

# **Local Context Report**

## **(Green Star SA for use in Mauritius)**

Prepared by



**GREEN BUILDING COUNCIL MAURITIUS**

On behalf of



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## EXECUTIVE SUMMARY

The report seeks to review how the Green Star SA can be applied to Mauritius. It only considers the applicability of the Green Star SA – Office v1 tool. The purpose of this report is to provide minor changes to make the Green Star SA applicable to Mauritius such that the rating and certification tool can be made available within a short period term, and will allow the GBCSA to certify office projects in Mauritius in collaboration with the GBCM.

It must be noted that a similar report has been produced by the Ghana Green Building Council to the Green Building Council SA<sup>1</sup>.

Changes to the Green Star SA – Office v1 tool recommended in this report includes:

- MAN-2: The credit can be used in its current form until the building code is enacted.
- IEQ-1: A CIR can be submitted by the project team should an alternative standard be proposed.
- IEQ-2: Deemed to satisfy criteria can be proposed by projects via CIR if they don't want to follow GSSA.
- IEQ-3: The credit can be maintained in its current form with reference being made to CIBSE Guide B and AM 10 instead of SANS 10400 for naturally ventilated building.
- IEQ-9: A CIR can be submitted for an alternative approach and for the departure from design condition for DTS.
- IEQ-11: Reference should be made to Mauritian OHS rather than SA OHS as far as possible.
- IEQ-12: A CIR can be submitted to GBCSA for approval if alternative standards are to be used.
- IEQ-17: Credit can be omitted for Mauritius by making it “Not Applicable”.
- ENE-0: The reference for compliance route 1 should include ASHRAE and CIBSE instead of SANS 204 through submission of CIR by projects. For compliance route 2 an alternative route using OTTV should be investigated through submission of CIR by projects. For compliance route 3 it is recommended to use the EEBC although it is in the draft form by submitting a CIR.
- ENE-1: The submission of a CIR is mandatory. A revised modelling protocol with an adjusted reference building must be submitted as a CIR by projects choosing the modelling route.

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<sup>1</sup> Alfris, M., 2011. Green Star SA-Ghana Local Context Report (for the One Airport Square Project).

- ENE-5: The credit should be maintained in its current form with the Standards, referred to, adapted to the local context. Projects can submit a CIR to propose an alternate Standard to calculate peak demand.
- TRA-4: The credit requirements are applicable to the situation in Mauritius, but require minor adjustment to the calculator to omit trains from the total potential score.
- WAT-1: The credit should be made a conditional requirement. In this case, a minimum of one point should be achieved for the project to be eligible for Green Star requirements.
- WAT-4: It is recommended that the credit is omitted by making it 'Not Applicable'.
- MAT-7: It is recommended that the credit is omitted by making it 'Not Applicable'.
- MAT-11: The credit should be omitted by making it 'Not Applicable'.
- ECO-0: It is recommended that ECO 0 is maintained as a conditional requirement. Projects should submit a mandatory CIR for this credit.
- ECO-2: It is recommended that the credit is maintained in its current form, but a CIR must be submitted for projects targeting the second point referring to 'urban edge'.

ECO-4: The calculator should be adapted to the local context with the help of ecologists.

## ACKNOWLEDGEMENT

This report would not have been possible without the contribution of key individuals and their respective companies.

GBCM would like to thank Sabrina Ramsamy from WSP, who drafted the first report, under the supervision of Eric Noir.

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Special thanks go to Tim Redman from Red Properties, Dominic Wade from Arup Sigma and Yanish Panchoo from Hooloomann & Associates for their review and valuable comments on the different credits.

# 1 INTRODUCTION

The purpose of this report is to investigate the applicability of the Green Star SA in Mauritius. It applies to Green Star SA – Office v1 tool and considers how it can be adopted for Mauritius. The target audience for this report is the Green Building Council of South Africa.

The objectives of the report are to:

1. Provide a brief description of the energy and environmental context (including legal framework) in Mauritius.
2. Analyse each credit and assess its applicability in Mauritius.
3. Make recommendations on how each credit can be adapted.

## 2 LOCAL BACKGROUND

### 2.1 General

The Republic of Mauritius consists of a group of islands with an area of approximately 2045 km<sup>2</sup> and has an Exclusive Economic Zone of 1.9 million km<sup>2</sup>. The mainland, Mauritius, has an area of 1865 km<sup>2</sup> and has a population of approximately 1.2 million inhabitants. It is located in the Indian Ocean, near the Tropic of Capricorn (20.3S, 57.5E).

Given similar conditions encountered in other islands within the Indian Ocean (the Mascareignes Island, Mayotte, Comores, Seychelles and Madagascar, perhaps even Maldives, Mozambique and coastal Tanzania), projects on those islands could use this report as a starting point, but would still have to produce their own local context report for approval with the GBCSA and GBCA.

### 2.2 Topography

Mauritius is divided into nine districts of which seven are mainly coastal plain areas that rise to a Central Plateau (400-670 m above sea level), surrounded by discontinuous mountain ranges.

### 2.3 Climate

#### 2.3.1 Temperature

Mauritius experiences a tropical climate. Summers (October-April) are warm and humid while winters (May-September) are cool and dry (MMS, 2010)<sup>2</sup>. The mean summer and winter temperature is 24.7°C and 20.4°C respectively. During the hottest months (January and February), the average daily maximum temperature can reach 29.2°C while during the coolest months (July and August), the average night temperature can drop to 16.4°C.

Although no climatic zone has been formally identified, the following must be noted:

1. Below the 400-meter level on most of the windward (south-eastern) side of the island and below 450 meters on the leeward side, a humid, subtropical climate prevails.

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<sup>2</sup> (MMS) Mauritius Meteorological Services, 2010. Climate of Mauritius. Mauritius Meteorological Services. Available at: [http://metservice.intnet.mu/?page\\_id=644](http://metservice.intnet.mu/?page_id=644) [Accessed 12<sup>th</sup> March 2012].



2. Above these altitudes, the climate is more temperate<sup>3</sup>.

The local climate is close to the human comfort zone, very often natural ventilation provides reasonable to good comfort, making air conditioning systems unnecessary. However, cities on the island experience heat island effect over long periods since they are considerably hotter than the surrounding countryside. This heat island effect distances the micro-climate from the comfort zone, pushing the temperatures to a level where air conditioning can't be avoided any more, considering a minimum level of environmental comfort. Higher energy demand for air conditioning means higher emissions, especially here where most electric energy comes from non-renewable sources.

### **2.3.2 Relative humidity**

Relative humidity peaks frequently above 80% during summer while in winter it is around 70-80%.

### **2.3.3 Rainfall**

The mean annual rainfall is 2010 mm with summer being the 'rainy season'. The Central Plateau receives the most rainfall (4000 mm); the eastern coastal plain receives around 1500 mm while the north western part of the island (which is on the leeward side) receives only 800 mm<sup>4</sup>.

### **2.3.4 Wind**

The island is exposed to South East Trade Winds for the whole year. Moreover, coastal areas benefit from sea breezes.

### **2.3.5 Cyclones**

Mauritius is subject to tropical cyclones during the summer seasons. Building structures are designed to resist the strong cyclonic winds.

## **2.4 Institutions and legal framework**

### **2.4.1 Governmental bodies**

The three main ministries which are responsible for sustainable development for buildings are:

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<sup>3</sup> ([http://www.geography-site.co.uk/pages/countries/climate/mauritius\\_climate.html](http://www.geography-site.co.uk/pages/countries/climate/mauritius_climate.html)).

<sup>4</sup> Ministry of Environment and National Development Unit, 2009. Mauritius Strategy for implementation National Assessment Report 2010. [online] [www.gov.mu](http://www.gov.mu).

1. Ministry of Environment and Sustainable Development which develops and implements environmental policy.
2. Ministry of Housing and Lands which develops planning policy guidelines and bills for implementation by the local councils.
3. Ministry of Public Infrastructure, National Development Unit, Land Transport and Shipping.

## **2.4.2 Legislation**

### *Environmental Protection Act (EPA) 2002*

The main environmental legislation is the Environmental Protection Act (EPA) [amended in 2008].

The Act provides the procedure for carrying out:

- Environmental Impact Assessment (EIA) and,
- Preliminary Environmental Report (PER) – which is for projects having less environmental impacts compared to EIA project types.

The activities requiring either an EIA or PER are available on the government website. Typically, offices are not concerned.

The Act also provides a number of regulations pertaining to ambient air quality, noise levels and hazardous waste.

### *Planning and Development Act 2004*

Some of the objectives of the Act are to ensure that land development is properly managed and to provide for land development which is ecologically sustainable. The Act also establishes the structure and scope of Planning Policy Guidance (PPG). The PPG provides guidelines regarding space planning and allocation for services for commercial, industrial and hotels development.

PPG 5 Commercial development is the most relevant for office buildings.

### *Energy Efficiency Act 2011*

The Act main objective is to provide for the setting up of an Energy Efficiency Management Office with the purpose of the office is to:

- 1) Promote the efficient use of energy
- 2) Promote national awareness for the efficient use of energy as a means to reduce carbon emissions and to protect the environment.

#### Draft Energy Efficiency Building Code

This Energy Efficiency Building Code has been developed as one initiative to meet the goal regarding energy efficiency in the building sector under the project: Removal of Barriers to Energy Efficiency and Energy Conservation in Buildings.

Separate Guidelines has been developed to provide detailed suggestions for good practices and examples of application. These are:

- (a) Passive Solar Design Guidelines
- (b) Duct and Piping Guideline

The aim of this Code is to:

- Assist architects and professional engineers to comply with the energy performance objectives prescribed in the Energy Efficiency Building Regulations (EEBR).
- Encourage the design, construction and operation and maintenance of new and existing buildings in a manner that reduces energy by the means of passive design technologies for solar design and cooling strategies.
- Provide guidance for energy efficiency buildings design and encourage the application of renewable energy in new buildings.
- Set standards for energy efficient requirements for mechanical and electrical building services and construction solutions.

#### Draft Building Control Bill

The Building Control Bill aims at regulating the building works in order to ensure minimum conditions of safety and comfort. Under the current situation in Mauritius, many buildings, particularly dwellings, are drawn and designed by draughtsman with little or no design input by a registered professional and/or is constructed under no control of minimum requirements.

The Bill mentions the minimum requirements that all new buildings must comply with. These requirements need to be developed and detailed further by technical specifications mentioning

Codes and Standards including Guidelines incorporated in the Regulations, codes or standards issued under this Bill once it is enacted.

### *Draft Energy Efficiency Building Regulations*

The purpose of this document is to link the Building Control Bill with the Energy Efficiency Building Code. This regulation has the objectives of:

- a) Providing technical requirements for compliance with minimum energy efficiency requirements for buildings.
- b) Defining a special compliance and inspection mechanism.

### **2.4.3 Standards in use within the building sector**

<b>Services</b>	<b>Main Standards / Guidelines</b>
Architect	Planning policy guidance – Design guidance commercial development
	Technical sheet – Access for people with disabilities
Occupational health and safety	Occupational health and safety Act 2005
Structural	n/a
Electrical	BS 7671 IEE Wiring Regulations
	MS 63 Requirements for electrical installations
	CIBSE Code for lighting
Heating, ventilation and air conditioning	CIBSE Guide B
	ASHRAE Fundamental Handbook
Fire safety and protection system	Fire safety guidelines (Government fire services)
	BS 9999 Code of practice for fire safety in the design, management and use of buildings

It must be noted that where no standards have been available, consulting engineers and contractors have used design guidelines / methodology from manufacturers (typically French).

#### 2.4.4 Maurice Ile Durable (MID)

Maurice Ile Durable (MID) is a national strategic project initiated in 2007 to make Mauritius a model of sustainable development. The MID project has committed to mainstream sustainable development with particular focus on 5 main issues namely energy, environment, employment, education and equity. In order to elaborate its strategy, policy and action plan, a green paper on Mauritius was published to henceforth serve as a working document for the further consultative process with the different stakeholders. Prepared in April 2011 by the Prime Minister's Office in collaboration with the Ministry of Environment and Sustainable Development the stage of consultation was implemented in June and July 2011 through 6 working groups to cover the "5Es".

A number of projects have been funded under this project; examples included grants for solar water heaters, sale of compact fluorescent lamps at cheaper price and wind farm projects.

### 3 LAND USE

Land is a scarce resource in Mauritius. Efficient land use is a major concern due to its limited size, relatively high population density and its economic growth.

The island is heavily dependent on its agricultural production since it guarantees the subsistence for a significant part of the population. The share of this sector to GDP has been continuously declining over the last decade i.e. dropping below 5% in 2009. The total annual food requirement of the country is 686,000 tonnes of which about 23% is met by local production. Figure 1 below shows the different uses of land in Mauritius.

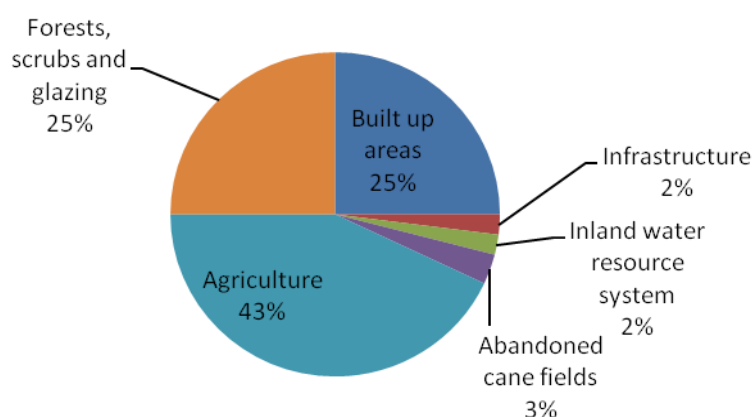


Figure 1: Land Use in Mauritius

(Source: CSO, 2008)

From the pie chart it can be seen that agriculture retains the highest share of land use, where 93% is under sugarcane production and the rest is used for the cultivation of food crops, tobacco, tea and fruits and as farmland. However, it has shown a drop of about 6% from 1995-2005 (CSO, 2008), which is mainly due to the reform of the sugarcane industry, brought about by the loss in revenue from sugar exports following the change in EU sugar regime as well as the release of land for construction purposes.

Urban sprawl, buildings (mostly residential) scattered on the countryside without recognizable pattern and “Morcellements” can be observed on the island. This seals huge areas of former farmland and other green areas every year. Due to increased distances to work and leisure, traffic and therefore air pollution increases.

### 3.1 Land conversion

The reform is formalised by the Sugar Industry Efficiency Act 2001 (Amended in 2007) which eases the land conversion process for sugar cane planters to use the land for non-sugar cane cultivation purposes. The Ministry of Agro-Industry and Fisheries reviews the land conversion permit application. The assessment criteria for assessing the application are to:

- Ensure that the level of production of sugar is sufficient to meet the commitments of Mauritius.
- Preserve agricultural land; optimising agricultural production.
- Prevent speculation in agricultural land.
- Respect outlines schemes and planning and development directives.
- Preserve irrigation areas.

### 3.2 Ecology and biodiversity

With reference to **Error! Reference source not found.**, green areas (forests, scrubs etc) represent 25% of land use.

The Mauritian biodiversity exhibits a high level of endemism, uniqueness, and species diversity. However, the island has a highly modified ecosystem due to pressures from human activities and natural factors such as invasion by exotic species. Nowadays only 1.6% of the indigenous forests remain on the island (MEND, 2009).

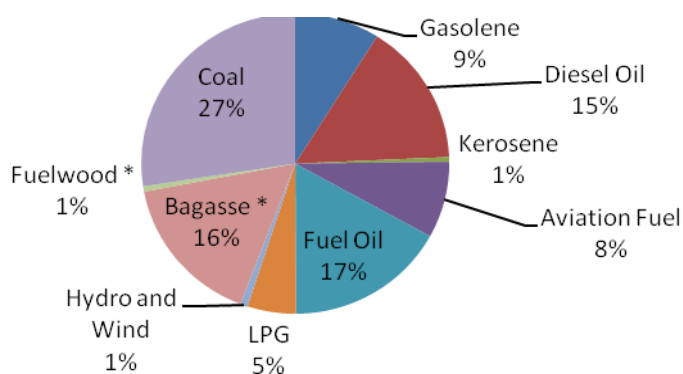
The International Union for Conservation of Nature (IUCN) has characterised Mauritius as a Centre of Plant Diversity and ranked it third in the world (after Hawaii and Canary Islands), for having the most threatened plant species. 89 % of the Mauritius endemic flora is considered threatened. Here again, one of the reasons is the conversion of land for services, dwellings and land based pollution. Tourism, a dominant economic factor, depends on sound environment and protected nature. Due to agriculture, Mauritius already lost most of its original fauna and flora. So the still existing fragments have to be protected, and, whenever possible, reconnected and/or extended.

## 4 INFRASTRUCTURE

### 4.1 Energy

Currently around 83% of energy requirements in Mauritius are derived from imported fossil fuels, which are used mainly for generating electricity and for powering the transportation and manufacturing sectors. It is expected that energy demand will rise in future years, given the prospect of two million tourists by 2015 and further economic growth.

Figure 2 shows the different sources of energy used on the island.

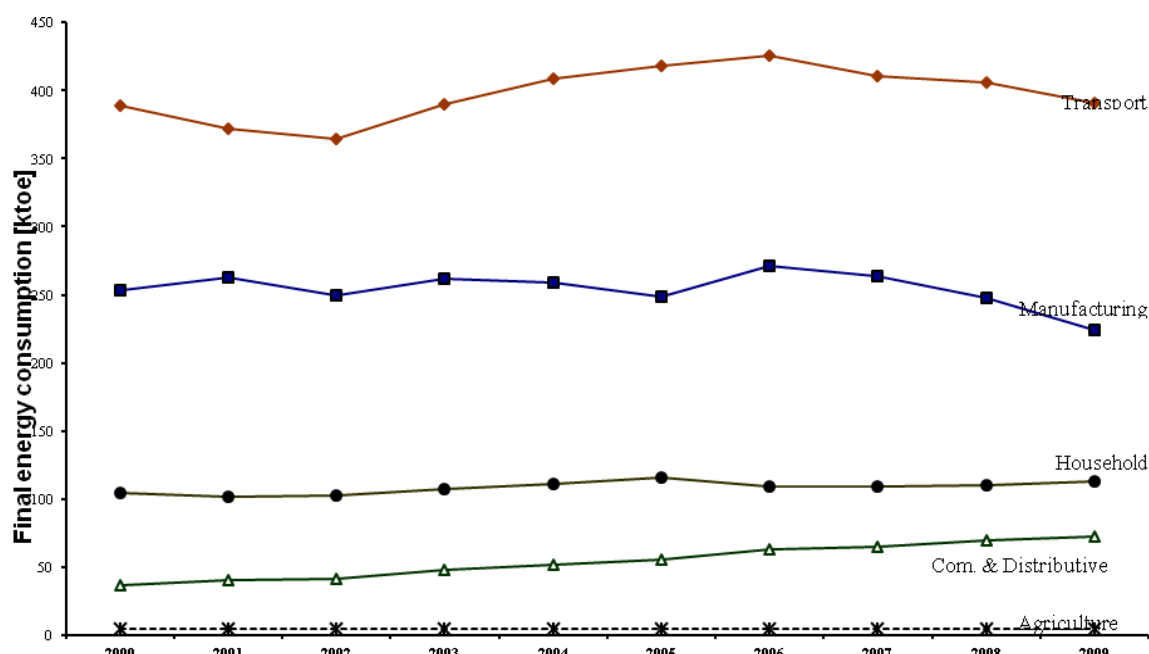


**Figure 2: Energy Mix for Primary Energy Requirements**  
Source: CSO, 2009

From 1999-2009,

- There has been a decrease of 5% in the locally available renewable energy sources: bagasse and hydro.
- Import of coal has considerably increased (from 8% to 27%).

- In terms of final energy consumption by sector (shown in Figure 3), the highest consumer remains the transport sector followed by the manufacturing industry. The commercial and distributive trade (which includes the energy consumption by offices) have also increased continuously during the last decade.



**Figure 3: final energy consumption by sector from 2000-2009**  
Source: CSO, 2009

The buildings sector accounts for about 22% of energy demand in Mauritius. From the Mauritius Energy Balance of 2010, it can be seen that the main form of energy in this sector is electricity, which accounts for 67 % of the total electricity used in Mauritius.

As a developing country Mauritius is in general not characterized by very good levels of energy efficiency (on both the supply or demand sides). The annual number of building permits in Mauritius is about 7,000 (including additions), which is insignificant when compared to the number of existing buildings. Therefore, the major potential for energy efficiency improvements is located in the existing building stock.

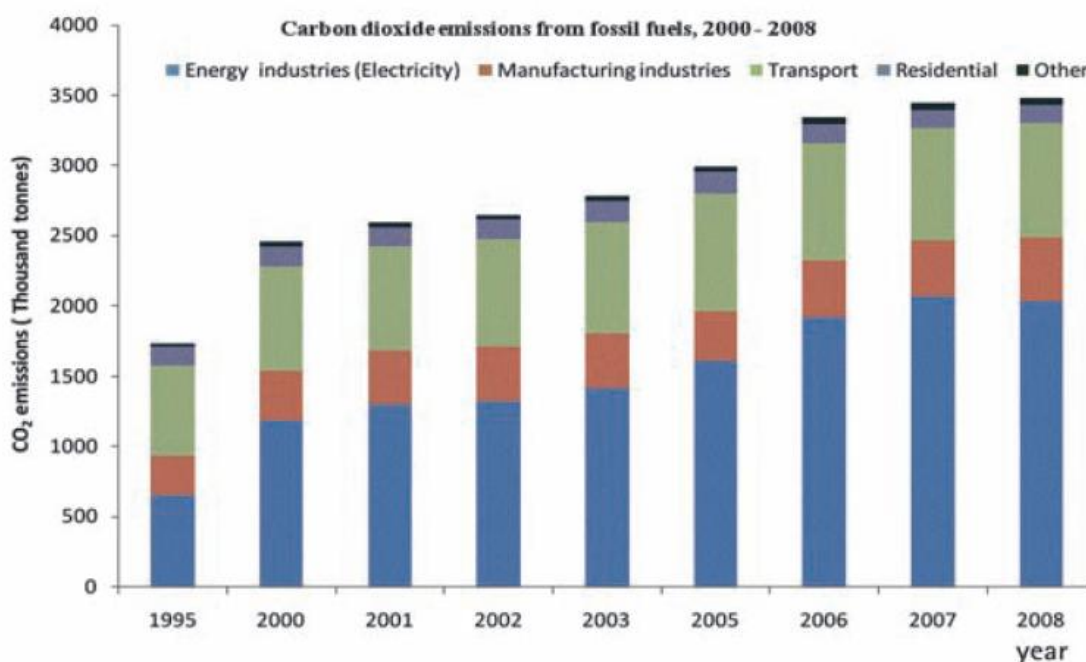
There is an on-going concern about peak demand and some measures have been taken by the Government to curtail it (e.g. roll-out of compact fluorescent lamps for the residential sector).

#### 4.1.1 Power reliability

Power supply is reliable although businesses usually allow for standby generator set to cater for power outages especially during cyclonic conditions.



### 4.1.2 CO<sub>2</sub> Emissions



**Figure 4: CO<sub>2</sub> emissions by sector from 1995-2008**  
Source: CSO, 2009

Carbon dioxide emission resulting from fuel combustion went up from 1,736.9 thousand tonnes in 1995 to 3,485.8 thousand tonnes in 2008, a rise of 100.7% with an annual increase of 5.5%. Over the years, the energy industries have remained the principal source of CO<sub>2</sub> emission in the atmosphere. They contributed around 58% of the emissions, with 2,032 thousand tonnes in 2008. They were followed by the transport sector which contributed around 23% of the total emissions and the manufacturing industries with 13.1%. From 2007 to 2008, a 1.7% decrease of CO<sub>2</sub> emissions was obtained from energy industries. This could be explained by the rise in total energy production from local renewable sources which rose by 7.3% from 246 ktoe in 2007 to 264 ktoe in 2008. This was primarily due to a higher production of bagasse for electricity production.

## 4.2 Water

In Mauritius, the main sources of water are rainfall, river and underground water. The island receives an average annual rainfall of about 3,700 Mm<sup>3</sup>. However, owing to its topography, hydro geological conditions and tropical location, it experiences high levels of rapid run off. Only 10 % of the precipitation goes as ground water recharge, while evapo-transpiration and surface runoff represent 30% and 60% respectively. Part of the surface runoff is conveyed to the impounding

reservoirs, abstracted from rivers for domestic, agricultural and industrial uses and the remaining flows to the sea.

To date 99.7% of the population is connected to the water supply network. Housing and living conditions improved from 2000 to 2011, with a higher proportion of households receiving piped water inside their house (from 83.7% to 94.2%). In spite of this improvement some 1,400 households still do not have piped water in their premises and 600 households do not have a toilet.

Mauritius is classified as a water-stressed country and faces water scarcity problems during periods of drought. Previous experiences of water shortage in the country are an alert to the possibility of future similar or more severe situations. Thus, water cuts are frequent especially during the dry season. As such, most buildings are equipped with water tanks with usually a minimum capacity of two days. Climate change is expected to further exacerbate water scarcity as a result of decreasing rainfall and rising temperatures. Other challenges arise owing to increasing demand from a growing population, agriculture, industry and tourism. In 2010, the water consumption per capita per day was 164 L.

In 2008, the total water demand was estimated at 947 Mm<sup>3</sup>. The agricultural sector accounted for 42%, hydropower 35% and domestic, industrial and tourism 23 %.

The Government has taken measures to deal with the water shortages such as the building of dams, improved irrigation practice and campaigns for an efficient use of water.

Concerns have been raised regarding stormwater runoff as illustrated from this excerpt from the Mauritius strategy for implementation (MEND, 2009):

*“An increase trend in rapid surface run off generation has been observed by the **Water Resources Unit**. These challenges have to be faced. Introducing more surface storage facilities is important as the country has no adequate forest cover or potential to substantially increase forest cover to modify the surface run off in the steep terrain.”*

### 4.3 Wastewater

The main sources of freshwater water pollution in Mauritius are dumping of solid waste in rivers, discharge of domestic and industrial effluents, and run-off from agricultural fields. The following measures are adopted on the island for controlling water pollution:

- Providing sewerage infrastructure and solid waste management system to prevent pollution at source.
- Requiring industries to pre-treat their effluent to prescribed standards before discharge into the sewerage system.
- Prohibiting industries which use or store large quantities of chemicals to be sited within water catchments.

In 2010, some 93,000 m<sup>3</sup> of wastewater was captured and treated daily and it is expected that with the increase in house connection in the near future, this volume will further shoot up and reach an estimated volume of 179,000 m<sup>3</sup> daily by the year 2015.

Currently, only 29% of the population is connected to the public sewer where around 47% of water is lost through leaks in the piping systems. The remaining 71% uses on-site disposal system. A national sewerage project is under way which aimed to connect 50% of the island by 2015 and 80% by 2030.

Wastewater treatment for office buildings depends on the location. They will be connected to the sewer network where it exists (towns and Ebene Business Park). Otherwise, package treatment plant or septic tanks are used.

#### **4.4 Waste**

The total amount of waste produced in 2010 was around 545,310 tonnes for a total population of 1,245,000 of which 78% was landfilled at Mare Chicose. Municipal Solid Waste (MSW) generated in Mauritius consists mostly of organic wastes, namely yard and domestic wastes, representing around 70% of the total generation.

Solid waste collection is undertaken by the local authorities in areas under their jurisdiction and disposed of at the Mare Chicose landfill via a network of transfer stations situated at St Martin, Roche Bois, Poudre d'Or, La Brasserie and La Laura. There is a target to reduce municipal waste by 25% (MEND, 2009).

Waste recycling is still in infancy. Only about 9% of paper, 3% of plastics and 31% of textiles are recycled (MEND, 2009). An NGO, Mission Verte, has provided sorting bins at different locations across the island. It also provides a list of recycling facilities.

## **4.5    Transport**

Traffic congestion is a serious problem and is estimated to cost around 1.3% of GDP. The number of vehicles have almost doubled between the 1990s and 2008 (MEND, 2009). This expansion in the number of vehicles has also been accompanied by a corresponding growth in energy consumption and carbon dioxide emissions. It is noted that:

- At end of December 2010, 384,115 vehicles were registered at the National Transport Authority compared to 366,520 at the end of December 2009, i.e. an increase of 4.8%.
- Some 21,643 vehicles joined the fleet whilst 4,048 were put out of circulation during the year.
- The fleet consisted largely of cars and dual-purpose vehicles (175,634 or 46%) and motorized two-wheelers (159,329 or 41%). The remaining 13% comprised of vans, lorries, trucks, buses and other vehicles.
- The number of road accidents increased by 8.8% from 19,542 in 2009 to 21,258 in 2010. Among these accidents, 153 were fatal (caused death) against 129 in the preceding year, up by 18.6%.
- The total number of vehicles (motor and non-motorized) involved in road accidents in 2010 was 41,263, that is, 3,205 or 8.4% higher than the 2009 figure of 38,058.

Traffic management measures have focussed on logistics such as opening of certain road lanes in peak hours and construction of new roads.

# **5       GREEN BUILDINGS IN MAURITIUS**

## **5.1    Government policy**

### **5.1.1 Action plan for Sustainable Buildings**

Green buildings have been addressed under the Sustainable Consumption and Production (SCP) programme with an Action Plan being developed specially for buildings.

The Action Plan is intended to serve as a road map for Mauritius—to identify the most critical and practical steps needed to make sustainable building the standard practice in Mauritius. Specifically, the Plan's overall goals in the short term are to:

- Create a commonly accepted definition and language for sustainable building;
- Create a vision/message for sustainable building that will motivate people;
- Increase demand for sustainable building services/products/projects by increasing awareness and understanding, and by providing incentives; and
- Increase the supply of sustainable building services/products/projects by providing industry professionals with information, tools, resources, incentives, and rewards to enable them to undertake sustainable building practices.

The Six Strategies identified to meet the above goals are as follows:

- Develop a Shared Vision
- Develop Guidelines and a Rating system
- Devise Enabling Policies (Building Regulations and Financial Incentives)
- Create an Awards Program and Demonstration Projects
- Industry and Public Education
- Research and Development

### **5.1.2 Long Term Energy Strategy and Action plan on Energy Consumption**

Energy Efficiency for Green buildings have been addressed in the long term energy strategy 2009-2025 (Ministry of Renewable Energy and Public Utilities, 2009), and in the Action Plan on Energy Consumption under the SCP programme.

The following has been proposed under the strategy:

1. Promotion of energy efficiency in design of buildings.
2. Public building will be designed to high energy efficiency standards taking into account life cycle costs.
3. Planning policy guidelines

The parts related to buildings in the Action Plan include energy audits, efficient lighting, alternative energy efficient transport, public procurement policies and research.

Various programmes such as the ‘Removal of Barriers to Energy Efficiency and Energy Conservation in Buildings’ have been implemented, under which standard designs, Energy Audit Management Schemes, new regulations and codes, development of software amongst others, are being developed.

## 6 APPLYING GREEN STAR SA TO MAURITIUS

### 6.1 Eligibility requirements

Green Star SA requires 80% of a building’s gross floor area (excluding car park) to be office, in order for the project to be eligible for an office rating. This is applicable in Mauritius as mixed used development is still quite rare.

### 6.2 Conditional requirements

There are currently two conditional requirements in Green Star South Africa which projects need to achieve for a Green Star rating. These are:

- Eco-0, which prescribes the minimum ecological constraints for the building and,
- Ene-0, which prescribes the minimum energy efficiency which the building must achieve.

It is recommended that Eco 0 is maintained as a conditional requirement (see Section 7.7) and Ene 0 is maintained as a conditional requirement (see Section 7.3).

It is recommended that Green Star SA tool for Mauritius includes a minimum water efficiency requirement.

### 6.3 Environmental weightings

The environmental weightings should be maintained as per Green Star SA as given below:

Impact Categories	GBCSA
Management	9
IEQ	15
Energy	25
Transport	9
Water	14
Materials	13
Land Use & Ecology	7
Emissions	8

<b>Total</b>	<b>100</b>
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## 7 CREDIT ANALYSIS

### 7.1 Management

<b>MAN 1</b>	<b>Green Star Accredited Professional</b>
<b>Aim:</b>  To encourage and recognise the engagement of professionals who can assist the project team with the integration of Green Star aims and processes throughout design and construction phases.	
<b>Local context:</b>  Green Star accreditation courses have been provided by GBCM annually for the last two years. Presently, there are 10 Green Star Accredited Professionals in Mauritius.	
<b>Discussion:</b>  The credit is applicable to Mauritius.	
<b>Recommendation:</b>  It is recommended that the credit is maintained in its current form.	
<b>References:</b>  Green Building Council SA, n.d. "Accredited Professionals". Available at: <a href="http://www.gbcsa.org.za/education/ap_directory.php">http://www.gbcsa.org.za/education/ap_directory.php</a> [Accessed 14th May 2012]	

<b>MAN 2</b>	<b>Commissioning clauses</b>
<b>Aim:</b>  To encourage and recognise commissioning and handover initiatives that ensures that all building services can operate to optimal design potential.	
<b>Local context:</b>  Although the CIBSE commissioning codes cited in the credit are included in some tender specifications, the commissioning process is rarely based on same. The documents and activities required for the second point are usually available.	

In Mauritius apart from the security systems the Air Conditioning and Mechanical Ventilation systems are considered more critical, given their obvious impact on thermal comfort and other indoor air quality issues.

The draft Energy Efficiency building code has a clause on commissioning but does not refer to either ASHRAE or CIBSE. It has however more requirements, for instance the range of systems to be commissioned is wider.

**Discussion:**

The credit is applicable to Mauritius. It, however, does not cover all the aspects treated in the coming building code.

**Recommendation:**

It is recommended that the credit is maintained in its current form. However, this will need to be reviewed when the code is enacted as its requirements are more stringent.

**References:**

Draft Energy Efficiency Building Code (Government of Mauritius)

<b>MAN 3</b>	<b>Building Tuning</b>
<p><b>Aim:</b></p> <p>To encourage and recognise commissioning initiatives that ensure optimum occupant comfort and energy efficiency services performance throughout the year.</p>	
<p><b>Local context:</b></p> <p>Very few buildings are designed / built to allow building tuning, to the exception of some new projects integrating a BMS.</p> <p>There is a defects and liability period of one year during which contractors can be called in to rectify any malfunctioning of the system.</p>	
<p><b>Discussion:</b></p> <p>The scope of works during the defects and liability period can be expanded to include building tuning. A re-commissioning schedule will be required to ensure minimum disruption. Moreover, for shell and core buildings, which are now tenanted, tenants should be informed of the building tuning process.</p>	



A thorough analysis needs to take place with regards to building tuning, i.e., not only using feedback from the Facilities Manager, but also and foremost the building occupants.

**Recommendation:**

It is recommended that the credit is maintained in its current form.

**References:**

None

<b>MAN 4</b>	<b>Independent commissioning agent</b>
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**Aim:**

To ensure buildings are designed with regard to future maintenance and are correctly commissioned before handover.

**Local context:**

This is not common practice in Mauritius. However, the Draft Energy Efficiency Building Code requires an independent commissioning agent.

**Discussion:**

The cost of having an independent agent was debated during the presentation of the draft building code.

**Recommendation:**

It is recommended that the credit is maintained in its current form.

**References:**

Draft Energy Efficiency Building Code (Government of Mauritius)

<b>MAN 5</b>	<b>Buildings user guide</b>
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**Aim:**

To encourage and recognise information management that enables building users to optimise the building's environmental performance.

**Local context:**

Building user guide is not produced per se. A combined document is not received but several

specialist contractors will submit their commissioning report and the manuals. Training is provided mainly to maintenance staff to explain the operation of the building.

**Discussion:**

The credit is applicable to Mauritius.

**Recommendation:**

It is recommended that the credit is maintained in its current form.

**References:**

None

<b>MAN 6</b>	<b>Environmental management</b>
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**Aim:**

To encourage and recognise the adoption of a formal environmental management system in line with established guidelines during construction.

**Local context:**

The Environmental Protection Act 2002 provides a list of building/activity type which requires an EMP. The latter is usually produced by the EIA consultant. Office buildings are not included in this list and contractors do not provide EMP's. A research on the internet has shown that 30 companies has been certified ISO 14001 - the certification can be obtained from the Mauritius Accreditation Service (MAURITAS). It is not known if any construction contractors have such certification.

Currently new developments lack pollution prevention plans, which due to frequent tropical rain falls and strong winds cause loss of top soil and pollute water bodies.

**Discussion:**

Environmental management will help mitigate the impact of the construction process on the environment. EIA consultants have the experience in producing EMPs and can be appointed to do same for office buildings.

**Recommendation:**

It is recommended that the credit is maintained in its current form.

**References:**

1. MAURITAS, n.d. "Accreditation of certification bodies". Available at: [http://www.mauritas.org/accreditation\\_certification\\_bodies.php](http://www.mauritas.org/accreditation_certification_bodies.php) [Accessed 12th March 2012]
2. Observatoire de l'Industrie, n.d. "Standards". Available at: <http://www.industryobservatory.org/standards.php> [Accessed 12th March 2012]. 2003 EPA Construction General Permit

<b>MAN 7</b>	<b>Waste management</b>
<b>Aim:</b>  To encourage and recognise management practices that minimise the amount of construction waste going to disposal.	
<b>Local context:</b>  Construction and demolition (C&D) waste represents only 5.5% of the solid waste landfilled. This low percentage however does not result from a reuse/recycling strategy but mainly from the limited number of demolition / refurbishment projects. Recycling facilities for plastic, paper, glass, industrial waste, computer, oil and scrap metals exist in Mauritius.  A 2007 report refer to pilot activities for the management of C&D waste: <ul style="list-style-type: none"> <li>■ Submission of demolition plan to local authorities.</li> <li>■ Regional plant for the crushing and processing of C&amp;D waste.</li> </ul> The status of the pilot activities is unknown.  Mauritius imports most of its construction material. Recycled material can substitute part of the importations. For example mineral debris can be recycled and used as aggregate in concrete, substituting sand and gravel.	
<b>Discussion:</b>  It is possible for the contractor to produce a waste management plan. It may be necessary to rework minimum percentage of waste recycled or reused depending on opportunities for recycling.	
<b>Recommendation:</b>  It is recommended that the credit is maintained in its current form.	
<b>References:</b>	

1. Ramdowar, S, 2011."Construction and demolition waste management in Mauritius – Policy making". [online] <http://www.scribd.com/doc/71330163/CnD> [Accessed 13th March 2012].
2. Mission verte, n.d. "Prestataires locaux". [online] <http://missionverte.com/> [Accessed 13th March 2012].
3. MEND, 2007. "National workshop on the development of a programme on sustainable consumption and production for Mauritius (SCP)".

<b>MAN 8</b>	<b>Air tightness testing</b>
<b>Aim:</b>	
To encourage and recognise measures to reduce uncontrolled air leakage in buildings, and reward the testing and achievement of good airtightness levels.	
<b>Local context:</b>	
This is not a current local practice since the air required inside is normally only a few degrees different from that outside. Only one building was tested – BREEAM certified. Air leakage is dealt with in the Draft Energy Efficiency Building Code.	
<b>Discussion:</b>	
<p>This is important as a significant amount of energy is lost through infiltration where contractors have not sealed openings between the air conditioned spaces and risers/penetrations. Experience in Mauritius has shown that where the external risers connect directly to the room ceiling voids through unsealed penetrations, the AC cannot cope with the humid air infiltrating.</p> <p>An alternative to an air tightness test may be to use a thermographic camera to identify the key leakage points.</p>	
<b>Recommendation:</b>	
It is recommended that the credit is maintained in its current form.	
<b>References:</b>	
Draft Energy Efficiency Building Code (Government of Mauritius)	

## 7.2 IEQ

<b>IEQ 1</b>	<b>Ventilation rates</b>
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**Aim:**

To encourage and recognise designs that provide ample amounts of outside air to counteract build up of indoor pollutants

**Local context:**

The ventilation rate is usually taken from CIBSE Guide B and the system is designed to provide a minimum of 8l/s/p. The Occupational & Safety Act 2005 states that:

*"Effective and suitable provision shall be made for securing and maintaining the adequate ventilation of every workroom by the circulation of fresh or artificially purified air of suitable temperature and relative humidity and for rendering harmless, so far as is practicable, all impurities generated in the course of any process or work carried on in the workroom as may be injurious to health."*

Under our climatic conditions, comfort in residential buildings can be provided without air conditioning during long periods of the year, if efficient natural ventilation and a favourable micro-climate are guaranteed. This has to be taken into consideration when new developments are planned.

The Draft Energy Efficiency Building Code refers to ASHRAE, or approved equivalent for ventilation rate.

**Discussion:**

Natural ventilation as the sole design strategy for cooling is rarely used in Mauritius where the high humidity levels call for air conditioning. However, if such a system is adopted the applicability of SANS 10400 should be investigated.

Mechanically ventilated spaces - 50% above SANS set the ventilation rate to almost same value as CIBSE requirement of 8l/s/p.

Reference can also be made to EN 15251 which provides calculation methods to determine the required ventilation rate based on:

- Person and building component.
- Occupancy and floor area
- Carbon dioxide levels.

**Recommendation:**

It is recommended that the credit maintained in its current form. A CIR can be submitted by the

project team should an alternative standard be proposed.

**References:**

1. CIBSE, 2005. CIBSE Guide B Heating, Ventilation, Air Conditioning and Refrigeration. CIBSE: Norfolk.
2. BSI, 2007. Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics.
3. Draft Energy Efficiency Building Code – Government of Mauritius

<b>IEQ 2</b>	<b>Air distribution effectiveness</b>
<p><b>Aim:</b></p> <p>To encourage and recognise systems that effectively delivers optimum air quality to any occupant throughout the occupied area.</p>	
<p><b>Local context:</b></p> <p>Air distribution effectiveness is not assessed. There are few professionals who have knowledge of CFD but there is a growing interest in such simulation.</p>	
<p><b>Discussion:</b></p> <p>It will be difficult to apply this credit in Mauritius. Similar to the Ghana Context Report, the opportunities to use deemed to satisfy (DTS) criteria as an alternative should be investigated. For instance, for a naturally ventilated building using cross ventilation, the depth should be less or equal to five times the height. The inlets are on lower level while the outlets are on upper level on adjacent external walls.</p> <p>DTS criteria have been included for naturally ventilated building in the Green Star Australia Public and Educational Pilot manual. Additional guidance can also be obtained from CIBSE Application Manual AM10 Natural ventilation in non-domestic buildings.</p>	
<p><b>Recommendation:</b></p> <p>Deemed to satisfy criteria can be proposed by projects via a CIR should they not wish to follow the criteria as required by Green Star SA.</p>	
<p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. Alfris, M., 2011. Green Star SA-Ghana Local Context Report (for the one airport square).</li> </ol>	

2. CIBSE., 1996. Application Manual AM10 Natural Ventilation in non-domestic buildings. CIBSE: Norfolk.	
<b>IEQ 3</b>	<b>Carbon dioxide monitoring and control</b>
<p><b>Aim:</b></p> <p>To encourage and recognise the provision of response monitoring of Carbon Dioxide levels to ensure delivery of optimum quantities of outside air.</p>	
<p><b>Local context:</b></p> <p>CO<sub>2</sub> monitoring has not been installed in any known projects although it has been proposed especially for car park ventilation.</p> <p>A recommended design condition in the Draft Energy Efficiency Building Code is a CO<sub>2</sub> level less than 1000ppm.</p>	
<p><b>Discussion:</b></p> <p>CO<sub>2</sub> monitoring and control is feasible in office projects in Mauritius.</p>	
<p><b>Recommendation:</b></p> <p>It is recommended that the credit is kept in its current form. A CIR shall be submitted for the use of CIBSE Guide B and AM 10 in lieu of SANS 10400 for naturally ventilated building.</p>	
<p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. CIBSE, 2005. CIBSE Guide B Heating, Ventilation, Air conditioning and Refrigeration. CIBSE: Norfolk.</li> <li>2. CIBSE, 1997. CIBSE Application Manual 10 Natural ventilation in non-domestic buildings. CIBSE: Norfolk.</li> </ol>	

<b>IEQ 4</b>	<b>Daylight</b>
<p><b>Aim:</b></p> <p>To encourage and recognise designs that provides good levels of daylight for building users.</p>	
<p><b>Local context:</b></p> <p>Although buildings allow for daylight, there are no requirements / targets for daylighting. Electrical engineers are usually proficient in lighting software such as Dialux from which daylight factor and illuminance can be obtained.</p> <p>A study comparing classrooms with and without daylight shows significantly better performance</p>	

of students in day-lit rooms: daylight improved performance by up to 15%.

A Passive Solar Design Guidelines have been drafted for Mauritius, and daylighting is a section dealt within same.

**Discussion:**

The credit is applicable to Mauritius.

**Recommendation:**

It is recommended that the credit be maintained in its current form.

**References:**

Passive Solar Design Guidelines – Government of Mauritius

<b>IEQ 5</b>	<b>Daylight Glare Control</b>
<p><b>Aim:</b></p> <p>To encourage and recognise buildings that are designed to reduce the discomfort of glare from natural light.</p>	
<p><b>Local context:</b></p> <p>The Draft Passive Solar Design Guidelines includes information on glare control.</p> <p>For compliance with the Draft Energy Efficiency Building Code, sun shading strategies are required to reduce direct sunlight, hence glare.</p>	
<p><b>Discussion:</b></p> <p>Daylight glare control is usually in the form of internal blinds. Other sun shading solutions are used on projects, that reduce daylight glare</p>	
<p><b>Recommendation:</b></p> <p>It is recommended that the credit be maintained in its current form.</p>	
<p><b>References:</b></p> <p>None.</p>	

<b>IEQ 6</b>	<b>High frequency ballasts</b>
<p><b>Aim:</b></p>	



To encourage and recognise the increase in workplace amenity by avoiding low frequency flicker that may be associated with fluorescent lighting.
<b>Local context:</b> HF ballasts are widely adopted in Mauritius.
<b>Discussion:</b> Since HF ballasts are highly adopted in Mauritius this credit is not applicable to Mauritius.
<b>Recommendation:</b> It is recommended that the credit be removed by making it 'Not Applicable'
<b>References:</b> None

<b>IEQ 7</b>	<b>Electric lighting levels</b>
<b>Aim:</b> To encourage and recognise base building provided office lighting that is not over designed.	
<b>Local context:</b> Engineers use the recommended lux levels from CIBSE Code for lighting or manufacturers' data. Task lighting is designed to achieve between 300-500lux. This is also the recommended range given in the Draft Energy Efficiency Building Code. However the code provides the maximum lighting power allowance of 10 W/m <sup>2</sup> for offices.	
<b>Discussion:</b> Very few projects use light modelling to eventually design accordingly. An office with ample daylighting will have same light fittings as another office with lesser exposure to daylighting.	
<b>Recommendation:</b> It is recommended that the credit be maintained in its current form.	
<b>References:</b> Draft Energy Efficiency Building Code – Government of Mauritius	

<b>IEQ 8</b>	<b>External views</b>
<b>Aim:</b>	

To encourage and recognise designs that provides occupants with a visual connection to the external environment.
<b>Local context:</b>  There are no specific requirements from building regulations with regards to the need of access to external views.
<b>Discussion:</b>  The credit is applicable to Mauritius
<b>Recommendation:</b>  It is recommended that the credit is maintained in its current form.
<b>References:</b>  None

<b>IEQ 9</b>	<b>Thermal comfort</b>
<b>Aim:</b>  To encourage and recognise buildings that achieves a high level of thermal comfort.	
<b>Local context:</b>  Consultants are generally not conversant with the use of either ASHRAE 55 or PMV.  The Draft Energy Efficiency Building Code provides the following design conditions recommendations:  Recommended indoor and outdoor design conditions for air-conditioned spaces for comfort cooling: <ul style="list-style-type: none"> <li>• Recommended indoor temperature shall be 23°C. Recommended minimum indoor temperature shall be 22°C</li> <li>• Recommended CO<sub>2</sub> level shall be 1000 ppm</li> <li>• Recommended relative humidity shall be 55-80 %</li> <li>• Recommended air movement in occupancy zone shall be 0.15 – 0.5 m/s</li> <li>• Recommended maximum air movement 0.7 m/s</li> <li>• Recommended outdoor dry bulb temperature             <ul style="list-style-type: none"> <li>○ Climatic Zone 1      30</li> <li>○ Climatic Zone 2      27.7</li> </ul> </li> </ul>	

<ul style="list-style-type: none"> <li>Recommended outdoor wet bulb temperature <ul style="list-style-type: none"> <li>Climatic Zone 1      23</li> <li>Climatic Zone 1      25</li> </ul> </li> </ul> <p>There are two climatic zones but data is complete for only the first climatic zone.</p>
<p><b>Discussion:</b></p> <p>There is some difference in the range given in the design condition from the Energy Efficiency Building Code, and the one to satisfy the DTS.</p>
<p><b>Recommendation:</b></p> <p>It is recommended that the credit is maintained in its current form. A CIR can be provided for an alternative approach and for departure from the design condition for DTS.</p>
<p><b>References:</b></p> <ol style="list-style-type: none"> <li>Aynsley, R., 1999. Estimating summer wind driven natural ventilation potential for indoor thermal comfort. Journal of Wind Engineering and Industrial Aerodynamics, 83(1-3), pp.515-525.</li> <li>Draft Energy Efficiency Building Code – Government of Mauritius</li> </ol>

<b>IEQ 10</b>	<b>Individual thermal comfort control</b>
<p><b>Aim:</b></p> <p>To encourage and recognise designs that facilitate individual control of thermal comfort</p>	
<p><b>Local context:</b></p> <p>The extent of control depends on cost and system type.</p>	
<p><b>Discussion:</b></p> <p>This credit is applicable to Mauritius.</p>	
<p><b>Recommendation:</b></p> <p>It is recommended that the credit is maintained in its current form.</p>	
<p><b>References:</b></p> <p>None</p>	

<b>IEQ 11</b>	<b>Hazardous materials</b>
<b>Aim:</b>  To encourage and recognise actions taken to reduce health risks to occupants from the presence of hazardous materials.	
<b>Local context:</b>  SA OHS Act is more stringent than the Mauritian OHS Act.	
<b>Discussion:</b>  The credit is applicable to Mauritius.	
<b>Recommendation:</b>  It is recommended that the credit be maintained in its current form and reference to the SA OHS Act be kept.	
<b>References:</b>  <ol style="list-style-type: none"> <li>1. Ministry of Environment, 2001. "Environmental Protection (Disposal of Hazardous Waste) Regulations".</li> <li>2. Ministry of Health &amp; Quality of Life, 2005. "Occupational Health &amp; Safety Act 2005".</li> </ol>	

<b>IEQ 12</b>	<b>Internal noise levels</b>
<b>Aim:</b>  To encourage and recognise buildings that are designed to maintain internal noise levels at an appropriate level.	
<b>Local context:</b>  The Environmental Protection (Control of Noise) Regulations 2008 do not provide any recommendations regarding acceptable noise levels in working places. The Occupational Health and Safety Act 2005 states that:  <i>"Where in any place of work persons are employed in any process involving exposure to noise or vibration which may constitute a danger to their health, effective means shall be provided for the reduction of such noise or vibration within the place of work."</i>  The internal noise levels are typically designed to BS standards. It is noted that there are no acoustic engineers in Mauritius.	

<b>Discussion:</b>  The credit is applicable to Mauritius.
<b>Recommendation:</b>  It is recommended that the credit be maintained in its current form. A CIR can be submitted to GBCSA for approval if alternative standards are to be used.
<b>References:</b>  Ministry of Health & Quality of Life, 2005. "Occupational Health & Safety Act 2005".

<b>IEQ 13</b>	<b>Volatile organic compounds</b>
<b>Aim:</b>  To encourage and recognise specification of interior finishes that minimise the contribution and levels of Volatile Organic Compounds in buildings.	
<b>Local context:</b>  From the author's experience, architects and designers are generally aware of VOCs and motivated to minimise the use of products with high VOCs contents. Paint suppliers offer low VOCs / no VOCs products.  No information is available on adhesives and carpets.	
<b>Discussion:</b>  The credit is applicable to Mauritius.	
<b>Recommendation:</b>  It is recommended that the credit be maintained in its current form.	
<b>References:</b>  None	

<b>IEQ 14</b>	<b>Formaldehyde minimisation</b>
<b>Aim:</b>  To encourage and recognise the specification of products with low formaldehyde emission levels.	
<b>Local context:</b>	

At present, wood products are imported without any particular reference to Formaldehyde content.
<b>Discussion:</b> The credit is applicable to Mauritius.
<b>Recommendation:</b> It is recommended that the credit be maintained in its current form.
<b>References:</b> None

<b>IEQ 15</b>	<b>Mould prevention</b>
<b>Aim:</b> To encourage and recognise the design of services that eliminates the risk of mould growth and its associated detrimental impact on occupant health.	
<b>Local context:</b> Dehumidification is carried out by the AC system itself. There is no evidence that humidity sensors have been installed in any building ductwork.	
<b>Discussion:</b> Although not common practice, the use of humidity controls and monitoring is relevant to Mauritius, where mould is a problem due to badly ventilated spaces.	
<b>Recommendation:</b> It is recommended that the credit be maintained in its current form.	
<b>References:</b> None	

<b>IEQ 16</b>	<b>Tenant Exhaust Riser</b>
<b>Aim:</b> To encourage and recognise the design of buildings with a general exhaust riser that can be used by tenants to remove indoor pollutants from printing and photocopy areas.	

**Local context:**

The author is not aware of any shell and core project where a dedicated space has been allowed for photocopying and printing. As for legal requirements, the Occupational Health and Safety Act 2005 states that:

*"where in any place of work persons are employed in any process involving exposure to ultra-violet, infra-red and any other non-ionising radiation which may constitute a danger to their health, effective means shall, so far as is reasonably practicable, be provided for the reduction of such non-ionising radiation within the place of work".*

In addition, it also advocates the effective and suitable provision to be made for securing and maintaining ventilation to render harmless impurities produced during work related activities. It must be noted that the Environmental Protection (Standards of Air) Regulations 1998 provide the maximum limit for Carbon Monoxide and Ozone in ambient air (See Table IEQ16.1 below).

**Discussion:**

The provision for a tenant exhaust riser is feasible.

**Recommendation:**

It is recommended that the credit is maintained in its current form.

**References:**

1. Ministry of Health & Quality of Life, 2005. "Occupational Health & Safety Act 2005".
2. Ministry of Environment, 1998. "Environmental Protection (Standards of Air) Regulations 1998".

**Table IEQ 16.1 : Ambient Pollutants**

Pollutant	Acceptable Limits
CO	25mg/m <sup>3</sup> in 1h; 10mg/m <sup>3</sup> in 8h
Ozone	100ug/m <sup>3</sup> in 1h

<b>IEQ 17</b>	<b>Environmental tobacco smoke avoidance</b>
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**Aim:**

To encourage and recognise the air quality benefits to occupants by prohibiting smoking inside the building.

**Local context:**

Smoking in indoors areas is not allowed in Mauritius since the 1<sup>st</sup> March 2009 following the introduction of Public Health (Restriction of tobacco products) Regulations 2008. The objectives of this regulation are to "reduce tobacco use, decrease exposure to tobacco smoke and promote smoking cessation among smokers". Although the regulations allow for dedicated smoking area in the working place, this is rarely allocated in new buildings

**Discussion:**

The regulations are enacted and thus smoking in indoor areas is banned. There is generally no signage or space to designate outdoor smoking areas. The favoured location ends up being the balcony areas.

**Recommendation:**

It is recommended that the credit is maintained in its current form.

**References:**

1. Government Information Service, 2009. "Smoking and Drinking Prohibited in Public Places since 1 March 2009". Available at: <http://www.gov.mu/portal/site/Mainhomepage/menuitem>. [Accessed: 08th March 2012].
2. Ministry of Health and Quality of Life, 2008. "Public Health (Restrictions on Tobacco Products) Regulations 2008". Available at: <http://www.gov.mu/portal/goc/moh/file/tobacco1.pdf> [Accessed: 08th March 2012].

**References:**

3. Government Information Service, 2009. "Smoking and Drinking Prohibited in Public Places since 1 March 2009". Available at: <http://www.gov.mu/portal/site/Mainhomepage/menuitem>. [Accessed: 08th March 2012].
4. Ministry of Health and Quality of Life, 2008. "Public Health (Restrictions on Tobacco Products) Regulations 2008". Available at: <http://www.gov.mu/portal/goc/moh/file/tobacco1.pdf> [Accessed: 08th March 2012].

## 7.3 Energy

<b>ENE 0</b>	<b>Conditional Requirement</b>
<b>Aim:</b>	



To encourage and recognise designs that minimise the greenhouse gas emissions associated with operational energy consumption, and maximise potential operational energy efficiency of the base building

#### **Local context:**

There is an Energy Efficiency Act since 2011. There are the following documents that are in draft form:

- Building Control Bill
- Energy Efficiency Building Regulations
- Energy Efficiency Building Code

An Energy Audit scheme has been put in place with the relevant software tool – MBEAT. The same tool will be modified for code compliance requirements. Energy auditors have been trained and will be certified once the certification scheme has been set up.

A feasibility study has been conducted for Building Energy Labelling. There are no standards in Mauritius for notional buildings.

There are two climate zones that have been demarcated in Mauritius.

The compliance in the Draft Energy Efficiency Building Code is either a basic calculation using maximum solar factor or OTTV method (Overall Transfer Thermal Value). Logarithms have been developed to calculate these for code compliance.

#### **Discussion:**

As there are no notional buildings for benchmarking SANS 204 can still be used using the location which has the most similar climatic conditions as Mauritius which is Durban.

#### **Recommendation:**

It is recommended that the credit be maintained in its current form, but that projects apply Durban's climate zone for the notional building standards.

#### **References:**

1. Hui, S. C. M., 1997. Overall thermal transfer value (OTTV): how to improve its control in Hong Kong, In Proc. of the One-day Symposium on Building, Energy and Environment, 16 October 1997, Shangrila Hotel, Kowloon, Hong Kong, HKIE BS Division/CIBSE/ASHRAE/PolyU, pp. 12-1 to 12-11.

2. CLG, 2010. Non domestic building services compliance guide. Available at: [http://www.planningportal.gov.uk/uploads/br/non-domestic\\_building\\_compliance\\_guide\\_2010.pdf](http://www.planningportal.gov.uk/uploads/br/non-domestic_building_compliance_guide_2010.pdf). [Accessed on 15<sup>th</sup> March 2012].
3. Draft Energy Efficiency Building Code – Government of Mauritius

<b>ENE 1</b>	<b>Greenhouse gas emissions</b>
<b>Aim:</b>	
To encourage and recognise designs that minimise greenhouse gas emissions associated with operational energy consumption	
<b>Local context:</b>	
The government policy has mainly focussed on the minimisation of energy consumption. However, there is concern on climate change and rising sea level.	
<b>Discussion:</b>	
Refer to ENE 0.	
<b>Recommendation:</b>	
It is recommended that the credit be maintained in its current form, but that projects apply Durban's climate zone for the notional building standards.	
<b>References:</b>	
None	

<b>ENE 2</b>	<b>Energy sub metering</b>
<b>Aim:</b>	
To encourage and recognise the installation of energy sub-metering to facilitate on-going management of energy consumption.	
<b>Local context:</b>	
Sub metering is common practice in Mauritius. Energy consumption for Air conditioning is also sub-metered on the majority of project using a centralised system.	
The Draft Energy Efficiency Building Code has a section on mandatory sub-metering for systems:	

- a) Central air-conditioning system;
- b) Lift and escalator system;
- c) Major water pumping system;
- d) General power supply; and
- e) Lighting supply.

And for individual residential units in a residential development.

BEMS also is recommended for buildings >4000 m<sup>2</sup>.

**Discussion:**

The credit is applicable to Mauritius.

**Recommendation:**

It is recommended that the credit be maintained in its current form.

**References:**

1. Mauritius Environment Outlook Report Summary for Decision-Makers
2. Digest of Energy and Water Statistics – 2010, Ministry of Finance and Economic Development, Republic of Mauritius, October 2011]
3. Enkvist et al., McKinsey & Company, 2007 (page 38)
4. Republic of Mauritius, 2000 and 2011 Housing Census
5. Smart Meter Requirements - Dutch Smart Meter specification EnergieNed - Reference: B101 - Date: February 4th, 2008 - Version: 2.1 final
6. Organisation Internationale de Metologie Legale - OIML R49
7. Draft Energy Efficiency Building Code – Government of Mauritius

<b>ENE 3</b>	<b>Lighting power density</b>
<p><b>Aim:</b></p> <p>To encourage and recognise designs that provide artificial lighting with minimal energy consumption</p>	
<p><b>Local context:</b></p> <p>The Draft Energy Efficiency Building Code provides for lighting power allowances and</p>	

recommended illuminance.
<b>Discussion:</b>  This credit is applicable to Mauritius. There is a need to cross check if the Draft EEBC does not prescribe lower lighting power density figures.
<b>Recommendation:</b>  It is recommended that the credit is maintained in its current form.
<b>References:</b>  Draft Energy Efficiency Building Code

<b>ENE 4</b>	<b>Lighting zoning</b>
<b>Aim:</b>	To encourage and recognise lighting design practices that offer greater flexibility for light switching, making it easier to light only occupied areas.
<b>Local context:</b>	Lighting zones are usually defined on a case by case basis. Advanced lighting system has been installed in some buildings. The draft EEBC provides a section on lighting control requirements.
<b>Discussion:</b>	The credit is applicable to Mauritius.
<b>Recommendation:</b>	It is recommended that the credit is maintained in its current form
<b>References:</b>	None

<b>ENE 5</b>	<b>Peak energy demand reduction</b>
<b>Aim:</b>	To encourage and recognise designs that reduces peak demand on energy supply infrastructure
<b>Local context:</b>	Standby generator sets are used for back up power due to power outages (especially during and in

the aftermath of cyclonic conditions).

Renewable energy - PVs have been installed following a pilot feed in tariff system implemented by the CEB.

Solar thermal collectors are not installed in office buildings due to low demand.

**Discussion:**

The standard used to calculate the peak energy demand for the base building should be similar to ENE 0 and 1.

**Recommendation:**

It is recommended that the credit is maintained in its current form - projects can submit a CIR to propose an alternate Standard to calculate peak demand

**References:**

None

## 7.4 Transport

<b>TRA 1</b>	<b>Maximum car parking</b>
<b>Aim:</b>  To encourage and recognise developments that facilitates the use of alternative modes of transportation for commuting to work.	
<b>Local context:</b>  The minimum parking guidelines are given in PPG 5 Commercial Development – 1 car parking should be allowed for each 60m <sup>2</sup> of gross floor area.  The document also highlights that the parking requirements cater for future growth in car ownership and use in the next 15 years.  However the parking guidelines are less generous than those in South Africa.	
<b>Discussion:</b>  The reduction in parking space has not resulted in many cases to a marked alternative transport means. The 'rogue parking' at Ebene Cybercity is an example where car owners park on any public areas found.	
<b>Recommendation:</b>  It is recommended that the credit is maintained in its current form.	
<b>References:</b>  <a href="http://www.zimride.com">http://www.zimride.com</a>	

<b>TRA 2</b>	<b>Fuel efficient transport</b>
<b>Aim:</b>  To encourage and recognise developments that facilitates the use of more fuel efficient vehicles for work commuting.	
<b>Local context:</b>  Carpooling is rarely used as an alternative to public transport by people who own a private means of transport. It is, also, more common where company provide company cars to some of their employees. There is no requirement in PPGs for parking allocation for car pool vehicles.  Some hybrid cars have started to emerge in the local market. Government has provided incentives upon the acquisition of such cars.	
<b>Discussion:</b>	

The car parking provision required by the credit can be accommodated.
<b>Recommendation:</b> It is recommended that the credit is maintained in its current form.
<b>References:</b> None

<b>TRA 3</b>	<b>Cyclist facilities</b>
<b>Aim:</b> To encourage and recognise developments that facilitates the use of bicycles by occupants and visitors.	
<b>Local context:</b> <p>Cycling is mostly a leisure activity in Mauritius. There are no cycling paths and cycling may not be a safe way to travel especially over the long distances from home to work. Bicycle racks are difficult to find, which creates a further obstacle to the frequent and daily use of this mean of transport.</p> <p>The climatic conditions are favourable for the use of bicycles: the local climate is close to the comfort range during most days of the year and most cities and villages count with a relatively flat topography. With the decentralisation of offices from the Capital, Port Louis, we have noted an emergence of offices in Quatre- Bornes, Rose-Hill and Vacoas (Previously mainly residential zones). The use of bicycles as a means to commute to work will be easier and safer.</p>	
<b>Discussion:</b> The credit requirements can be met. PPG 5 recommends that it should be possible for people to make the local journey on foot, by bicycle or by public transport.	
<b>Recommendation:</b> It is recommended that the credit is maintained in its current form	
<b>References:</b> None.	

<b>TRA 4</b>	<b>Commuting mass transport</b>
<b>Aim:</b> To encourage and recognise developments that facilitates the use of mass transport for work commuting.	
<b>Local context:</b> Public transport is available to the main business hubs. Although the frequency of buses increases during	

peak hours, often there is long period of waiting at the bus stop due to the buses being unable to accommodate more passengers. Employers provide common transport services such as mini-buses where public transport is limited (e.g. in Riche Terre). Finally, there are taxis which charge similar fare as buses for remote areas such as Flacq or Southern regions.

The existing public transport system is very limited, based on bus lines, with mostly old and very polluting buses. The number of buses increased from 2,400 in 2000 to 2,800 in 2010, a very modest rise of 17%, compared to cars.

Traffic pattern and constant increase in congestions and pollution can be observed.

Mauritius does not have a public rail network.

**Discussion:**

The credit requirements are applicable to the situation in Mauritius, but require minor adjustment to the calculator to omit trains from the total potential score.

**Recommendation:**

It is recommended that the credit is maintained in its current form, but should exclude trains.

**References:**

None

TRA 5	Local connectivity
<p><b>Aim:</b></p> <p>To encourage and recognise office buildings that are integrated with or built adjacent to community amenities and/or dwellings in order to reduce the overall number of automobile trips taken by building users.</p>	
<p><b>Local context:</b></p> <p>PPG 5 does not mention any requirements for local connectivity.</p>	
<p><b>Discussion:</b></p> <p>This credit is applicable to Mauritius. More and more office parks are being built with facilities such as banks, pharmacies and convenience stores.</p>	
<p><b>Recommendation:</b></p> <p>It is recommended that the credit is maintained in its current form.</p>	
<p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. Design Guidance – Residential Development (revised). Ministry of Housing and Lands. December</li> </ol>	



2011
2. Neufert. Architect's Data. 3 <sup>rd</sup> Edition (English Version)
3. Neufert. Les éléments des projets de construction. 9 <sup>th</sup> Edition (French Version)
4. Neufert. Bauentwurfslehre. 39 <sup>th</sup> Edition (German Version)
5. Pedestrian & Bicycle Planning – A Guide to Best Practices. Victoria Transport Policy Institute. Canada, 20 February 2012. Available at: <a href="http://www.vtpi.org/nmtguide.doc">www.vtpi.org/nmtguide.doc</a>

## 7.5 Water

<b>WAT 1</b>	<b>Occupant amenity water</b>
<b>Aim:</b>	
To encourage and recognise designs that reduce potable water consumption by building occupants	
<b>Local context:</b>	
Water efficient fixtures are available and have been used in some projects. Office projects typically do not have any greywater or blackwater recycling facilities, although some of them have black water treatment plant. On some projects, rainwater harvesting has been proposed mainly for irrigation purposes.	
<b>Discussion:</b>	
Mauritius benefits from a decent amount of annual rainfall every year. Yet with bad management and logistics surrounding the issue, the country faces droughts on a yearly cycle.	
<b>Recommendation:</b>	
It is recommended that the credit can be maintained in its current form. In addition, similar to the recommendation made in the Ghana context report, the credit should be made a conditional requirement. In this case, a minimum of one point should be achieved for the project to be eligible for Green Star certification.	
<b>References:</b>	
None	

<b>WAT 2</b>	<b>Water meters</b>
<b>Aim:</b>	

To encourage and recognise the design of systems that both monitors and manages water consumption.
<b>Local context:</b>  Generally, for single occupant building, a main meter is installed. For multiple tenants, one meter is allowed per tenant.
<b>Discussion:</b>  It is possible to install additional meters. The credit is applicable to the local context; however with the cost/m <sup>3</sup> of potable water being relatively cheap as compared to developing countries, the cost/benefit of installing water meters to monitor any leakage may become a discussion topic.
<b>Recommendation:</b>  It is recommended that the credit is maintained in its current form.
<b>References:</b>  <ol style="list-style-type: none"> <li>1. Central Water Authority</li> <li>2. ORGANISATION INTERNATIONALE DE MÉTROLOGIE LÉGALE - OIML R49</li> <li>3. Casa Azul – Construção Sustentável [Caixa Económica Federal]</li> </ol>

WAT 3	Landscape irrigation
<b>Aim:</b>  To encourage and recognise the design of systems that aim to reduce the consumption of potable water for landscape irrigation.	
<b>Local context:</b>  The use of rainwater for landscape irrigation is used in some projects.	
<b>Discussion:</b>  The credit is applicable to Mauritius	
<b>Recommendation:</b>  It is recommended that the credit is maintained in its current form.	
<b>References:</b>	

None
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WAT 4	Heat rejection water
<b>Aim:</b> To encourage and recognise design that reduces potable water consumption from heat rejection systems.	
<b>Local context:</b> Water cooled systems are rarely used in Mauritius, especially for offices.	
<b>Discussion:</b> The credit is applicable to Mauritius, even though it would mean most projects achieve 4 points without doing anything more than they normally do in terms of heat rejection.	
<b>Recommendation:</b> It is recommended that the credit is omitted by making it 'Not Applicable'.	
<b>References:</b> None	

WAT 5	Fire system water consumption
<b>Aim:</b> To encourage and recognise building design which reduces consumption of potable water for the building's fire protection and essential water storage systems.	
<b>Local context:</b> To the author's knowledge, potable water is used for building's fire protection	
<b>Discussion:</b> The credit is applicable to Mauritius.	
<b>Recommendation:</b> It is recommended that the credit is maintained in its current form.	
<b>References:</b> none	



## 7.6 Materials

<b>MAT 1</b>	<b>Recycling waste storage</b>
<b>Aim:</b>  To encourage and recognise the inclusion of storage space that facilitates the recycling of resources used within buildings to reduce waste going to disposal.	
<b>Local context:</b>  Sorting of waste is not a common practice in Mauritius. However, as mentioned in Section 4.4, recycling companies do exist.  Some new constructions – especially those which have an EMS in place perform waste recycling. This is very important since Mauritius is facing a big problem with landfill space.	
<b>Discussion:</b>  The credit is applicable to Mauritius.	
<b>Recommendation:</b>  It is recommended that the credit is maintained in its current form.	
<b>References:</b>  none	

<b>MAT 2</b>	<b>Building reuse</b>
<b>Aim:</b>  To encourage and recognise developments that reuse existing buildings to minimise materials consumption	
<b>Local context:</b>  Currently there are some new projects which are considering renovations instead of demolition and reconstruction.  The reuse of demolished materials has been done recently on a hotel project.	
<b>Discussion:</b>  The credit requirements are applicable to Mauritius.	

**Recommendation:**

The credit can be maintained in its current form.

**References:**

none

**MAT 3****Reused materials****Aim:**

To encourage and recognise designs that prolongs the useful life of existing products and materials.

**Local context:**

In some building recycled wood and stones are used.

The will to embark on new product with longer lifetime with no previous history on the product is fairly limited. Invariably this means more expensive materials. The market is very much concerned with first costs.

**Discussion:**

The credit requirements are applicable to Mauritius.

**Recommendation:**

The credit can be maintained in its current form.

**References:**

None

**MAT 4****Shell and core or integrated fit-out****Aim:**

To encourage and recognise base building delivery mechanisms that eliminate the need for immediate tenant refits

**Local context:**

For shell and core buildings, common areas are fitted out while only the main electrical and water supply is provided for each tenant area.

In addition, an electrical point is provided in each tenant space to provide electrical power to

contractors who will carry out future fit out. On some projects with centralised systems, air conditioning is taken to the tenanted areas.
<b>Discussion:</b>  The credit requirements are applicable to Mauritius.
<b>Recommendation:</b>  The credit can be maintained in its current form.
<b>References:</b>  none

<b>MAT 5</b>	<b>Concrete</b>
<b>Aim:</b>  To encourage and recognize the reduction of embodied energy and resource depletion occurring through use of concrete.	
<b>Local context:</b>  With the geographical location and the occurrence of cyclones in the region on an annual basis, the construction industry is reluctant to find alternatives since concrete structure has stood the test of time over the last 40 odd years. There is also a proposal for a plant to produce cement with fly ash.	
<b>Discussion:</b>  The credit is applicable to Mauritius. There is a need to show that alternative suitable materials exist besides concrete.	
<b>Recommendation:</b>  It is recommended that the credit is maintained in its current form.	
<b>References:</b>  none	

<b>MAT 6</b>	<b>Steel</b>
<b>Aim:</b>  To encourage and recognise the reduction in embodied energy and resource depletion associated	

with reduced use of virgin steel.
<b>Local context:</b> Steel is recycled in Mauritius. Recycled steel is mainly used as reinforcement to concrete structures.
<b>Discussion:</b> The credit is applicable to Mauritius.
<b>Recommendation:</b> It is recommended that the credit is maintained in its current form.
<b>References:</b> None

<b>MAT 7</b>	<b>PVC minimisation</b>
<b>Aim:</b> To encourage and recognise the reduction in use of Poly Vinyl Chloride (PVC) products in South African buildings.	
<b>Local context:</b> PVC is used in sleeves, pipe and cable insulation.	
<b>Discussion:</b> PVC products are produced locally and the credit will mostly likely result in a negative impact on the "industry". Cost is an issue for alternative to plastic. The GBCSA has recently decided to omit the PVC credit from all future tools and future versions of the office tool.	
<b>Recommendation:</b> It is recommended that the credit is omitted by making it 'Not Applicable'.	
<b>References:</b> none	

<b>MAT 8</b>	<b>Sustainable timber</b>
<b>Aim:</b>	



To encourage and recognise the specification of reused timber products or timber that has certified environmentally-responsible forest management practices.
<b>Local context:</b>  Since most timber is imported, using a certified source should not be difficult. In the past this has proven to be costly to source certified wood
<b>Discussion:</b>  The credit is applicable to Mauritius.
<b>Recommendation:</b>  It is recommended that the credit is maintained in its current form.
<b>References:</b>  Forest Stewardship Council principles and criteria. Available at: <a href="http://www.fscus.org">www.fscus.org</a>

<b>MAT 9</b>	<b>Design for disassembly</b>
<b>Aim:</b>  To encourage and recognise designs that minimise the embodied energy and resources associated with demolition.	
<b>Local context:</b>  To the author's knowledge, the ability to disassemble the structure is not part of the design process.  There are projects that are looking at this as there are developments in sensitive areas and the structures are temporary and thus need to be easily disassembled.	
<b>Discussion:</b>  Since concrete framed buildings are widely used in Mauritius, disassembly is less possible than steel or timber frame structures. However in office buildings cladding systems or curtain walling are used.	
<b>Recommendation:</b>  It is recommended that the credit is maintained in its current form.	
<b>References:</b>	

None	
<b>MAT 10</b>	<b>Dematerialisation</b>
<b>Aim:</b>  To encourage and recognise designs that produces a net reduction in the total amount of material used.	
<b>Local context:</b>  There is no awareness of dematerialisation amongst the design teams on projects.	
<b>Discussion:</b>  The initiatives can be accommodated.	
<b>Recommendation:</b>  It is recommended that the credit is maintained in its current form.	
<b>References:</b>  None	

<b>MAT 11</b>	<b>Local sourcing</b>
<b>Aim:</b>  To encourage and recognise the environmental advantages gained, in the form of reduced transportation emissions, by using materials and products that are sourced within close proximity to the site.	
<b>Local context:</b>  Mauritius is an island with limited resources, or unexploited resources. It thus has to import almost all construction materials except for materials of basaltic sources. At the same time, the island faces serious challenges due to huge amounts of waste being generated daily.	
<b>Discussion:</b>  The credit is not relevant to the local market. However few initiatives to research on alternative materials have been conducted in Mauritius. Sourcing within the region could be spinning a positive economic impact rather than a reduction in travel related emissions). The credit was developed however in South Africa to address emissions and not economic issues.	
<b>Recommendation:</b>	

The credit should be omitted by making it 'Not Applicable'

**References:**

None

## 7.7 Land Use and Ecology

ECO	Conditional requirement
<p><b>Aim:</b></p> <p>To encourage and recognise development on land that has limited ecological value and to discourage development on ecologically valuable sites.</p>	
<p><b>Local context:</b></p> <p>Most development in Mauritius is on greenfields. In addition, the Government policy has been to facilitate land conversion especially for small sugar cane planters (see Section 3.1 above).</p>	
<p><b>Discussion:</b></p> <p>This credit, if maintained as a conditional requirement, should be adjusted to accommodate the local context, since many developments take place on agricultural lands. Sugar was the main industry. The sugar industry was protected with a preferential price. With the drop in the price of Sugar, this made it not economically viable to use such amount of land for sugar planting. Therefore some of the land is being converted into development zones.</p> <p>Land conversion is required for converting agricultural land, and this goes through a process before obtaining approval. Limited indigenous vegetation remains on the island, and this should be protected.</p>	
<p><b>Recommendation:</b></p> <p>It is recommended that ECO 0 is maintained as a conditional requirement. However the definitions must be changed in order to include the possibility to have green building on agricultural land that has been earmarked by Government for development. Projects should submit a mandatory CIR for this credit. The criteria should be changed as follows:</p> <p>Prime Agricultural Land - change definition to 'Prime Agricultural Land (prior to Land Conversion) which falls outside of the Development Zone as prescribed by the governments Outline Planning Scheme'</p> <p>Prime Vegetation or land within 100m of primary vegetation - no change to definition</p>	

Class 1 ridge - change definition to 'land which is above the mountain reserve line as defined in the Forests and Reserves Act 1983'

Land with confirmed presence of Red Data species or habitat for Red Data species or appropriate buffer as defined in the policies of the relevant Provincial Authority - to change definition to 'Land with confirmed presence of Red Data species or habitat for Red Data species or protected plants as listed in the Forests and Reserves Act 1983'

Land within 100m of a wetland or river as defined by The National Water Act, 1998 - no change to definition since The National Water Act, 1998 is more stringent than the Rivers and Canals Act 1863

**References:**

Forests and Reserves Act 1983 and Rivers and Canals Act 1863

<b>ECO 1</b>	<b>Top soil</b>
<b>Aim:</b> <p>To encourage and recognise construction practices that preserves the ecological integrity of topsoil.</p>	
<b>Local context:</b> <p>Normally on all projects the topsoil is persevered for re-use.</p>	
<b>Discussion:</b> <p>The credit is applicable to Mauritius.</p>	
<b>Recommendation:</b> <p>It is recommended that the credit is maintained in its current form.</p>	
<b>References:</b> <p>None</p>	

<b>ECO 2</b>	<b>Reuse of land</b>
<b>Aim:</b> <p>To encourage and recognise the reuse of land that has previously been developed and where the site is within an existing municipally approved urban edge.</p>	
<b>Local context:</b> <p>PPG 5-Commercial development provides a list of requirements pertaining to various locations where commercial development is possible. These are:</p> <ul style="list-style-type: none"> <li>■ central business district (CBD)</li> <li>■ edge-of-centre and out-of-town</li> <li>■ local centres</li> <li>■ corner shops</li> </ul> <p>No reference is made to municipality urban edge.</p> <p>There is a development outline scheme produced by the Ministry of Housing and Lands.</p>	

<b>Discussion:</b>
The credit is applicable to Mauritius.
<b>Recommendation:</b>
It is recommended that the credit is maintained in its current form, but a CIR must be submitted for projects targeting the second point referring to ‘urban edge’.
<b>References:</b>
<ol style="list-style-type: none"> <li>1. Ministry of Housing and Lands, 2004. Design Guidance Commercial Development.</li> <li>2. Neufert. Architect’s Data. 3<sup>rd</sup> Edition (English Version)</li> <li>3. Pedestrian &amp; Bicycle Planning – A Guide to Best Practices. Victoria Transport Policy Institute. Canada, 20 February 2012. Available at: <a href="http://www.vtpi.org/nmtguide.doc">www.vtpi.org/nmtguide.doc</a></li> </ol>

<b>ECO 3</b>	<b>Reclaimed contaminated land</b>
<b>Aim:</b>	To encourage and recognise developments that reclaim contaminated land that otherwise would not have been developed.
<b>Local context:</b>	There are not as many contaminated sites as in developed countries as there are not many industrial processes done due to the lack of resources.
<b>Discussion:</b>	The credit is applicable to Mauritius.
<b>Recommendation:</b>	It is recommended that the credit is maintained in its current form.
<b>References:</b>	None

<b>ECO 4</b>	<b>Change of ecological value</b>
<b>Aim:</b>	To encourage and recognise developments that maintains or enhances the ecological value of

their sites.
<p><b>Local context:</b></p> <p>Government policy has focussed on increasing awareness on endangered species and establishing conservation programme in nature reserves. There has been no promotion of biodiversity for construction projects.</p> <p>From a project that is currently under construction, the ecological value of the site has been enhanced, previously the area was not fit for construction, until the promoter invested heavily to revitalise the land and use it for construction.</p> <p>Sensitive areas are denoted on the Development Outline Scheme. This Outline Scheme is consulted prior to handing of development permits.</p> <p>Wetlands are protected by the Ramsar convention.</p>
<p><b>Discussion:</b></p> <p>There are no bio-regions defined in Mauritius. Although sensitive areas are defined, with corruption, development still occurs</p>
<p><b>Recommendation:</b></p> <p>It is recommended that the credit is kept in its current form. The calculator should be adapted to the local context with the help of ecologists. Same as for Ghana, it is recommended that mandatory CIR must be submitted to the GBCSA by projects to determine which South African bio-region is most applicable to the project.</p>
<p><b>References:</b></p> <p>None</p>

## 7.8 Emissions

EMI_1	Refrigerant / gaseous ODP
<b>Aim:</b>	To encourage and recognise the selection of refrigerants and other gases that does not contribute to long-term damage to the Earth's stratospheric ozone layer.
<b>Local context:</b>	HVAC engineers have been specifying zero ODP refrigerants such as R410a for a few years now. Refrigerant such as R22 is still available on the market.

<b>Discussion:</b>  The credit is applicable to Mauritius.
<b>Recommendation:</b>  It is recommended that the credit is maintained in its current form.
<b>References:</b>  None

<b>EMI_2</b>	<b>Refrigerant GWP</b>
<b>Aim:</b>  To encourage and recognise the selection of refrigerants that reduces the potential for increased global warming from the emission of refrigerants to the atmosphere.	
<b>Local context:</b>  Although the engineers are aware of low GWP refrigerants, these are not specified and used as they are not available on the market.	
<b>Discussion:</b>  The credit is applicable to Mauritius.	
<b>Recommendation:</b>  It is recommended that the credit is maintained in its current form.	
<b>References:</b>  None	

<b>EMI_3</b>	<b>Refrigerant leaks</b>
<b>Aim:</b>  To encourage and recognise building systems design that minimises environmental damage from refrigerant leaks.	
<b>Local context:</b>  There is an awareness of the monitoring systems, but these are not commonly used.	
<b>Discussion:</b>	



The credit is applicable to Mauritius.
<b>Recommendation:</b>  It is recommended that the credit is maintained in its current form.
<b>References:</b>  None

<b>EMI_4</b>	<b>Insulant ODP</b>
<b>Aim:</b>  To encourage and recognise the selection of insulants that does not contribute to long-term damage to the Earth's stratospheric ozone layer.	
<b>Local context:</b>  Consulting engineers and contractors are aware of such products which are sometimes specified.	
<b>Discussion:</b>  The credit is applicable to Mauritius.	
<b>Recommendation:</b>  It is recommended that the credit is maintained in its current form.	
<b>References:</b>  None	

<b>EMI_5</b>	<b>Watercourse pollution</b>
<b>Aim:</b>  To encourage and recognise developments that minimise stormwater run-off to, and the pollution of, the natural watercourses.	
<b>Local context:</b>  The policy on protection of water resources have been laid down in the National Development Strategy 2003 - policy No.WS2 as follows:  <i>“the natural functions and habitats of water resources including rivers, rivulets, aquifers, boreholes, groundwater, surface water and marine water resources will be protected from</i>	

*adverse effects of development either through incorporation of environmental mitigation measures in development schemes, prohibition of development in buffer zones (no development allowed within a 200 m radius of boreholes ) and/or the protection and maintenance of natural habitat adjoining such resources. “*

Stormwater runoff causes erosion and pollution but if properly managed can reduce costs by using the water for non-potable purposes like irrigation (landscaping) or toilet flushing. Stormwater runoff can also cause erosion, which is responsible for the loss of valuable topsoil and its subsequent loss of soil fertility and biodiversity.

**Discussion:**

The credit is applicable to Mauritius.

**Recommendation:**

It is recommended that the credit is maintained in its current form.

**References:**

None

<b>EMI_6</b>	<b>Discharge to sewer</b>
<p><b>Aim:</b></p> <p>To encourage and recognise developments that minimise discharge to the municipal sewerage system.</p>	
<p><b>Local context:</b></p> <p>Typically, grey and black water treatment is not carried out in office buildings due to costs and availability of municipal sewer line.</p> <p>It is often the case that the wastewater department requires the building to connect to the municipal sewer, even though on-site treatment is proposed.</p> <p>It must be noted that the wastewater treated at Grand Baie and St Martin treatment station is used for irrigation (MEND, 2009) Several office projects are now being done on the coastal zones where the water table is high. Since some of the coastal zones are not sewered, a treatment plant is installed.</p>	
<p><b>Discussion:</b></p>	

The credit is applicable to Mauritius.

**Recommendation:**

It is recommended that the credit is maintained in its current form.

**References:**

MEND, 2009. Mauritius Strategy for Implementation National Assessment Report 2010. [online]  
www.gov.mu

<b>EMI_7</b>	<b>Light pollution</b>
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**Aim:**

To encourage and recognise developments that minimise light pollution into the night sky.

**Local context:**

According to PPG 5 Design Guidance Commercial development, use of floodlighting should be indicated to local planning authority and such lighting should not cause light pollution to neighbouring areas.

**Discussion:**

The credit is applicable to Mauritius.

**Recommendation:**

It is recommended that the credit is maintained in its current form.

**References:**

Planning policy guidance – Ministry of Housing and Lands

<b>EMI_8</b>	<b>Legionella</b>
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**Aim:**

To encourage and recognise building systems design that eliminates the risk of Legionnaires' disease (Legionellosis).

**Local context:**

Evaporative cooling towers are rarely used in Mauritius due to the humidity level.

Suppliers are aware of this problem on hot water systems.

**Discussion:**

The credit is not applicable to Mauritius.

**Recommendation:**

It is recommended that the credit is omitted by making it 'Not Applicable'

**References:**

None

**EMI\_9**

**Boiler and generator emissions**

**Aim:**

To encourage and recognise the use of boilers and generators that minimise harmful emissions.

**Local context:**

The available generator sets presently comply with EU Stage II.

**Discussion:**

The credit is applicable to Mauritius.

**Recommendation:**

It is recommended that the credit is maintained in its current form.

**References:**

None

## 7.9 Innovation

The innovation credits should be maintained in their current form.

## 8 SUMMARY

The table below summarises the proposed changes, if any, that need to be accommodated to the Green Star SA for its adoption in Mauritius.

Credit	Credit name	Proposed amendments
MAN-1	Green Star accredited professionals	None
MAN-2	Commissioning clauses	The credit can be used in its current form until the building code is enacted.
MAN-3	Building tuning	None
MAN-4	Independent commissioning agent	None
MAN-5	Building users' guide	None
MAN-6	Environmental management	None
MAN-7	Waste management	None
MAN-8	Air tightness testing	None
IEQ-1	Ventilation rates	A CIR can be submitted by the project team should an alternative standard be proposed.
IEQ-2	Air change effectiveness	Deemed to satisfy criteria can be proposed by projects via CIR if they don't want to follow GSSA.
IEQ-3	Carbon dioxide monitoring and control	The credit can be maintained in its current form with reference being made to CIBSE Guide B and AM 10 instead of SANS 10400 for naturally ventilated building.
IEQ-4	Daylight	None
IEQ-5	Daylight glare control	None
IEQ-6	High frequency ballasts	Credit can be omitted for Mauritius by making

		it “Not Applicable”.
IEQ-7	Electric lighting levels	None
IEQ-8	External views	None
IEQ-9	Thermal comfort	A CIR can be submitted for an alternative approach and for the departure from design condition for DTS.
IEQ-10	Individual comfort control	None
IEQ-11	Hazardous materials	It is recommended that the credit be maintained in its current form and reference to the SA OHS Act be kept.
IEQ-12	Internal noise levels	The credit should be maintained in its current form. A CIR can be submitted to GBCSA for approval if alternative standards are to be used.
IEQ-13	Volatile organic compounds	None
IEQ-14	Formaldehyde minimisation	None
IEQ-15	Mould prevention	None
IEQ-16	Tenant exhaust riser	None
IEQ-17	Environmental tobacco smoke avoidance	None
ENE-0	Conditional Requirement	It is recommended that the credit be maintained in its current form, but that projects apply Durban’s climate zone for the notional building standards.
ENE-1	Greenhouse Gas Emission	It is recommended that the credit be maintained in its current form, but that projects apply Durban’s climate zone for the notional building standards.
ENE-2	Energy Sub-metering	None

ENE-3	Lighting Power Density	None
ENE-4	Lighting Zoning	None
ENE-5	Peak Energy Demand	The credit should be maintained in its current form with the standards referred to, adapted to the local context. Projects can submit a CIR to propose an alternate Standard to calculate peak demand
TRA-1	Provision of Car Parking	None
TRA-2	Fuel-Efficient Transport	None
TRA-3	Cyclist Facilities	None
TRA-4	Commuting Mass Transport	The credit requirements are applicable to the situation in Mauritius, but require minor adjustment to the calculator to omit trains from the total potential score.
TRA-5	Local Connectivity	None
WAT-1	Occupant Amenity Water	It is recommended that the credit can be maintained in its current form. In addition, similar to the recommendation made in the Ghana context report, the credit should be made a conditional requirement. In this case, a minimum of one point should be achieved for the project to be eligible for Green Star certification.
WAT-2	Water Meters	None
WAT-3	Landscape Irrigation	None
WAT-4	Heat Rejection Water	It is recommended that the credit is omitted by making it 'Not Applicable'
WAT-5	Fire System Water Consumption	None
MAT-1	Recycling Waste Storage	None

MAT-2	Building Reuse	None
MAT-3	Reused Materials	None
MAT-4	Shell and Core and Integrated Fitout	None
MAT-5	Concrete	None
MAT-6	Steel	None
MAT-7	PVC Minimisation	It is recommended that the credit is omitted by making it 'Not Applicable'.
MAT-8	Sustainable Timber	None
MAT-9	Design for Disassembly	None
MAT-10	Dematerialisation	None
MAT-11	Local Sourcing	The credit should be omitted by making it 'Not Applicable'
ECO-0	Conditional Requirement	It is recommended that ECO 0 be maintained as a conditional requirement. Projects should submit a mandatory CIR for this credit.
ECO-1	Topsoil	None
ECO-2	Reuse of Land	It is recommended that the credit is maintained in its current form, but a CIR must be submitted for projects targeting the second point referring to 'urban edge'.
ECO-3	Reclaimed Contaminated Land	None
ECO-4	Change of Ecological Value	The calculator should be adapted to the local context with the help of ecologists.
EMI-1	Refrigerant/Gaseous ODP	None
EMI-2	Refrigerant GWP	None
EMI-3	Refrigerant Leaks	None
EMI-4	Insulant ODP	None



EMI-5	Watercourse Pollution	None
EMI-6	Discharge to Sewer	None
EMI-7	Light Pollution	None
EMI-8	Legionella	The credit should be omitted by making it 'Not Applicable'
EMI-9	Boiler and Generator Emissions	None
INN-1	Innovative Strategies and Technologies	None
INN-2	Exceeding Green Star SA Benchmarks	None
INN-3	Environmental Design Initiatives	None

## 9 References

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- 5 Design Guidance – Residential Development (revised). Ministry of Housing and Lands. December 2011.
- 6 Detailed Design Guidance: Design for Sloping Sites (Revised). Ministry of Housing and Lands. December 2011.
- 7 Digest of Energy and Water Statistics – 2010, Ministry of Finance and Economic Development, Republic of Mauritius, October 2011
- 8 Draft Building Control Bill
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- 12 Mauritius Environment Outlook Report Summary for Decision-Makers
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- 19 Republic of Mauritius, 2000 and 2011 Housing Census
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