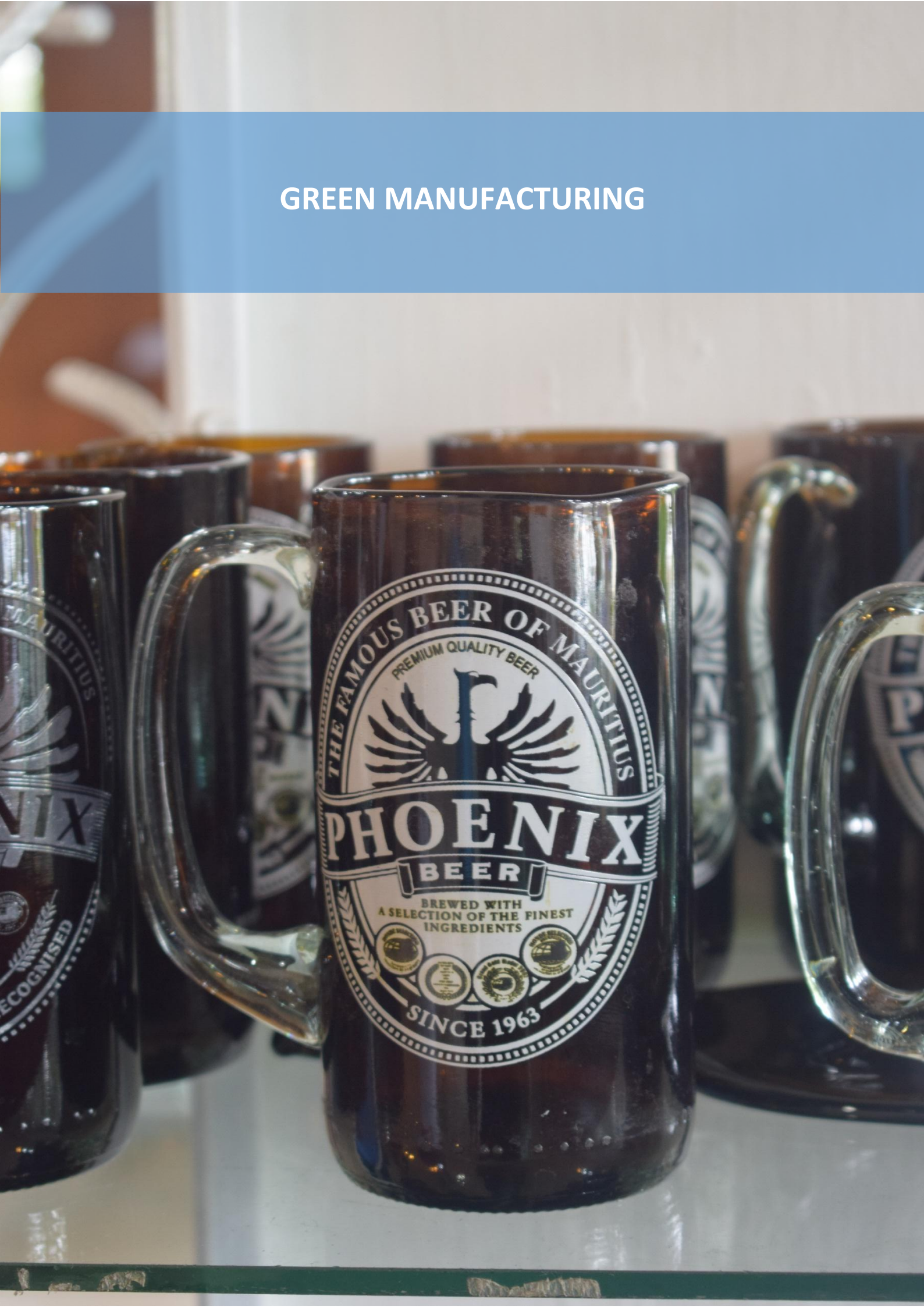
The International Centre for Sustainable Tourism and Hospitality of the University of Mauritius was set-up in 2015 to facilitate transfer of knowledge between the University and public and private sector stakeholders. The ICSTH acts as a think-tank, advising government and industry partners on tourism and hospitality policies that promote the sustainable development of tourism. ICSTH has well-established links with universities around the world and has a pool of leading scholars in the field of tourism and hospitality.

School of Sustainable Development and Tourism, University of Technology, Mauritius

The School of Sustainable Development and Tourism caters for very specific areas of the Mauritian economy such as Tourism, Sustainable Development and Environmental Sciences. The School aims at producing graduates to work in sustainable economic, social and environmental sectors of Mauritius. The School offers a BSc (Hons) Tourism and Hospitality which has modules in relation to sustainable tourism.

[34] Faculty of Law and Management, http://www.uom.ac.mu/flm/

GREEN MANUFACTURING



5.3. Green Manufacturing

At the tertiary level, it is observed that there are several institutions that provide training courses where the concept of sustainable development and greening is inculcated to participants.

University of Mauritius

The University of Mauritius has a long experience in the programmes that lead directly or indirectly to greening the industry. One of the programmes, the BSc (Hons) Sustainable Product Design from the Faculty of Engineering, is classic example of the knowledge and skills which are transferred to students on sustainable innovation The Faculty of Engineering also offers several programmes related to Engineering. Researchers are fully involved in energy and resource-based research which are strongly connected to competencies required in the business environment.

The Department of Economics and Statistics has over the years created several modules which are directly related to sustainable development and green business development. Modules such as Environmental Accounting and Natural Resource economics, Project Appraisal for Sustainable Development, Economics of Sustainability, among others, form part of the many different programmes across Faculties. At master level, the programme, entitled Master in Public Policy and Administration strongly advocate for sustainability analysis in natural resource management, including energy, water, etc. The Department has also contributed towards a Training Manual on Cost-Benefit Analysis for Climate Adaptation Project for the Ministries[35] and has over years trained many public officials on the impact assessment tool.

The Faculty of Law and Management offers a series of programmes on management, law and accounting, including the Master of Business Administration where sustainable related topics are taught to students.

University of Technology, Mauritius

The University of Technology, Mauritius has a dedicated School of Sustainable Development and Tourism as well as a School for Innovative Technologies and Engineering. There are courses which are geared towards sustainable manufacturing. For example:

- MSc Sustainability for Business, Society and Environment
- MSc Property and Resort Management
- BSc (Hons) Sustainable Environmental Planning and Management
- Diploma in Architectural Studies

Université des Mascareignes, Mauritius

The Université des Mascareignes, Mauritius has also specialised in a series of programmes on engineering which is an essential competency for sustainable innovation. The Faculty of Sustainable Development and Engineering provides a list of engineering course, some of which are listed below:

- BEng (Hons) in Civil Engineering
- Diploma in Electrical Engineering and Automation

[35] Sultan, R. and Sobhee, S. K. (2016) Training Manual for Cost Benefit Analysis for Climate Change Adaptation Project in Mauritius. Government of Mauritius

- Diploma in Civil Engineering (Rose-Hill Campus).
- Diploma in Electromechanical & Automation Engineering
- BSc (Hons)in Electromechanical Engineering.
- BSc (Hons) in Electrical Engineering and Automation
- BSc Maintenance, Diagnosis and Rehabilitation of Built Civil Engineering Heritage
- BSc (Hons) in Electrotechnics and Renewable Energy
- BSc (Hons) in Civil Engineering

Charles Telfair Institute

Charles Telfair Institute integrates sustainability issues in various modules at undergraduate and postgraduate programmes. For example, sustainable issues are embedded in programmes on Design, Interior Decoration, Entrepreneurship and Marketing (undergraduate level) and in MBA programmes which integrate a module on 'Global Sustainable Corporate Strategy'.

Mauritius Standard Bureau

The Mauritius Standard Bureau (MSB)[36] is a parastatal body operating under the aegis of the Ministry of Industry, Commerce and Consumer Protection. Established in 1975 with a mandate to develop national standards and provide conformity assessment services, it came a corporate body under the Mauritius Standards Bureau Act 1993. The Bureau operates five separate and distinct technical units: the Standards Development Unit for the elaboration of standards; the Engineering and the Chemical Unit for the testing of a wide range of products; the Quality Assurance and Training Unit for product and management systems certification and the organisation of training courses on Standardisation, Quality Assurance and related systems; and the Metrology Unit for the calibration of equipment in industry and for the custody of national measurement standards. The Business Development Unit and the Documentation and Information Centre provide support to the training component of the Bureau.

The Quality Assurance Unit of the MSB organises training courses for the public large. The following courses are offered at different interval over a year: training on quality Management System (ISO 9001) for implementers and Internal Auditor, courses on Internal Auditing Techniques, and Food Safety Management System.

Open University: Communication, management and other employability skills

The Open University also caters for a range of employability skills such 'Effective Communication', 'Internet and Social Media', 'Presentation Skills', 'Time and Priority Management', among others.

Mauritius Institute of Training and Development

The MITD has taken several initiatives for green skills development. Short training courses for technicians in the field of photovoltaic solar power technology are organised with a view to build 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 and 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 are used during the training session such as Grid-

[36] Mauritius Standards Bureau (2018) Corporate Profile at http://msb.intnet.mu/English/AboutUs/Pages/About-MSB.aspx. Accessed date 3rd May 2018.

tie type and a stand-alone type PV energy generation system to show case 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.

A module on environment protection has been included in 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 courses to courses. In training courses where a minimum knowledge of environmental sustainability is needed, the module provides participants with a competency level while in other training courses, the module treats the topic on sustainable development, green practices in more details. The curricula also incorporate competencies on safe handling and disposal of hazardous wastes 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.

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 covered the conversion of existing equipment using CFC and HCFC refrigerants by the eco-friendly refrigerants.

The MITD has organised 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 in case there is a sufficient number of candidates, it is offered on a regular basis.

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 continuously opened.

Chapter 6

6. Opportunities for Action to Strengthen Green Economy Learning

Based on the previous section on emerging green economy learning priorities, it is observed that the transition to a greener, low emission and climate-resilient economy would require an unprecedented level of awareness, knowledge and competencies in among public sector officials as well as executives and administrators in the private sector in Mauritius. Consequently, the gap between exiting and desired competencies provide opportunities for action, especially to education and training institutions to strengthen green economy learning.

A common pattern of competency gap is observed across the four areas which form part of the assessment. This section covers a synthesis of some commonalities that offer the opportunities for developing training courses across the four focus areas – sustainable agriculture, sustainable agriculture, green manufacturing and climate change adaptation.

It is important to emphasise that currently there is no systematic learning system for officials from Ministries and public sector departments to keep pace with current development in the field of green projects across the four focus areas. Officers from the Ministries and related departments have to conduct their own learning and research as and when the need arises. In many cases, recent development in this field greening and climate change is only communicated to them following ad-hoc workshops or the implementation of national or international projects.

Transformational competencies

The assessment concludes that while there is a general awareness on green economy issues among policy-makers, economic and social partners, it is not sufficient to allow a systematic shift towards a low carbon economy with low ecological risk. One main gap is observed at the level of transformational competencies in all the focus areas of the assessment. The deficiency is found in both the public and private sector. Concepts and processes which are related to sustainable agriculture, sustainable tourism, green enterprises as well as climate change adaptation are not properly understand from the agenda setting to organisational and operational level. Policy-makers are expected to be fully acquainted with green economy issues and climate change solutions which can be mainstreamed in economic development plans. The competency development at the transformational level would include a clear and an in depth understanding of the economic, social and environment implications of green economy actions, together with the associated challenges and opportunities that they offer.

A competency gap is also observed from officers at the organisational and operational in the public sector on green economy actions across the four focus areas, how they are expected to be implemented and their economic, social and environmental impacts. Transformational competencies are emphasised on bio-farming, green agricultural practices, climate smart agriculture, the conceptualisation green agricultural projects within the Mauritian context, frameworks for ecotourism development, sustainable innovation, and climate change impacts and solutions across economic sectors.

Opportunities therefore exist for the education and training institution to enhance transformational competencies of policy-makers and people from the agenda-setting to operational level on green economy and climate change thinking within the social, economy and ecological domain in order to mainstream them in policies, programmes and actions. Based on the review of institutional capacities for green economy, it is found that education and training institutions have significant capabilities to develop such training programmes.

Technical competencies

The gap between formal training and informal courses offered by Universities and Vocational training institutions does not cater for a systematic and continuous learning of public officials on sustainable agriculture, sustainable tourism, eco-tourism as well as green enterprises. Training is practically non-existent on greening at the level of Ministries. Officials learn these concepts when there are ad-hoc workshops or conferences, or they have to learn them by themselves.

At the technical level, a strong competency gap is being felt in relation to impact assessment tools of green economy actions across the four focus areas within the social, economic and environmental domain. It is highly recommended that the green learning strategy caters for the competencies of public officials to assess projects, measure their impacts in a quantitative manner, and monitor progress over time, among others. Public officials have a deficient competency on modelling tools of impacts assessment as well as response measures. In all the four areas forming part of the study, there a strong need to introduce a diverse set of modelling tools, train several lead persons or champions within departments, and to ensure the transfer of knowledge over time. Impact assessment tools at project level such as cost-benefit analysis, life cycle costing, life cycle assessment, carbon footprint, or economy-level such as input-output analysis, system analysis and computable general equilibrium are almost absence in policy analysis.

In the private sector, managers at different hierarchies are expected to be aware of the performance-based assessment tools for green initiatives and impact assessment tools of greening practices at enterprise level. At the same time, a wide range of technical competencies is expected across the four areas of focus such as energy auditors and implementers, waste audit and management, managing green supply chain, preparation of bankable green project proposal, sustainable value chain, greening the core functional areas, business's adaptation to climate change. Such technical competencies are not currently provided through a specialised programme in any institution in Mauritius.

Officers in the local authority department are relatively closer to the population and hence, they have a greater role to play in greening the economy. The survey reveals that municipalities and district councils dealing with Building and Land Use Permit have to advise and recommend the residents and business operators on the proper construction for building and land. The survey reveals that the officers from the operational to organisational level lack the technical skills and competencies on greening concepts and this reduces the effectiveness to promote green practices. There is a huge gap in knowledge as learning takes place on the site and on the basis of self-initiative.

Management competencies

Project management and coordination are yet another key set of competencies which are weak at the level of public sector institutions. While officers do have experience in managing projects, continuous learning does not exist. State-of-the-art management principles are not really inculcated to project leaders. In the field of greening and climate change actions, new set of management competencies are required and public officers, especially in local authorities, are relatively at a disadvantage from the start when it comes to implementation. The assessment reveals that education and training institutions, especially Universities, in Mauritius, have a pool of resource persons who are well-versed on these issues. However, the mechanism, and most importantly, the resources to develop training programmes for public officers are very limited. This is an important gap in the current learning system in Mauritius. Another critical management competency is related to communication and coordination. On the job learning is the main approach from which many officers are trained.

A scientific approach to communication especially on green issues is seen as a priority. Officers require the right communication skills to transfer the green guidelines to residents and business operators. In many cases, being unprepared, they face difficulties to explain the rationale for eco building, composting, renewable energy, etc.

Officers reveal that training in interpreting legislations as well as drafting of reports are important to execute their tasks.

Participatory competencies

Public institutions as well as private enterprises refer to a participatory approach when designing and implementing projects. The involvement of stakeholders, namely the civil society, social and economic partners and resource persons when framing green and climate related policies is an essential element to drive the green economy. Accordingly, there is a range of tools, which may be used to tap the views of stakeholders from formal surveys and focus group discussion to informal community-based discussion. A vacuum is observed in this area from the current learning needs and competency development system.

Chapter 7

7. Recommendations and Conclusion

The Green Economy Learning Assessment concludes that there is a strong gap in relation to the desired transformational competencies, which affects strategic, long-term thinking and an integrated approach to advancing green economy in all the four focus areas in Mauritius - sustainable agriculture, sustainable tourism, green manufacturing and climate change adaptation. This is observed in both the public sector and the private sector.

Taking into account responses from the survey, observations from key informants, and views of participants in the consultative workshops, the Assessment proposes to develop transformational learning and training initiatives on several key elements in the immediate future, namely**, bio-farming** and **green agricultural certification** as drivers in the area of sustainable agriculture, **sustainable innovation** to foster a green manufacturing sector, and **eco-tourism**, **sustainable value chain** and **cultural heritage** for sustainable tourism. Moreover, competency development is also emphasised at the technical level on **sustainable agrosystems**, **climate-resilient processes** (agricultural sector and tourism), and **public-private partnership** especially in relation to **climate change adaptation projects**.

The following key recommendations provide the basis to improve the competencies of officials in the public sector and operators in the private sector towards the transition of a green economy.

1. The first recommendation is to create a common understanding of the green economy and its related concepts in the areas such as agriculture, tourism, manufacturing, and climate change adaptation in Mauritius. **As an immediate action, there is thus a need for more foundational green economy trainings for public officials and business operators.**

2. Executive officers and managers at the agenda-setting, organisational and operational level emphasised that they should have an in-depth knowledge on the concepts and related processes which can be implemented at enterprise level. The learning and knowledge should allow them to bring a paradigm shift towards green economy thinking in their respective decision-making units. **Thus, a recommendation is directed towards education and training institutions to design training programmes on transformational competencies, i.e. strategic systemic thinking, in all the four focus areas.** On the job trainings can be envisaged for civil servants and professionals as an immediate action. As a long-term action, vocational training and apprenticeships can be promoted in collaboration with private sector. Business Mauritius, SME Mauritius, Ministries may collaborate to provide (e.g. trainings, mentorship) for new entrepreneurs. It is also observed that to a large extent, education and training institutions possess the capabilities to design programmes and courses to upscale transformational competencies in Mauritius. These capabilities can be used to fill the gaps between learning requirements and the desired capacities of public officials and the business community.

3. One recommendation to accommodate the learning needs of executive officers and managers to make the shift towards green enterprises is **to design a manual, which elaborates on greening initiatives, processes, and practices,** which may be implemented at enterprise level. This would encourage the adoption and implementation of efficient resource processes and practices (energy and waste audit).

4. One of the main weaknesses facing decision-making units in both the private and public sector is the lack of a systematic and continuous approach to training to enhance competencies on greening processes. In order to be able to analyse complex systems which are embedded in sustainable agriculture, green tourism, ecotourism, sustainable innovation and climate change adaptation, **a systematic approach must be established which cater for the learning needs from general to specific processes within the focus areas over well-defined period of time**. The training programmes may include a range of face-to-face short courses, public lectures, workshops and conferences as well as online distance learning short course. The learning in the priority areas should be continuous, focusing on the recent development in the field. In this respect, online courses as an accessible and cost effective alternative to face-to-face courses can be promoted. The creation of an online platform for green economy education for professionals in various areas can be envisaged in the immediate term.

5. In the mid-term, there is a need for a more systematic collaboration between institutions especially between universities and public service and private sector. In the long-term, it would be useful to introduce concepts of green economy into accreditation/quality control criteria for learning products and programmes (especially at university level). This would guarantee that all new courses and programmes include a sustainability angle. A centralised institution such as Tertiary Education Council or the Ministry of Education, Human Resource, Tertiary Education and Scientific Research, can ensure compliance.

6. The right mechanisms through which the transformational competencies can be inculcated to policy makers have to be worked out. One approach to cater for transformational competencies is the sharing of best practices and critical success factors in a systematic manner. **Success stories from other countries must be used as case studies to showcase the results and motivate decision makers, managers and administrators to fully integrate green economy actions in their plans.**

7. Another recommendation is to improve technical competencies on economic, social and environment impact assessment tools to examine green economy policies and programmes at the organisational and operational levels. **Training institutions are recommended to promote courses on impact assessment as well as modelling tools such as cost-benefit analyses, life cycle costing, multi criteria analysis, computable general equilibrium analysis and systems dynamics.**

8. **In order to cater for the competencies of public officials, it is recommended that green policies and programmes be accompanied by a set competency development initiatives**. These initiatives may be worked out jointly by the Government and training

institutions. Representatives of education and training institutions consequently would have to be involved in the policy formulation of green economy actions and to assist in identifying the relevant learning needs accordingly.

9. There is also an urgent need to raise awareness in society of the importance of a green economy. The media has an important role to play in this respect. **Trainings on green economy issues should be targeted to media representatives so that they can lead awareness programmes to the wider community**.

10. In the mid-term term, the report recommends to improve educational and training curriculum on green economy issues. **It is important to reflect on an institutional and curriculum change so that the concepts of green economy are inculcated as from early childhood to secondary and tertiary education level.** There is thus a need to mainstream green economy into the curriculum. It follows that there will also be a need for *Training for Trainers Programmes* for educators so that they can play the role of change agents to instil a culture of green entrepreneurship in Mauritius.

11. **In the long-term, Mauritius requires a strategic and visionary approach to the green economy.** A green economy learning strategy through formal legislation, approved by the Government could be an important step to spearhead the strategic thinking. Such visionary approach would also set the priorities and actions at various level for various audiences.

12. **One recommendation in this direction is to set up a green economy coordination body at the centralised level**, preferably at the Prime Minister's Office, to ensure that all institutions are aware of the importance and action is consolidated.

List of persons contacted during the project

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Representatives	Municipal Council of Curepipe
Representatives	Municipal Council of Vacaos/Pheonix
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Representatives	Ministry of Agro Industry and Food Security
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