UNIVERSITY OF MAURITIUS

SDGs NEWSLETTER-UoM

Welcome to the third edition of the UoM SDGs Newsletter:

Special Edition on the Observatoire de l'Environnement

3rd Edition – October 2020

Message by The Honourable Kavydass RAMANO

Minister of Environment, Solid Waste Management and Climate Change

I am deeply honoured to contribute to this special edition of the UoM SDGs newsletter dedicated to the Research and Development component of the *Observatoire de L'Environnement*.

Indeed, the daunting global challenges are impelling us to rethink about our day-to-day lifestyle, the way we do businesses and the way we are addressing our environmental challenges. To chart a sustainable 10 years' pathway towards an ecological transition for Mauritius, my Ministry held an *Assises de L'Environnement* in December 2019 with relevant stakeholders. The consultation process was very fruitful resulting in a series of recommendations, one of which was the setting up of an *Observatoire de L'Environnement.*

This *observatoire* will, amongst others, serve as a repository of environmental data and will also provide a science-to-policy platform to foster and disseminate scientific and technological knowledge for policy development and rational decision-making.

Research and innovation are imperative for a sustainable and robust economic growth. Many institutions including public, parastatal, private bodies and even NGOs have undertaken and are currently undertaking impactful research works in Mauritius. However, their findings often remain "*dans l'oubliette"* and do not reach decision makers. In order to bridge this gap, my Ministry is embarking on an ambitious agenda to collaborate with academia and research institutions to develop the research and development component of the *Observatoire de l'Environnement*. I am pleased that the University of Mauritius is fully collaborating with my Ministry in this endeavour.

As a first step, my Ministry jointly with the University of Mauritius is organizing a half-day workshop with all relevant stakeholders to brainstorm on the modalities and way forward to support and enhance applied research and innovation on environmental issues.

I have no doubt that with the support of all stakeholders, the setting up of a science to policy platform will be a reality to serve as an advisory body for improved environmental governance, evidence-based decision-making and adaptive management.

Message from the Vice-Chancellor

PROFESSOR D JHURRY,

C.S.K., G.O.S.K., FAAS
Vice-Chancellor

It is with immense pleasure that I welcome this partnership with the Ministry of Environment, Solid Waste Management and Climate Change entrusting the UoM to lead the Research & Development component of the 'Observatoire de l'Environnement'. This is perfectly in line with UoM's vision to promote a 'Research-engaged and Entrepreneurial University' and we are most grateful to Hon. Minister Kavydass Ramano for his trust in the UoM.

This partnership focusing on research is most timely as the world including Mauritius faces (i) an unprecedented environmental and climate crisis with air, water and ocean pollution as well as a threatening of the biodiversity (ii) a rise in technological capacity where cooperation becomes a must and (iii) the digital revolution and all accompanying disruption that causes to our traditional economic model.

To address these challenges, we cannot think in terms of either the economy or the environment. We have to embrace fully the concept of sustainability and reconcile economic development with environmental sustainability and social inclusion. The UN SDG Agenda 2030 provides us with a roadmap to achieve sustainability through 6 societal transformations: education and know-how; health and well-being, clean-energy and industry, sustainable land use, sustainable cities and digital technologies.

Science and Technology lies at the heart of all six transformations. The COVID-19 pandemic and the Wakashio oil spill have both reminded us how dependent we are on S&T and how much innovation depends on S&T. It is imperative we have in our country a critical mass of scientists and engineers that can tackle problems and develop actionable solutions. At the UoM, we have put in place several projects that support the SDGs through the Agri-Tech Park to address food security and modern agriculture, the e-library to provide access to knowledge to all, the National Road Safety Observatory to contribute to solving the road safety problem in Mauritius, the green roof project for sustainable energy and the marine litter project for ocean pollution amongst others.

It is important for me to say that we do not know everything at the University, nor can we do everything on our own. It is through such partnership and through global cooperation that we can bring solutions to problems we face. The 'Observatoire de l'Environnement' will serve as a platform to draw stakeholders together to share a common vision, the starting point for addressing problems.

Education and environment / sustainability: More a conviction rather than just a vision

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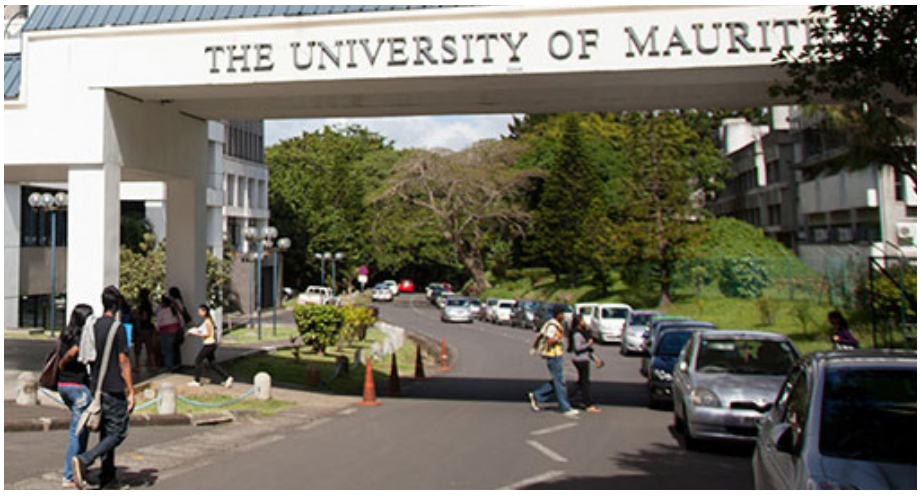
The diversity of environmental courses at tertiary level continues to increase (Cosgrove, L., & Thomas, I. (1996). The tertiary courses offered at the University of Mauritius with key terms associated with 'environment' in their title were surveyed to gain an understanding of the approach to teaching in the environmental field and to perform a quantitative assessment of the capabilities the courses sought to assist the graduates to develop. Such a survey was considered important to match the skills requirements with respect to the 17 SDGs and would serve as a basis to expand on further works to determine the extent to which graduates were being employed to meet sustainability objectives of the country.



Moreover, the modules for each programme were analysed for keywords such as environment, environment management, sustainability, marine, ecosystem, environment assessment, risk management, waste management, water pollution, industrial ecology, circular economy, green economy renewable energy, sustainable tourism, marine diversity, solar power, wind power, hazards, environmental health, disaster management, ecotoxicology, quality systems, standards, coastal ecosystems, environmental law, remote sensing, food science and safety, biosecurity, sustainable product design, and community planning.. This survey has shown that the University of Mauritius has embraced the national policy towards sustainability education by providing over seventy courses in various fields

List of fields covered by the modules at UOM) and continues to develop further partnerships to enhance on topics such as climate change adaptation and mitigation strategies for a more sustainable future.

Some fields covered by the modules on offer at UoM on sustainability education [undergraduate (UG) and postgraduate programmes (PG)]

- Sustainable environmental management
- Renewable energy technologies and sustainable energy management
- Environmental risk assessment and management
- Sustainable agri-business
- Sustainability in the textile industry (sustainable product design)
- Industrial ecology
- Sound manufacturing practices
- Coastal zone management
- Marine Environmental sciences
- Urban and community planning and environmental impact assessment
- Environmental engineering
- Environmental sciences
- Health and safety
- Sustainable tourism
- Environmental law
- Climate change and sustainable livelihoods
- Green economy

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Green roof performance for sustainable buildings under winter weather conditions in MAURITIUS

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Due to the high heat recorded in Mauritius in December 2019, a significant increase has been noted in the demand for electricity, with a peak of around 507.2 MW [1]. The peak electricity demand will continuously rise over the years, in Mauritius and the monthly mean temperature is highly correlated to maximum power demand in Mauritius thereby confirming the impact of high temperatures. Hence, this explains the massive use of air conditioning in Mauritius [5]. Accordingly, an alternative to the use of air conditioners is needed.

[8] shows that green roofs suppress the downward heat flux into the top-floor indoor area to reduce air conditioning electricity consumption. Green roof technology reduces energy consumption and improves internal comfort where the climate is characterized by high temperature and irradiance values during the day [7]. One way of reducing the impact of global warming and heat transfer into a building is the implementation of green roof technology [6].

Recent local surveys in Mauritius discuss the status of the green roof market in Mauritius and possibilities of implementation of green roofs locally [2, 3, 4]. It was found that a green roof lowers the peak of the conduction heat gain over 24 hours [3].

In [9], a team consisting of researchers from the FENG, FOA and FOS of UOM con-ducted a preliminary assessment of the performance of green roof at Reduit from July 11, 2017 to October 08, 2017. The experimental setup is shown in Fig. 1. The experimental model comprises of 9 structurally identical cells, of which 6 were equipped with green roofs.

Figure 1: The 6 green roof cells.

The efficiency of the green roof was gauged by evaluating its effect on indoor temperature fluctuations conductive heat fluxes and the daily peak indoor temperature. On site measurements of weather data and indoor temperature were collected round the clock from July 11, 2017 to October 08, 2017. It was found that green roof increases the thermal mass of the experimental cells thereby reducing the fluctuations in indoor temperature (Figs.(4,3)).

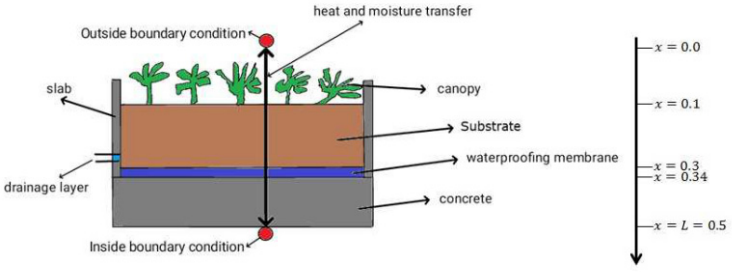

Figure 2: Structural composition of the green roof under consideration.

The green roof reduces the daily peak indoor temperature, which is attenuated significantly as compared to a conventional roof (Fig. 5). A one dimensional mathematical model was proposed in order to simulate the evolution of the heat and moisture transfer in a porous multilayer material. The numerical results showed that the model simulated the variation of the indoor temperature round the clock quite accurately during the second half of the winter season in Mauritius. The model has the ability to be integrated in decision support tools with the capacity of the physically based simulation model to be easily transferred in conditions and locations other than those used for in the present study.

Figs. (3-6) illustrate the results obtained during the study. The present study gives the preliminary design guidelines in order to implement green roof systems and to encourage the movement to install green roofs in Mauritius. The next stage is to set up the exper-imental system with external windows in order to confirm the findings in [9] for a typical civil building.

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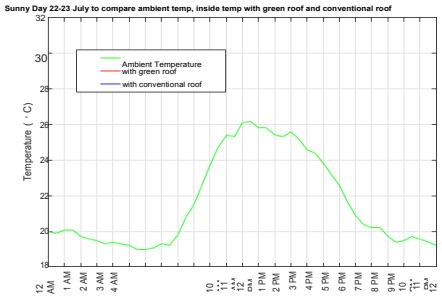


Figure 3: Indoor surface temperature for green roof and conventional roof respectively on a sunny day [9].

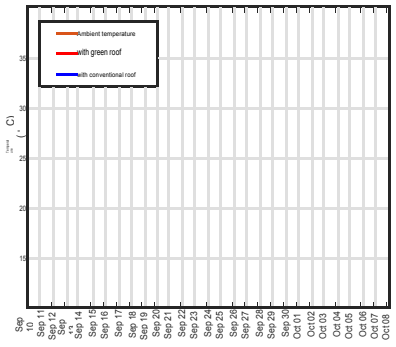
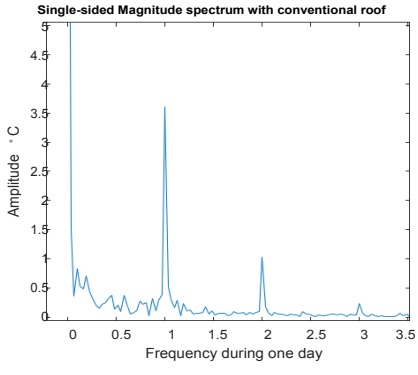
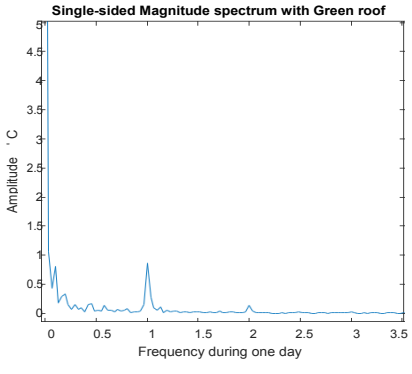


Figure 4: Variation of outside air temperature and indoor surface temperature for a green roof cell and a conventional roof respectively in late winter [9].

The green roof reduces the daily peak indoor temperature, which is attenuated significantly as compared to a conventional roof (Fig. 5). A one dimensional mathematical model



(a) Conventional roof.



(b) Green roof.

Figure 5: Distribution of peaks in daily temperature [9].

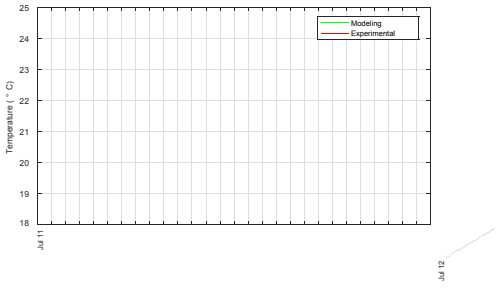


Figure 6: Experimental and numerical comparison of the temperature inside the cell with green roof in mid winter [9].

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FlexSmart:

A Dynamic and Flexible Architecture for Smart Homes

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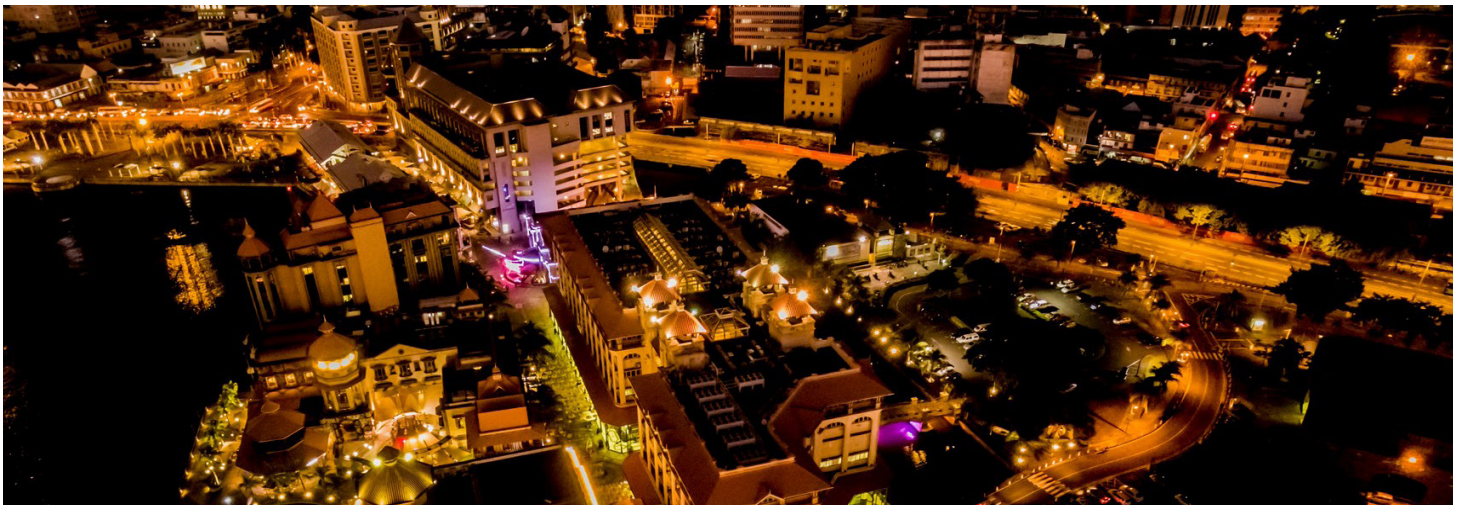

Advancements in the field of consumer electronics have led to the development of numerous home automation solutions that enable appliances to be interconnected and controlled remotely. Home automation systems present several benefits including providing safety and convenience in busy home environments, assisting individuals with physical limitations as well as managing energy usage.

Using energy efficiently in smart homes saves money, enhances sustainability and reduces carbon footprint at large. Consequently, the need for smart energy management is on the rise for smart homes and smart cities in general. However, the lack of low cost, easy to deploy, and low maintenance technology has somewhat limited a large-scale deployment of such systems.

Many of the current approaches towards achieving automation in smart spaces use proprietary solutions that are costly and that do not scale adequately. Moreover, the implementation of such systems requires the combinations of different sensing technologies and communication protocols, which are in turn developed by different providers. As a result, the integration of these varying technologies often poses significant challenges with regards to compatibility and adaptability. In this context, more open and interoperable solutions are required. Clearly, there is a pressing need for a flexible and customisable architecture that can be adapted to various usage scenarios in smart environments. Important considerations in the design of this architecture are scalability, high customisability, device heterogeneity and automatic configuration of devices. Furthermore, current smart environment solutions still lack in features with regards to safety, surveillance and energy use monitoring.

This research aims at formulating a low-cost, scalable home automation system that can be controlled using smart handheld devices with minimal user configuration. We refer to this system as a dynamic Smart Home Management System (SHMS). A prototype home automation system was implemented with a view to exploring the technical feasibility of the system as well as investigating the different functionalities that can be provided within a home environment. The prototype system comprises of an Android mobile application, capable of interfacing with different sensors and actuators, to provide different solutions such as live video feed, carbon monoxide detection and lighting control. Moreover, the system architecture (FlexSmart) decouples the different aspects of the home automation solution completely from each other, thereby providing support for sensors and actuators from different manufacturers.

At present SHMS addresses many challenges in terms of device heterogeneity, scalability, user interaction, level of customisation and feature adaptation based on context and cost. Till date, Smart Home solutions are costly, hence not affordable to everyone. Besides most of them are specific to vendors and support a fixed number of devices. Therefore, having a low-cost, interoperable and scalable system has the potential to lead to an affordable solution that can encourage the adoption of Smart Home solutions.

Corresponding SDG

SDG 11: Sustainable Cities and Communities

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Marine Litter Monitoring in the Republic of Mauritius, a contribution to understanding SDG 14.1

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The Western Indian Ocean Marine Science Association (WIOMSA) in collaboration with the African Marine Waste Network and country partners are implementing a marine litter-monitoring program in the Western Indian Ocean (WIO) region, for which limited marine litter data is available. Seven countries have been chosen, namely Kenya, Madagascar, Mauritius, Mozambique, Seychelles, South Africa and Tanzania in order to set baselines for relevant targets as required in the SDG 14.1.

The overarching objective of this regional monitoring programme is to develop litter baselines and database, identify main litter components and sources (with focus on plastics), address solid waste management issues, propose strategies for reducing marine litter inputs, opportunities for the circular economy, and development of education manuals.

This regional project is also geared towards developing standard protocols and uniformity in sampling. A marine litter-monitoring guide has been developed with contributing authors from University of Mauritius (Chapter 5: Macro-Litter Monitoring in Mangrove and Chapter 6: Maso-Litter Monitoring in Mangrove), which focuses on developing monitoring programmes mainly from land-based sources of litter.

The main outcomes of the study are:

i. Development of a baseline of marine micro-, meso- and macro-litter around Mauritius and Rodrigues, and islets;

ii. Mapping of marine litter hotspots and tracking of source and movement; locations, using GIS techniques;

iii. Social factors influencing marine litter;

iv. Recommend strategies for marine litter and solid waste management.

Education Entrepreneurship & Sustainable Development

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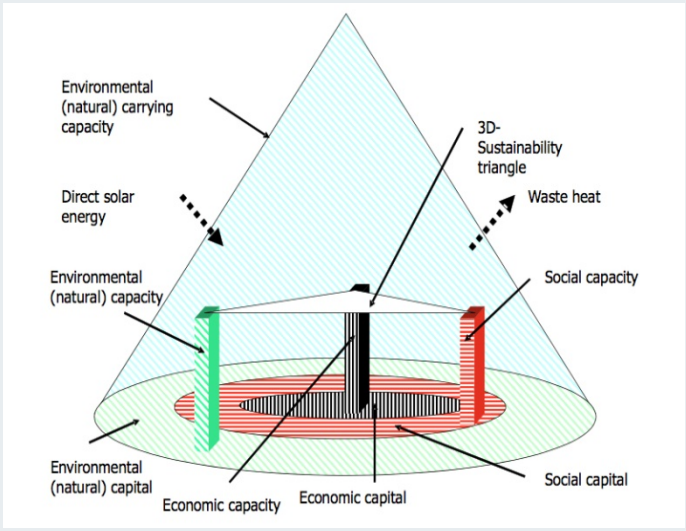
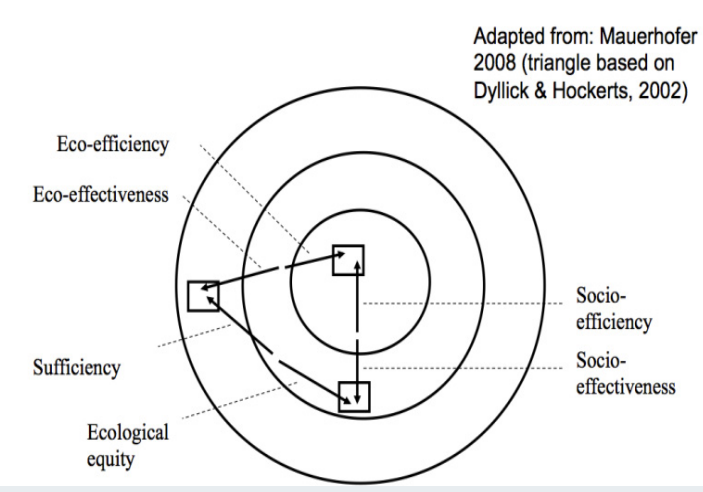


Sustainable Development Goals bent towards social-economic development otherwise they have no purpose to exist and would beat the system provided, however, there is a sane environment for them to sustain and develop properly. It is in these three main dimensions that these goals may be achieved otherwise they die coupled with sub existing factors such as, inter alia, finance, tourism, entrepreneurship, peace, management and various promotions for them to develop at maturity in a clean environment. Strangely enough, a survey carried out recently (Dowarkasing 2013) reflects to what extent a majority of respondents, including people in the legal profession, have not heard of the terms "sustainable development" or "sustainability" ! This article shall therefore demonstrate the importance of sustainable development and its education using the 3-D sustainability conceptual framework.



As per the Brundtland Report, the development of Sustainable Developments Goals is "The development that will meet the needs of this generation without compromising the needs of the future generations''. In other words, we must all leave this world in a better way we got. Education is at the centre of this development as it caters for human needs, enhance economic growth and the needs of humans and their social environment. Various models exist already (Dowarkasing 2013), and there is no need to invent the wheel, once the economic capital may in turn nature capital by humans. And for it to sustain in the long term various international conventions have been implemented by most countries to better achieve the development process and its compliance coupled with our domestic laws to impose penatlies, if necessary, like in any all civilized country.

Why is the SDGs' education important? Compared to other countries, the Mauritian Constitution, 1968 does not provide for any relevant provision on sustainable development or on the environment per say until the Mauritian legislator passed a plethora of related environment legislations to better cater for our, *inter alia*, environment, biodiversity, wildlife and national parks. It is widely recognized and accepted that education is an effective tool for sustainable development in terms of providing training and raise public awareness on sustainable development. In as much as there is no specific laws in relation to education that are explicit on the need to educate people on sustainable development, it has to be noted that children, at the earliest age should be given the opportunities to attend school, starting from pre-primary school, so as to be in an education environment where awareness can be raised on sustainable development. The Final Report on the Working group on Education recommends that policies be formulated to provide equal opportunities to all students and that free basic schooling be offered to children especially focusing on vulnerable groups. The methods of assessment at primary level schooling have also been deemed to be insufficient and it is recommended to review it so as to take on board multiple skills, artistic abilities and musical abilities. These students are also prospective students at the University of Mauritius (UoM) in the next generation. Therefore, support UoM Entrepreneurial and Sustainable Development must be catered of in:

•Promoting Research & Innovation

•Offering Quality Education

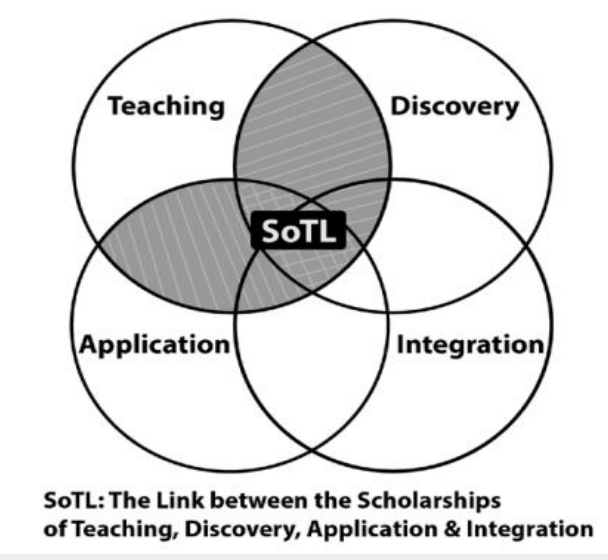
•Fostering link with stakeholders and industries

• Supporting the development of the country though capacity building

• Financial sustainability and community engagement

• Regionalisation and Internationalisation

• Ensuring a pleasant, dynamic, confident and vibrant learning environment both for students, staff and academic to ensure an efficient administrative and technical support in order to grow and prosper in an excellence socially, professionally and academically



SoTL: The Link between the Scholarships of Teaching, Discovery, Application & Integration

The Planning and Development Act of 2004 has as objective to provide, in relation to land development, ecologically sustainable development as provided for in Section 3 of the Act. The National Development Strategy that needs to be prepared and adopted by the relevant ministry(ies) consist(s) of plans, policies and guidelines with mechanisms for their implementation, which aim at creating and stimulating investments in the public and private sectors so that economic growth and social development in relation to land development can be undertaken in a sustainable and equitable manner, so as to maintain and enhance the natural and built environment. In addition, all development plans must take into account the sustainable aspect of as provided by section 15 of the Act - A development plan shall include such of the following matters as the Minister, or other planning authority, may deem necessary a statement, explanation and justification of policies and proposals for the future sustainable development of the area.

[1]M. Dowarkasing (2013), Legislation checks of the sustainability concept within the major environment-related laws of the Republic of Mauritius, MSc dissertation (under the supervision of Professor (Dr) R.P.Gunputh and Associate Professor (Dr) Ranjeet Bhagooli), University of Mauritius.

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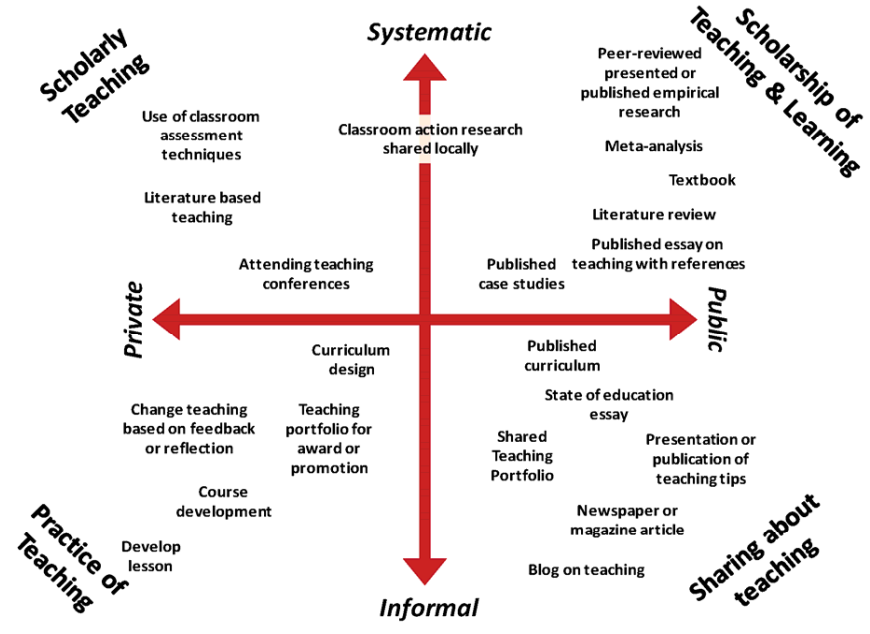

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An Assessment of Food Waste generated by the Food and Beverages sector of the Hotel Industry in Mauritius for Sustainable Food Waste Management

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According to the FAO, roughly one-third, about 1.3 billion tons per year, of the edible parts of food produced for human consumption, gets lost or wasted globally. Food waste refers to discarded food that is still appropriate for human consumption (Parfitt, 2010). Per capita waste by consumers is between 95-115 kg a year in Europe and North America, while consumers in sub-Saharan Africa, south and south-eastern Asia, each throw away only 6-11 kg a year (FAO, 2014). As the production of food is resource-intensive, food wastes are accompanied by a range of environmental concomitants, such as soil erosion, deforestation, water and air pollution, as well as greenhouse gas emissions that occur in the processes of food production, storage, transportation, and waste management (Mourad, 2016). This means that a large quantity of resources used in the production of food goes to waste and that the greenhouse gas emissions caused by it could have been avoided. Due to these growing environmental but also social and economic concerns, food waste is increasingly acknowledged as an urgent issue among governments, businesses, Non-Governmental organisations (NGOs), academics, and the general public.

The tourism industry within the hospitality industry in Mauritius is one of the important pillars of the Mauritian economy and it is expected to witness significant growth in the next few years and challenges post COVID-19. Despite a growing number of studies in other countries, little is known about the determinants of food waste in the tourism industry most specifically from the Food and Beverages sector of hotels in Mauritius as well as the underlying factors that encourage, drive or impede food waste behaviours and practices.

This study aimed at exploring food waste generation and food waste management strategies by the hospitality industry and most specifically from the Food and Beverages (F&B) Sector in selected hotels in Mauritius. The unit of analysis for the case study was a few selected hotels which were agreeable to participate in the study, given the complexity of achieving a random sample in this situation. The approach used was a mixed method including in-depth and semi-structured interviews, observation, and also quantitative data collection techniques. Food waste generation were studied from the time of purchasing of raw food supplies, through food storage, preparation and cooking, consumption and, finally, discarding of food waste (Papargyropoulou *et al*., 2016).

The research methods are detailed below and were based on the conceptual framework devised by Papargyrypoulou *et al*. (2016) as shown in Figure 1.

Results

Food waste that occurred during preparation was found to be unavoidable and some were also partially avoidable while the food waste that occurred on buffet and consumer plates was mostly avoidable. Customers leftovers accounted for the most food wastage which are considered to be partly avoidable. When comparing peak season with off-peak season, it was clearly observed that most of the food wastage is indeed caused by the customers, which was also observed by the study of Khanh Linh (2018). When peak and off peak seasons were compared it was seen that more food wastage occurred during the peak season.

To tackle the problem of food waste it is important to educate the people about the issue as this will allow them to change their habits towards food. Making changes in the ways that foods are sold or exposed can be helpful in extending the shelf life of food. These can be achieved by methods like planning meals before cooking, checking available food levels prior to shopping,

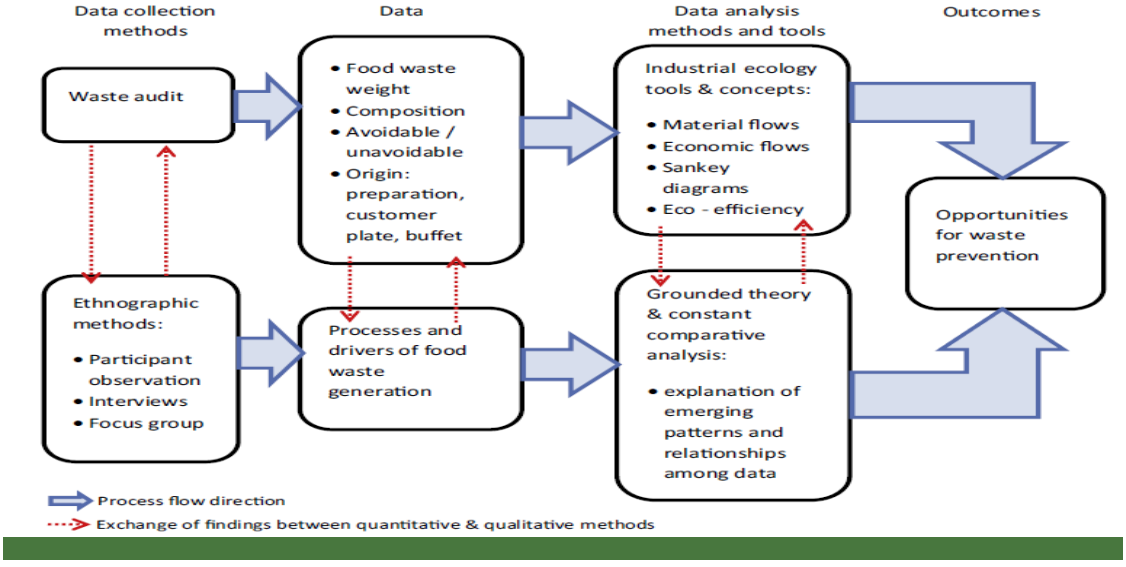

Figure 1: Conceptual framework for the study of food waste generation and prevention in the hospitality sector

making use of shopping lists, training staffs on how to store specific food items, the use of a freezer to extend food shelf life, reducing serving portions, using leftovers in a creative manner and providing knowledge about date-labels on food (Quested et al., 2013). Strategies and recoveries such as vermicomposting, food rescue programs, adoption of portion plates, source reduction, customer education and adoption of food waste diary are recommended.

With the growing importance of Mauritius as an increasingly popular holiday destination and due to the global nature of the COVID-19 pandemic challenge, this research will help the tourism industry better manage the growing problem of food waste by identifying the inputs and factors that contribute to the problem. It can also assist hotels in acquiring a green hotel label.

Food waste reduction can help to mitigate climate change. Annually, food waste disposal accounts for 7% of global gas emissions (3.3 billion tonnes CO_2 equivalent). Undeniably, reducing food waste can save our environment and less food waste will end up in landfills, thus contributing to less environmental pollution. The Republic of Mauritius can also be made more visible in the region as a country working concretely towards SDGs.

Business Managers in the Food and Beverages sector in the Hotel Industry at all levels can adopt food waste management strategies and save financially by throwing away less food. They can also increase their visibility as environmentally and socially responsible entities that work not only for commercial objectives, but also for the benefit of society at large. Any financial savings made from food waste reduction strategies can be passed on to consumers through reduced costs of meals. Consumers can also be encouraged to change their eating behaviour by wasting less food in food service outlets. Cost savings can also be proportionately diverted to other sub-sectors, for example, sourcing of responsibly-grown foods (Bio-farming/ MauriGAP/ Eco-Cert/ other eco-labelled foods) for the benefits and well-being of consumers and tourists at large. Wasted food in hotels, as well as restaurants and canteens may be meticulously managed to provide food to the undernourished communities. NGO's, '*force vives*' communities are likely to benefit from the deliverables of the project, by planning for more effective distribution of wasted food to the poverty-inflicted families.

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Corresponding SDGs:

SDG 2 Zero hunger

SDG 11 Sustainable Cities and Communities

SDG 12 Responsible Consumption

SDG 13 Climate Action

Status: Started in 2019 and completed in April 2020.

SUSTAINABLE DEVELOPMENT GOALS

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Ministry of Environment, Solid Waste Management and Climate Change

UNIVERSITY OF MAURITIUS

Programme
Half-Day Workshop on

Observatoire de L'Environnement
(Research & Development Component)

Programme of the day

Opening

09h 15-09h 17	Welcome Address
09h 17-09h 25	Address by **Professor Dhanjay JHURRY**, *CSK, GOSK* Vice Chancellor, University of Mauritius
09h 25-09h 35	Speech by **Hon Kavydass RAMANO** Minister of Environment, Solid Waste Management and Climate Change
09h 35-09h 45	Keynote Address and Opening of Workshop by **Hon Mrs Leela Devi DOOKUN- LUCHOOMUN,** *GCSK* Vice-Prime Minister, Minister of Education, Tertiary Education, Science and Technology
09h 45-09h 50	Launching of the Special Edition of UoM SDGs Newsletter on *Observatoire de L`Environnement*: Research & Development Component
09h 50-10h 20	Tea Break & Visit to Exhibition on Ongoing Research by UoM Staff and Students

Workshop

10h 20-10h 30	**Presentation** by Dr Rajendra Kumar Foolmaun, Divisional Environment Officer, MOE on: Setting up of the ***Observatoire de l'Environnement***
10h 30- 11h 30	**Presentations by University of Mauritius**
	Theme: Education, Gender and Equality Dr Robin NUNKOO, Associate Professor, Dept of Management, Faculty of Law and Management, and Head, International Centre for Sustainable Tourism and Hospitality
	Theme: Health, Well-being and Demography Dr Marie France CHAN SUN, Associate Professor, Dept of Medicine, Faculty of Science Dr Vidushi NEERGHEEN, Associate Professor, Dept of Health Sciences, Faculty of Science and Biopharmaceutical Unit, Centre for Biomedical and Biomaterials Research
	Theme: Energy Decarbonisation and Sustainable Industry Dr Vimi DOOKHUN, Senior Lecturer, Dept of Chemical and Environmental Engineering Dr Yatindra RAMGOLAM, Senior Lecturer and Head, Dept of Electrical and Electronic Engineering, Faculty of Engineering
	Theme: Sustainable Food, Land, Water and Oceans Dr Sushma MATTAN-MOORGAWA, Senior Lecturer & Head, Dept of Biosciences and Ocean Studies, Faculty of Science Mr Shane HARDOWAR, Senior Lecturer, Dept of Agricultural Production and Systems, Faculty of Agriculture
	Theme: Sustainable Cities and Communities Dr Manta NOWBUTH, Associate Professor, Dept of Civil Engineering, Faculty of Engineering
	Theme: Digital Revolution for Sustainable Development Dr Baby GOBIN-RAHIMBUX, Acting Dean, Faculty of Information, Communication and Digital Technologies
11h30 – 12h 30	**Discussion on Modalities, Collaboration and Way Forward** **Moderators:** Professor Toolseeram Ramjeawon, University of Mauritius Mr Jogeeswar Seewoobaduth, Deputy Director, Ministry of Environment, Solid Waste Management and Climate Change