

NEWSLETTER

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FOREWORD BY DIRECTOR



Dear Readers,

This year, the Mauritius Oceanography Institute (MOI) has witnessed several key projects being implemented while others have been successfully completed.

As we emphasised in previous editions, climate change has reached a critical point where we absolutely need to reduce our greenhouse gas emissions worldwide. Renewable energy symbolise hope to achieve our target on the Paris Agreement and to reduce our dependency on fossil fuels. Towards this end, the MOI has installed photovoltaic solar panels on its buildings to help reduce its carbon footprint and generate clean energy to meet its energy demands. Importantly, this year has also seen the launching of a wave energy converter prototype by a team of scientists from the MOI and the University of Mauritius. This low-cost prototype offers numerous advantages for Small Islands Developing States (SIDS) such as Mauritius to tap into their extensive marine renewable energy potential to meet their energetic demands and we look forward to further consolidate and develop this prototype on a larger scale.

Corals are impacted through fluctuations in temperatures, excessive nutrient levels, climate change, along with anthropogenic causes, and currently, around 80% of the coral cover around Mauritius has been affected. Our Community Based Coral Culture Project set out to create a skilled labour force in the techniques required to create and maintain coral gardens. This project is drawing to an end and we are pleased to report that

we have successfully been training 110 men and women in four coastal areas around Mauritius in coral culture and gardening techniques.

The MOI has been and remains committed to inventory the marine specimens found in the Exclusive Economic Zone (EEZ) of the Republic of Mauritius. Back in 2016, the Biological Oceanography Unit successfully undertook the genetic identification of all the commercial/market fish specimens found on the local market. Riding that wave, the team proceeded to identify all the species of sea cucumber available in the waters surrounding Mauritius, successfully identifying 21 species. Currently the team is involved in the identification of the different types of molluscs, some of which can be easily spotted on a trip down the beach. In the future, the MOI will look into identifying species from other Phyla such as Arthropoda and Porifera.

Earth Observation (EO) technologies are nowadays playing an increasingly important role in supporting economic and social developments and is therefore of interest to all; policy makers, scientists, businesses and society at large. In this context, the African Union (AU) is implementing an EO Programme namely the Global Monitoring for Environment and Security (GMES) and Africa. This Pan African programme is jointly funded by the European Union (EU) to address the growing needs of African countries to access and use EO data for the implementation of sustainable development policies in the region. In the framework of this project, the MOI as the Regional Implementation Centre (RIC) for the Indian Ocean Commission (IOC) thema Marine and Coastal Management has been awarded a grant of 1.2 Million Euros. The MOI will be working with the Tanzania Fisheries Research Institute (TAFIRI), Kenya Marine Fisheries Research Institute (KMFRI), Institut Halieutique et des Sciences Marines (IHSM) of Madagascar, Seychelles Meteorological Authority (SMA) and the Western Indian Ocean Marine Science Association (WIOMSA) based in Tanzania to promote a more sustainable management of marine

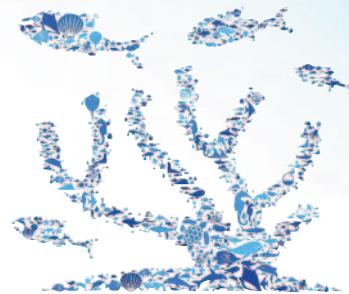
and coastal resources by improving decision making process through satellite derived data and findings. The project was officially started at the kick off meeting in August 2019 and was attended by its national and regional partners.

New collaborations and working agreements are being successfully implemented to further the scientific agenda of the Institute and also to build the technical capacity of its staff to develop and implement new projects which will help the development of the Blue Economy.

Please read on to find out more about these exciting new developments at the MOI. Further information can be obtained from our website.

I would like to seize the opportunity to convey our best wishes and Season's Greetings to all our readers. We look forward to an interesting year ahead

Dr. Ruby MOOTHIEN PILLAY
Director



PREFACE BY CHAIRMAN



Problems identification and the provision of solutions to mitigate negative impacts in marine environments are interdisciplinary in nature and require state of the art data collection technology, interpretation and laboratory modelling. These require inter-institutional and inter-regional cooperation and team based research.

The MOI is engaged in an electrical energy shift from brown energy to green energy by setting up a photovoltaic unit and then to blue energy. The Ocean has a lot to offer to mankind, especially in terms of renewable energy potential. The MOI has designed and tested successfully a simple but effective technology to extract wave energy. In so doing, the Institute is contributing to make the difference and chartering the way towards achieving the 35% green energy objective set by Government.

Since July of this year, the GMES and Africa Project aiming to strengthen the capacities of the use of EO data in the region with a focus on marine and coastal environment has been given a new boost. It is

an honour that MOI, based on its previous successful deliverables, has been chosen to lead the consortium for the East Africa region.

I welcome the publication of this new edition of our OceanQuest and congratulate all staff of MOI for their dedication to research and development.

Merry Christmas 2019 and Happy New Year 2020!

**Prem Saddul,
Associate Professor
Chairman**

I welcome the 10th edition of OceanQuest which provides clear glimpses of different activities being carried out by the MOI as well as proactive initiatives being taken for the sustainable management of our marine ecosystem.

This issue shows that the MOI is doubly aware that global warming of ocean waters impacts disproportionately on the lagoon and coastal ecosystems of SIDS especially those located in tropical seas.

Unveiling the marine renewable energy potential- Launching of the Wave energy converter prototype

The MOI has always been monitoring the temporal variations of wave regimes since its inception. This has been achieved using state-of-the-art technologies comprise of Wave-Tide-Recorder (WTR) gauges and a Fugro Wave Buoy. The wave profiles of several regions around the island have been probed and analysed and include among others, the regions of Port-Louis, Grand-Bay, Trou d'Eau Douce, Flic-en-Flac, Tamarin. Additionally, in the context of a regional implementation project, Monitoring for Environment and Security in Africa (MESA), a Fugro Wave Buoy was deployed at Roches Noires to collect three years of spectral wave data which has been distributed to major stakeholders.

With an impressive database of wave data owned by the MOI, researchers of the institute engaged in probing into the wave spatial and temporal variations, with the purpose of characterising the different wave regimes of the island. The outcome of this study was the publication of a peer-reviewed research paper, indexed in the Springer journal of Germany. Recognising the abundant untapped wave energy potential that can be derived from our coastal and offshore regions, the MOI embarked on a project involving the tapping of surface wave energy using an oscillating water column principle back in 2017. The main objective of the project was to showcase the possibility of generating electricity from waves using a low-cost device. A two-phase approach was initially used for the successful completion of the wave energy converter prototype. The first phase involved the construction of the floating platform and air chamber by the MOI whilst the second phase was mostly targeted at implementing the power take-off module by collaborators from the University of Mauritius. After numerous trials and testing the prototype was finally operational and was successful at converting energy from waves into electricity.

This project is in line with Government's vision of achieving 35% renewable energy by 2025. The successful completion of this project would enable the Government to come up with a low-cost alternative to fossil fuel use, by gearing the Blue Economy into Marine Renewable Energy resource exploitation. Such a strategy would serve the dual benefits of reduced fossil fuel imports mostly from the Middle-East, in addition to establishing mitigation strategies concerning the rising concerns of climate change.

On the day of the launching of the prototype, a seminar was held in the morning at the MOI on marine renewable energy. Various presentations were made by stakeholders including MOI, Mauritius Renewable Energy Agency (MARENA), University of Mauritius (UoM), Université des Mascareignes (UdM) and Mauritius Research and Innovation Council (MRIC).

The afternoon session included a video presentation followed by the launching of the wave energy converter by the Hon. Minister of Energy and Public Utilities, Mr. Ivan Leslie Collendavelloo in the presence of the Minister of Ocean Economy, Marine Resources, Fisheries and Shipping, Hon. Mr. Premdut Koonjoo.

Mr Jay Doorga



Address by Acting Prime Minister, Minister of Energy and Public Utilities, Mr. Ivan Leslie Collendavelloo



Address by Minister of Ocean Economy, Marine Resources, Fisheries and Shipping, Hon. Mr. Premdut Koonjoo



Address by Chairman



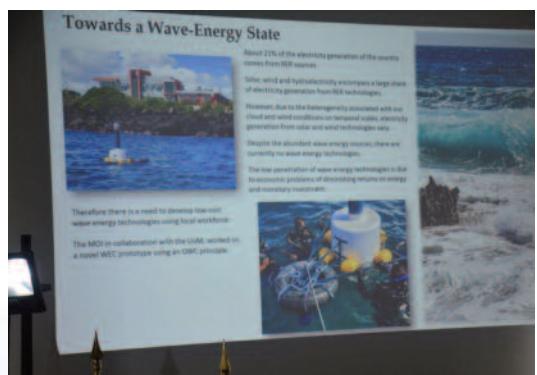
Address by MOI Director



Photo of the audience



Presentation By Staff



Presentation Of Wave Energy State



Presentation by Staff



Wave energy prototype

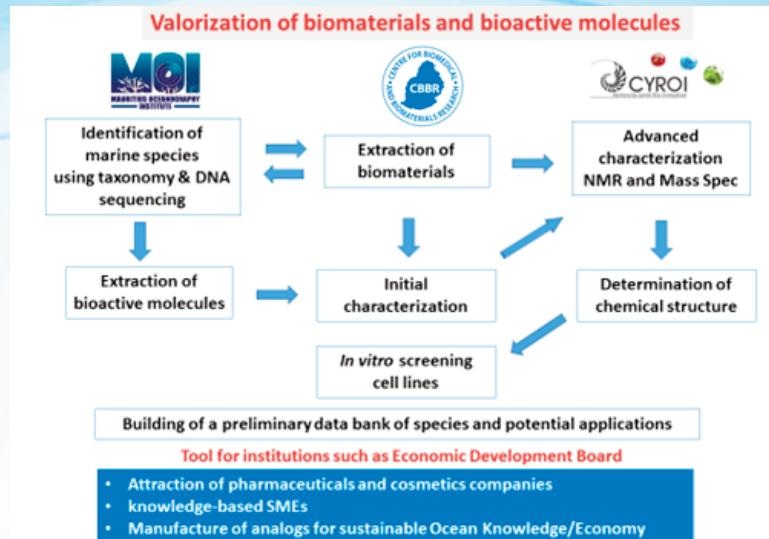


Launching of the Wave energy prototype



Members of the MOI team

Joint research project between MOI-CBBR-CYROI on the “Valorisation of marine resources of the Indian Ocean: Biopolymers and active biomolecules for biomedical and cosmetic applications”



In 2017, the MOI signed a Memorandum of Understanding (MoU) with the UoM for five years to increase collaboration in areas of biological, chemical and physical oceanography, marine sciences, biotechnology and geosciences. In this context, in 2019, the MOI, the UoM and Cyclotron Réunion Océan Indien (CYROI) signed a Research Collaborative Agreement (RCA) for the project “Valorisation of marine resources of the Indian Ocean: Biopolymers and active biomolecules for biomedical and cosmetic applications”. This project is being funded by the Tertiary Education Commission (TEC) under the Inter-disciplinary/inter-institutional Team based Research 2018/2019 over a period of three years and aims at screening specific species of marine sponges and seaweeds for bioactive molecules and biomaterials collected in Mauritius and Rodrigues.

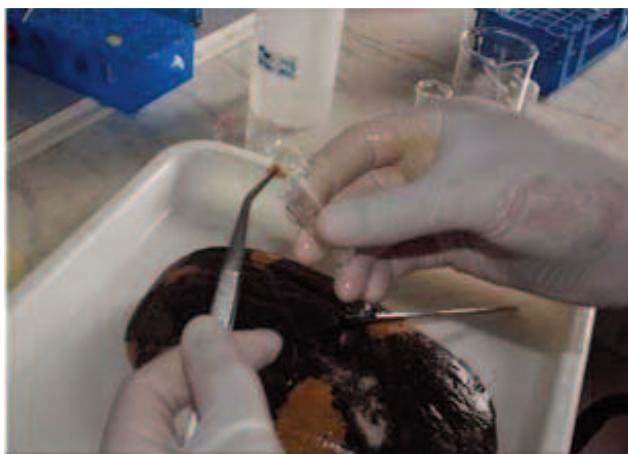
This project will bring together the competencies of three institutions namely the MOI, Centre for Biomedical and Biomaterials Research (CBBR) Unit (Biomaterials, Drug Delivery and Nanotechnology Unit) and CYROI in specific areas. Over the past decade, the MOI has developed significant expertise in the screening of marine extracts for their biological properties. The ongoing research has identified around 50 species of marine sponges, whose extracts have been tested for their anti-cancer, anti-Alzheimer, anti-diabetic and antioxidant activities. The CBBR Unit has been actively involved in the extraction, characterisation and application of some biopolymers in nanoscaffolds for tissue engineering and over the years has built strong expertise in the field of biopolymers. CYROI Research Platform (La Réunion) has a technological arsenal to carry out multi-disciplinary research projects which includes characterisation of new materials using amongst others the most advanced NMR system in the Indian Ocean Region. They have expertise in characterising plant-based bioactive molecules.

The team of this joint collaborative project would create a data bank of active molecules/biomaterials from marine resources of the region and their potential applications which would eventually attract pharmaceutical and cosmetic companies. Rodrigues has also been included as such studies are scarce. More importantly, this collaborative research work will pave the way for in vitro chemical synthesis of analogs for an environment-friendly approach to materials discovery and overcome the over-utilisation of marine resources as well as the use of destructive collection practices.

Mr. Avin Ramanjooloo

Assessment of marine living resources in the EEZ of Mauritius

Inventory of sea cucumber



Tissue sampling for DNA extraction

Sea cucumbers also known as holothurians are a conspicuous and diverse group of echinoderms in the world's ocean. They can be found throughout the marine environment, from the intertidal and shallow seas to abyssal depths. They are particularly prominent in tropical regions where they inhabit soft sediment and reef environments. Most sea cucumbers are detritivores and provide important ecosystem services enhancing nutrient cycling and local productivity in oligotrophic carbonate sediments through their bioturbation and deposit feeding activities. In addition to their important ecosystem functions, many holothurians are also the focus of artisanal or commercial fishing efforts and are traded as 'bêche-de-mer'. Sea cucumbers have a high nutritional value and are regarded as traditional delicacies. A total of 52 species are commercially exploited worldwide as food

with most of them located in the tropical and sub-tropical regions.

Despite the relatively large size and dominance of these mobile invertebrates on reef flats and lagoons, the taxonomy of many sea cucumbers is uncertain. This is due to the difficulty in application of traditional taxonomic characters such as body profile and skeleton morphology, which have not been used in sufficient detail to distinguish cryptic species.

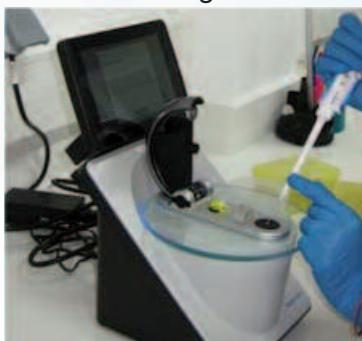
At the MOI, sea cucumbers inhabiting the coastal waters of Mauritius have been identified using a combination of taxonomical characters as well as more contemporary DNA-based techniques. The technique, commonly referred to as DNA barcoding, involved the amplification of a section of the mitochondrial cytochrome c oxidase I (COI) gene. This tool greatly speeds up traditional taxonomic investigations and allows the accurate assessment of holothurians composition. Through the DNA-based approach, 21 species of sea cucumbers have been identified and uploaded on the MOI online marine diversity and genetic database.



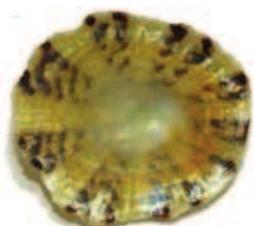
Microscopic spicules examination of sea cucumber tissue

Inventory of marine molluscs

Marine molluscs live in various habitats ranging from shallow areas including intertidal rocky shores and mud-flats to depth of 9,000 m. They provide tremendous socio-economic benefits, serving as food sources, ornaments and home decorative items and are also considered as a potential drug cabinet. In addition, their shells are used as raw materials for the production of lime and cements. Some species of marine molluscs act as scavengers in cleaning the environment and also as pollution indicators. Marine molluscs are also considered a potential drug cabinet; their secondary metabolites have been reported to contain compounds that have anti-microbial, anti-inflammatory, anti-cancer, anti-oxidant and anti-tumour properties. Although marine molluscs have been the subject of considerable research, the number of species remains uncertain for several reasons, e.g. due to the existence of cryptic taxa that exhibit phenotypic plasticity, as well as a shortage of molluscs taxonomists. All these factors impede morphological approaches to species identification and highlight the imperative need to integrate molecular diagnostics for identification of molluscs species.



DNA concentration measured using the Nanodrop spectrophotometer



Cellana radiata (Univalve)



Scapharca globosa



Nerita aterrima (Gastropod)

Following a regional training workshop on marine molluscs in Mauritius waters, funded by the European Union (EU) through the Commission de L'Ocean Indien (IOC), in October 2017, that saw the participation of 25 scientists from across the western Indian Ocean region, including participants Mauritius and Rodrigues, a survey of the invertebrates was undertaken from various sites around Mauritius. Molluscs specimens consisting of univalves, bivalves and gastropods were collected in the coastal waters of Mauritius. The workshop was run by Dr M. Kosnik from the University of Macquarie, Sydney, Australia. Currently, the MOI is identifying the specimens sampled, using a DNA-based approach along with traditional taxonomy techniques. Following DNA extraction from molluscs specimens, the COI gene is amplified and sequenced so as to determine the DNA barcoding profile of the organism.

Mr. Sarvanen Curpen

Mapping the physico-chemical parameters of the Blue Bay Marine Park

In the event of climate change and other anthropogenic factors, the world is currently facing its 6th mass extinction. “The trend is hitting global fauna on multiple fronts, as hotter oceans, deforestation, and a climate change drive animal population to extinction in unprecedented numbers” (A. Woodward). Marine protected areas (MPAs) play an important role in that scope as a regulatory tool for the conservation of sensible ecosystems.

The International Union for Conservation of Nature (IUCN) defines an MPA as “a clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values”.

They exist in many regions around the globe, and are also referred to as marine parks, sanctuaries, reserves, or closures. As of early 2019, only 4.8% of the world's oceans are protected in implemented and active MPAs. The Republic of Mauritius has, so far, proclaimed six fishing reserves and two marine parks namely Balaclava and Blue Bay, as well as five fishing reserves, four marine reserves and a multiple-use MPA (South East Marine Protected Area) in Rodrigues.

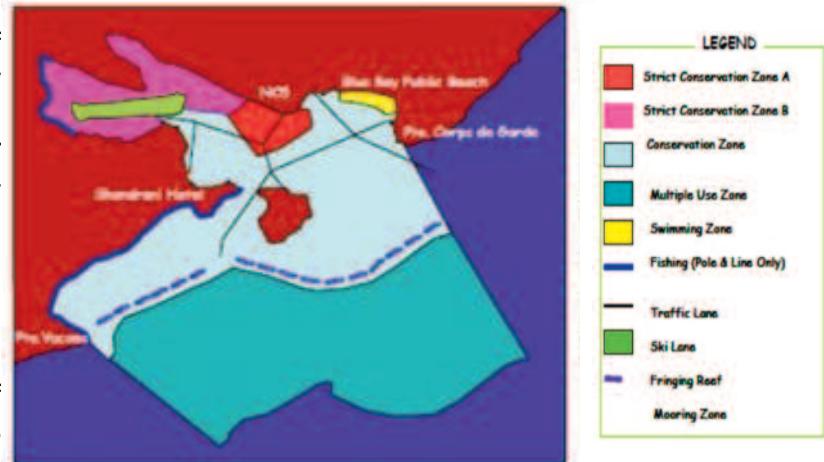


Figure 1: Zoning plan of Blue Bay Marine Park[8]

The Blue Bay Marine Park was proclaimed a national park in October 1997, and then declared a MPA and designated as a marine park in 2000 under the Fisheries and Marine Resources Act 1998. It is the second Wetland of International Importance (Ramsar site) in Mauritius. “The Fisheries and Marine Resources (MPAs) Regulations 2001 provide for the control, surveillance and sustainable management of the various permissible activities within the park through a zoning plan, enforcement of the law, permit system, education campaigns, and research and monitoring”.

The Blue Bay Marine Park is located in the south-east of Mauritius and extends over an area of 3.5 km². It is known for its diverse and rich fauna and flora. Its coral, including brain coral measuring 6–7 m in diameter, is particularly notable. In 2012, 108 species of coral, 233 fish species and 201 species of molluscs were inventoried.

In a step to enhance the management of MPAs, the MOI has been undertaking a study of the lagoon within the Blue Bay Marine Park.

The survey started in May 2019 and aims to characterise the lagoon with respect to its physico-chemical parameters, biological and geological characteristics. For the physical characterisation, an electromagnetic current meter (ECM) and a multiparameter conductivity, temperature and depth (CTD+) instruments are used for in situ measurements of the lagoon. The ECM collects relevant information of the water current, including turbidity measurements. The CTD+ on the other hand, provides conductivity, temperature, pressure, salinity, density and fluorescence measurements among others.

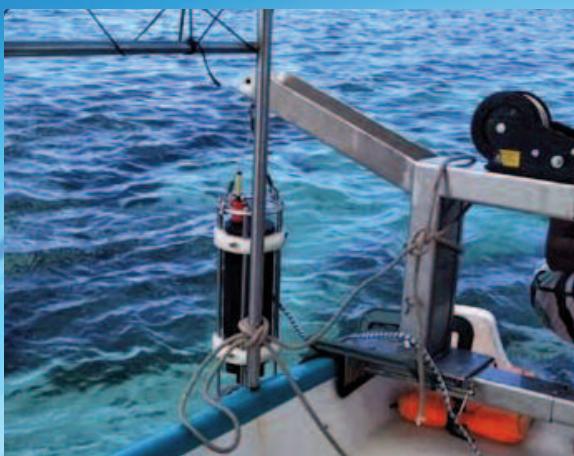


Fig. 2: CTD+ instrument

These measurements are processed on a geographical information system (GIS) software and the results will be used in advising policy-makers and marine spatial planning. Moreover, information provided will offer baseline data for further studies to be undertaken.

Mr. Ruben Louis

Community Based Coral Culture Project in the Republic of Mauritius

In 2017, the MOI in collaboration with the Albion Fisheries Research Centre (AFRC) initiated a “Community based coral culture project in the Republic of Mauritius”. This three-year project aims at training and capacity building of coastal communities in coral culture and reef rehabilitation techniques, hence providing additional skills to the communities. The project which is in phase with the Government’s initiative of “Promoting coral culture as an alternative livelihood for fisherman and coastal communities for conservation of marine biodiversity”, is currently being implemented at four locations around the island, namely La Gaulette (LG), Quatre Soeurs (QS), Grand Gaube (GG) and Bel Ombre (BO). At these sites, awareness raising programmes are carried out for sensitisation of defined stakeholders, local communities and the public at large.

During 2019, activities under the project continued at the four project implementation sites; 110 trainees have registered under a “Coral Culture Training Programme” (CCTP) (Fig. 1). These trainees have so far benefited from specific trainings as enumerated in the table below:

Project activities	Implementation sites			
	LG	QS	GG	BO
Coral biology, coral culture and rehabilitation techniques.	✓	✓	✓	✓
Construction and set-up Demo sea-based coral farms.	✓	✓	✓	✓
Maintenance, monitoring and management of Demo farms.	✓	✓	✓	✓
Coral transplantation and creation of coral gardens.	✓	✓		
Maintenance, monitoring and management of coral gardens.	✓	✓		
Snorkeling and PADI-Emergency First Responder (EFR).	✓	✓	✓	✓
Training as eco-guides.	✓	✓		

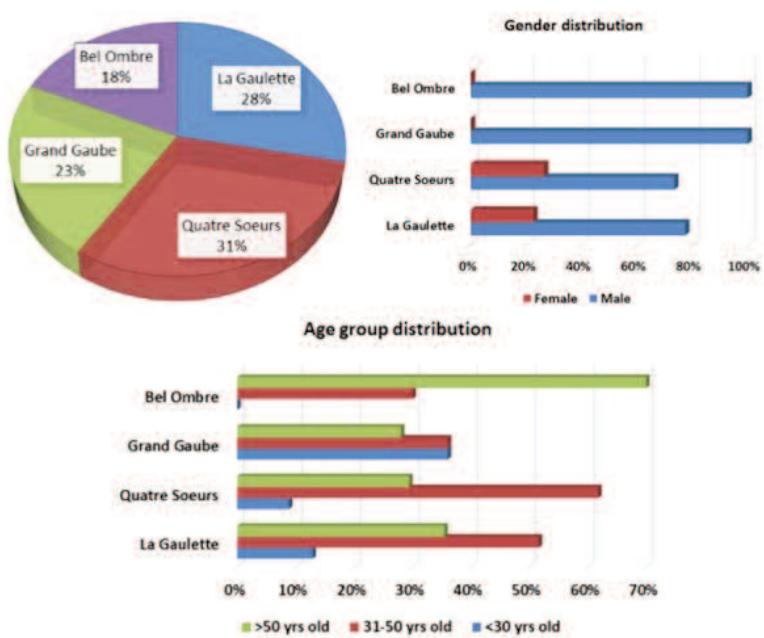


Fig. 1: Mean percentage (%) of trainees (based on gender and age groups) registered under the CCTP at LG, QS, GG and BO (n=20-34)

Fig. 1: Mean percentage (%) of trainees (based on gender and age groups) registered under the CCTP at LG, QS, GG and BO (n=20-34)



Fig. 2: Classroom sessions at QS Community Centre and LG Village Hall

Training of CCTP-participants is through theoretical classroom courses and hands-on practical/field sessions at sea. Throughout the project, CCTP-participants have been provided with the necessary course materials (i.e. booklets, flyers, etc.) and field accessories (i.e. snorkeling sets, protective field equipment, etc.) (Figs. 2–6).

At the four sites, coral under culture are from the Acroporidae, Helioporidae, Pocilloporidae and Poritidae families. Mean survival rate for all coral species at the culture sites is >50%. Maintenance of the demo farms and coral gardens (i.e. cleaning from fouling organisms, predators, algae, etc.) is undertaken once per month.



Fig. 3: Farm construction at LG, QS, GG and BO respectively (from top to bottom row)



Fig. 4: Demo farm set-up, monitoring, maintenance and management at LG, QS, GG and BO respectively (from top to bottom row)



Fig. 5: Transplantation of nursery-grown coral colonies to coral gardens at LG and QS



Fig. 6: and certification in snorkeling and EFR at BO and GG respectively (from top to bottom row)

At La Gaulette and Quatre Soeurs, activities under the project have been completed. The CCTP trainees are now accomplished “Coral Gardeners” and eco-guides. These trainees will soon be awarded with a certificate of attendance. At these two sites, three coral gardens comprising 1500–1800 coral colonies have been established over an area of 350–400 m². By April 2020, the CCTP will be completed at Grand Gaube and Bel Ombre, with trainees at these sites certified as “Coral Gardeners” and eco-guides, and around 1600 coral colonies transplanted to 400 m² degraded reefs at each site.

Mr. Suraj Bacha Gian

The implications of the Blue/Ocean Economy for Small Island Developing States

"All countries are affected by global warming. But the impacts tend to fall disproportionately on the poor and vulnerable, as well as those least responsible for the problem." (IPCC Special Report: Global Warming of 1.5°C – 2018).

The largest Arctic research expedition ever undertaken, Multidisciplinary drifting Observatory for the Study of Arctic Climate (MOSAiC) is currently taking place with the aim of broadening our understanding of climate change and its possible impacts on global climate. Areas that were ice in the Arctic are now open water – the Polar Regions have already been affected by climate change. The Arctic region has already witnessed a temperature rise of 3°C since the 1990s and the last four years have globally been the warmest since records began.

Even though SIDS are the least responsible nations for climate change, generating less than 2% of global greenhouse gas emissions, they are the most vulnerable group of countries which remain at the frontline of life-threatening impacts of climate change. What chance do SIDS, such as Mauritius, stand against such drastic climate change effects and what measures could, and should be undertaken to adapt and mitigate these potential effects?

Small Island Developing States, as indicated by the name, are relatively small developing countries, populated by a few hundred thousand to a few million inhabitants, facing a unique set of economic, social and environmental challenges. They are environmentally vulnerable by virtue of their relative isolation in the different oceans around the world and so SIDS were recognised as a special case at the United Nations Conference on Environment and Development (UNCED) in Brazil in 1992. There are currently 58 recognised SIDS around the world, classified as either UN members (38 countries) or Non-UN members/Associate members of Regional Commissions (20 countries). UN member states have been further categorised by region, wherein the Atlantic, Indian Ocean and South China Sea (AIS) consist of 19 islands, including Mauritius, Singapore, Maldives, and Comoros amongst others. The Caribbean Ocean comprises 16 island states while the Pacific Ocean has 13 member states.

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Since most SIDS are located in the tropics, they are naturally prone to experiencing erratic and often severe, weather events, both rapid-onset and temporary ones. For instance, cyclones and rainfall patterns in Mauritius have been changing over the last few years, with long periods of droughts interspersed with short periods of intense rainfalls leading to considerable loss of livelihoods and infrastructures. More than 75% of corals qualitatively surveyed in April this year around the lagoons of Mauritius by scientists from the MOI were either partially or completely bleached, due to a relatively 'small' 1.5°C increase in the average seasonal temperature of 29°C. There have been increasing reports of coral bleaching, marine inundation and land erosion, degrading ecosystems and biodiversity loss chronicled globally.

In addition to their relative isolation, SIDS are also characterised by their limited land natural resources, restricted economies and markets, high energy and transportation costs, heavy reliance on external trade, among others. Importantly though, these island states have much larger EEZ compared to their land size, giving them access to a wide range of marine resources- both living and non-living- for example trade, tourism, minerals and fisheries.

The Blue or Ocean Economy (hereafter commonly referred to as the 'Blue Economy') offers vast opportunities to SIDS by virtue of their large EEZ, whereby they can be used as trial sites to test new developments in renewable energies and marine protected areas to improve conservation efforts, for instance. Several SIDS such as the Maldives, Tuvalu and a few Caribbean islands are striving towards 'climate neutrality' by adopting greener and more sustainable practices such as renewable energies and climate-friendly technologies. Since they rely heavily on maritime trade, adopting sustainable shipping practices will help SIDS ensure the resilience of their marine environment.

The Blue Economy aims at sustainably using marine resources to enhance society and the livelihood of its residents through economic growth while conserving the marine environment. And thus, at its core, the Blue Economy provides multiple opportunities to help SIDS alleviate poverty by creating sustainable jobs and enhancing livelihood, improving access to nutritious foods, minerals and medicines, adapting and mitigating climate change through their considerable carbon sequestration and coastal protection abilities. All of these benefits however, rely on healthy oceans, productive marine ecosystems and their sustainable development. Furthermore, the Blue Economy promotes the use of renewable energies such as wave, wind and solar farms and encourages a more circular economy which promotes recycling and reuse of materials, thereby reducing waste.

What are we then, as a SIDS nation, doing to adapt and improve our resilience in this cycle of erratic climate change?

Mauritius has been very proactive in showing its commitment by participating in global efforts aimed at tackling climate change and by ratifying international conventions geared towards this purpose. For instance, it was the first SIDS to ratify the United Nations Framework Convention on Climate Change (UNFCCC) back in 1992, followed by its ratifications of both the Kyoto Protocol and Paris Climate Change Agreement in 2001 and 2016, respectively. It has also participated in the exercise of the United Nations urging countries to make their own Nationally Determined Contributions (NDCs) aimed at reducing greenhouse gas emissions by 2025 or 2030 and which may also lay out plans to devise more climate change-resilient economies and populations.

The Republic of Mauritius also set up a National Disaster Risk Reduction and Management Centre (NDRRMC) which is responsible for monitoring, coordinating, managing and reducing the impacts of potential disasters such as flash flooding. The Ministry of Environment, Solid Waste Management and Climate Change has also produced its Third National Communication report for the period of 2010–2016 as required by Article 12 of the UNFCCC. This detailed report maps the various opportunities, successes, vulnerabilities and challenges which the Republic faces in terms of climate change. It also lays out plans which could be implemented to not only lean on the Blue Economy to develop the ocean's financial potential but also to tackle climate change. The Government of Mauritius is also partaking in meeting the various Sustainable Development Goals (SDGs) of the United Nations (UN) aimed at empowering all nations in various issues of global pertinence, including Climate Action (Goal 13) among others.

Although the Blue Economy offers considerable potential to SIDS, there remains several challenges to making it a success. For instance, many SIDS lack the human, technical and institutional capacity necessary to propose and enforce measures and policies adapted and required for the particular country's needs to develop its marine economy. The economic impacts and potential of the oceans need to be reassessed and policy makers have to address the deteriorating and unsustainable exploitation of the oceans and weigh these over direct economic benefits. The value of the oceans and the various hitherto unappreciated and underestimated marine ecosystem services have to be evaluated and accounted for in the national economy of each country since once damaged or lost, the cost of restoring these services to their productive and healthy status would far exceed the cost of preserving them, resulting in an extra burden on the financial economy of SIDS.

To conclude, even though SIDS are not directly responsible for climate change, we, as responsible global citizens, need to work together to help curb greenhouse gas emissions. The ozone layer, for instance, is a success story that we all need to remember so that we can work together again to limit the 1.5°C temperature rise to protect the planet for future generations.

(This article is the third and final part of a three series article focusing on the Blue Economy, the Ocean Economy in Mauritius and their implications for Small Island Developing States.)

Dr. Namrata Reetoo

Western Indian Ocean Science to Policy Workshop of the UNEP-Nairobi Convention

The Western Indian Ocean Science to Policy workshop of the UNEP-Nairobi convention, hosted by the Ministry of Ocean Economy, Marine Resources, Fisheries and Shipping and the Mauritius Oceanography Institute were held from the 27th to 29th of May 2019 at the Sofitel Hotel, Flic en Flac.

At the official opening ceremony that was held on Monday the 27th of May 2019, opening statements were made by the President of the Board of WIOMSA, Dr. J. Uku, the Officer-in-Charge of Environment and Climate in the Indian Ocean Commission, Mrs. G. Bonne, the Acting United Nations Resident Coordinator for Mauritius and Seychelles, Dr. L. Musango and the Head of Nairobi Convention Secretariat, Mr. D. Waruinge followed by the opening speech of the Minister of the Ocean Economy, Marine Resources, Fisheries and Shipping, the Hon. Mr. Prendut Koonjoo.

The workshop had the two following major segments:

1. Science to Policy workshop
2. Regional Experts Stock-taking Workshop on Oceanographic Research and Data in the WIO Region

Science to Policy Workshop

Goal

The overall goal of the meeting was to establish and operationalise the Science to Policy Platform as a core structure within the Nairobi Convention.

Objectives

1. Review of the Terms of References of the Platform, its membership and modus operandi;
2. Discussions on the need for a regional ecosystem/indicator monitoring framework and road map on its development;
3. Discussions on topical emerging scientific findings with potential policy implications in the management of coastal and marine resources in the region;
4. Regional stock-taking of oceanographic research and data in the region;
5. Validation of various regional toolkits and Guidelines.

Regional Experts Stock-taking Workshop on Oceanographic Research and Data in the WIO Region

Goal

The object of the regional stocktaking workshop of experts on ocean/LME assessment in the WIO was to:

1. Review the existing and planned initiatives on scientific data as well as marine and oceanographic research; and
2. Identify needs and gaps to be addressed through any future initiatives by coordination and collaboration with wider partners.

Objectives

1. To take stocks of research cruises/ocean-based monitoring and identify the gaps in data capturing and management.
2. To design appropriate mechanism to support the countries to improve their access to oceanographic/marine science data collected by a number of ongoing and forthcoming initiatives in WIO, through Trans-boundary Diagnostic Analysis/ Marine Ecosystem Diagnostic Analyses (TDA/MEDAs) update.
3. Bringing together all partners to exchange information and coordinate efforts to stretch collective impacts of our respective investments (programmes) in the WIO.

FOCUS

Dr. Daniel Marie, Deputy Director of MOI made a presentation on projects of the MOI during the session on Regional Stocktaking on oceanographic data and scientific research in the WIO region under the SAP-PHIRE project.

The closing remarks were made by Mr. D. Waruinge, Head of Nairobi Convention and Dr. Ruby Moothien Pillay, Director of MOI.

Participants

There were about 90 participants from 15 countries comprising of representatives of formal and informal knowledge generating institutions, practitioner, policy makers, communities and private sector within the WIO region. The workshop was also attended by experts and consultants from within and outside of WIO.

Ms. Ranjeeta Boyjoonauth

World Oceans Day 2019

The Ministry of Ocean Economy, Marine Resources, Fisheries and Shipping and the Mauritius Oceanography Institute jointly organised a series of activities from the 27th of May to the 8th of June 2019 to celebrate the World Oceans Day 2019 under the theme “Gender and Oceans”.

During the first week, that is, from the 27th to the 31st of May 2019, presentations and talks on marine related activities were held in secondary schools by different ocean partners.(Reef Conservation, Albion Fisheries Research centre,Competent Authority and MOI). On Sunday the 2nd of June 2019, a sensitisation/awareness campaign was held at the public beach of Trou aux Biches and Blue Bay, respectively, with members of the public. The sensitisation campaign included glass bottom boat trips with explanation by scientists from the MOI as well as from the Albion Fisheries Research Centre and Fisheries Protection Services on the importance and protection of the marine ecosystem. Activities also included drawing competition, quiz, face painting, sand castle and musical chair for the children.

The MOI also organised an open day for secondary school students on Friday the 7th of June 2019 from 10 00 to 14 00 hours. Activities on that day included a multi stakeholders' exhibits including several displays such as posters, short films and scientific equipment used during field activities and a guided tour of the research facilities at the Institute (Stakeholders for exhibits included the AFRC,UOM,WOMESA,Shipping Division,NCG and the FPS,Ministry of Housing and Lands, UTM,MPA and EDB).

On Saturday the 8th of June 2019, a launching ceremony of the “Ocean Carbonate Chemistry Observatory” by the Hon. Prendut Koonjoo, Minister of Ocean Economy, Marine Resources, Fisheries and Shipping was held followed by a guided visit to the newly furnished laboratories and to the stakeholders' exhibits from 09 30 to 11 30 hours. Further to the protocol ceremony, there was an open day for members of the general public from 11 30 to 16 00 hours.

Co-sponsors for all the above events included the Ministry of Ocean Economy, Marine Resources, Fisheries and Shipping, the UNDP-GEF Mainstreaming Biodiversity Project and the MOI.

Ms. Ranjeeta Boyjoonauth



Key Note BY Director Of MOI



Key Note by Hon. P.Koonjoo



Visit to MOI Booth



Visit to MOI Laboratory



Visit to MOI Laboratory



Boat trip



Boat trip and presentation to Public



Presentation on Ocean Acidification database



Boat trip



Boat trip

Installation of Photovoltaic (PV) System

In view of enhancing energy efficiency and promoting environmental sustainability, the Institute has installed a 50 kW Grid Tied Solar Photovoltaic System (solar panels) within its premises to partially meet its electrical energy requirement. The Photovoltaic (PV) System is generating electricity without burning fossil fuels and emitting greenhouse gases and other pollutants, thus reducing the Institute's environmental impact in accordance with the SDGs and the Government's vision on reducing greenhouse gases and restricting the use of fossil fuels. MOI is a research institution and we advocate for the protection and conservation of our planet by reducing our carbon footprint.

The PV System is managed by authorised personnel of the MOI, thereby real-time monitoring can be performed. The installed PV System has a capacity of 49.665 kilowatt-peak (kWp) and is categorised as a Small-Scale Distributed Generator (SSDG). This 50 kW solar panel installation will generate almost 200 kWh (kilowatt-hours) of electrical energy per day and the Institute is expecting to save at around 20–30% of energy per month. For the period covering September 2019 to mid-November 2019, the MOI has contributed towards environment protection by saving CO₂ emission of approximately 7,000 kg which is the equivalent of 23 trees planted.

Mr. Vivekanand Bhantoo



Solar Panels Installed at the Institute

Mr. Vivekanand Bhantoo

Global Monitoring for Environment and Security (GMES) and Africa

Working Session with the African Union Commission (AUC) Team

In the context of the Global Monitoring for Environment and Security (GMES) and Africa project, the African Union Commission (AUC) Team led by Dr. Tidiane Ouattara, Space Science Expert and GMES & Africa Program Coordinator was at the MOI for a two days' working session on Monday the 22nd and Tuesday the 23rd of July 2019 with the MOI/GMES Core Team.

The objectives of the working session were:

1. To monitor GMES and Africa action implementation by the consortia since inception in 2018 to-date.
2. To understand the project up to date success towards the outcome and results achieved from the project goal, purpose and outputs per agreement contracts
3. To identify and address challenges with respect to the implementation

The MOI-GMES Team was led by Dr. Rajiv Bheero, Project Expert/Leader. The MOI-GMES Team comprised Mr. Javed Iqbal Mosaheb, assigned Project Manager and Mr. Oomarsing Gooroochurn, Project Coordinator/Thematician, Ms. Ranjeeta Boyjoonauth, PRO/Communication Officer, Mrs. Neermala Mudhoo, Accounts Officer, Mr. Kunal Kutwaroo, Procurement and Supply Officer, Mr. Prathav Askoolum, System Administrator, Mr. Vivekanand Bhantoo, IT Service, Thematicians namely Mr. Olivier Pasnin, Mr. Murughen Sadien, Mr. Suraj Bacha Gian, Mr. Oocheetsing Sadasing.

Ms. Ranjeeta Boyjoonauth

MOI-GMES and Africa Kick Off Meeting

The Global Monitoring for Environment and Security (GMES) and Africa is an initiative that contributes to the EO domain of the African Outer Space Flagship programme. It builds on the existing projects in the continent (PUMA, AMESD and MESA) that have generated intellectual and infrastructural capacities and capabilities in the use of EO applications in order to enhance decision making process in environmental management, through provision of evidence-based information. The expanded rationale of the GMES and Africa programme is to continue addressing the growing needs of African countries to access and use space-derived data for sustainable development policies through deployment and integration of EO systems that would respond to African needs and requirements in nine thematic areas. The key outcome of this initiative will be to address the growing climatic and socio-economic strains on its natural resources that threaten livelihoods of the population.

The East Africa THEMA on Marine and Coastal Management will use both EO and in situ data to generate information; conduct analysis and forecasts that will eventually help institutions and decision/policy makers to observe, understand, anticipate and make better use of marine related resources. Thus mandated institutions in the East Africa consortium region will be able to promote a more sustainable management of marine and coastal resources.

The islands of the South West Indian Ocean and countries along the East Coast of Africa are especially dependent on their Marine and Coastal resources for their social, economic and ecological value. Fisheries management, better understanding of marine and coastal ecosystems, monitoring and control of illegal fishing, climate change impact monitoring and forecasting of extreme weather events are some of the main concerns. The Marine and Coastal Service for the East Africa region will provide information about the biological and physical state and dynamics of the ocean, fishing grounds, marine ecosystems for the regional seas, coastal vulnerability, sea state forecasts thereby supporting marine and coastal management activities and adaptation strategies.

For the implementation of this action a consortium consisting of the MOI, the Tanzania Fisheries Research Institute, the Kenya Marine and Fisheries Research Institute, l’Institut Halieutique et des Sciences Marines, the Seychelles Meteorological Authority and the Western Indian Ocean Marine Science Association has been setup.

In view of the above, the of Ocean Economy, Marine Resources, Fisheries and Shipping and the MOI organised a three days' workshop of the Pan-African “Global Monitoring for Environment and Security (GMES) & Africa” project for the Eastern African region from the 14th to 16th of August 2019. The objectives were to: (1) introduce the GMES & Africa project to all key stakeholders, (2) give an overview of the different applications proposed under the GMES & Africa by the MOI Consortium, and (3) plan activities with the different regional partners.

An opening ceremony was held on Thursday the 15th of August 2019 at the Sofitel Mauritius L’Imperial Resort & Spa, Flic en Flac with addresses by Dr. Ruby Moothien Pillay, Director of MOI, Mr. Prem Saddul, Chairman of MOI Board, Mrs. Gina Bonne, Chargée de Mission, Indian Ocean Commission, Mr. Massimiliano Messi, Team Leader and Second Secretary, European Union Delegation to the Republic of Mauritius, followed by the official opening by the Hon. Premdut Koonjoo, Minister for Ocean Economy, Marine Resources, Fisheries and Shipping. Invitees to the opening ceremony included officials from several Ministries, the diplomatic corps, representatives from NGOs as well as the private organisations in the marine related sectors, academies, MOI board members as well as its Consortium Partners and respective beneficiaries of the thematic actions.

Prior to the official Kick-Off meeting, a Project Management Meeting (PMM) was held on Wednesday the 14th of August 2019 at the MOI with the GMES Team and the Consortium Partners, which included representatives from Kenya, Tanzania, Seychelles and Madagascar, respectively.

The objective of the PMM was to discuss the roles and responsibilities of each partner and the expected deliverables of the project. A Regional Steering Committee (RSC) meeting was scheduled on Friday the 16th of August 2019 at the Sofitel Mauritius L’Imperial Resort & Spa, Flic en Flac. The main areas of discussion during the RSC was on the roles and responsibilities of the designated National Focal Points (NFPs) of each participating country, the reporting mechanism, Monitoring & Evaluation Strategy as well as the Communication Strategy.

Participants from the regional countries to the event included Mauritius, Comoros, Madagascar, Seychelles, Reunion Island, Kenya, Tanzania, Rwanda and Somalia.

Ms. Ranjeeta Boyjoonauth

Regional/International Projects



Members present



Speech by Gina Bonne



Group Photo



Members of the GMESTeam



Photo of the audience



Group Photo



Group photo



Photo of the audience

Visit of Dr. Hauke Reuter from Leibniz Centre for Tropical Marine Research (ZMT)

Dr. Hauke Reuter, workgroup leader from Leibniz Centre for Tropical Marine Research (ZMT) in Bremen, Germany, gave a presentation on “Handling of marine biodiversity data aiming at creating policy advice”. During the presentation, he highlighted on some of the ongoing activities in terms of (biodiversity) data handling, databases and new technologies that support the collection, handling, analysis and dissemination of biodiversity data. He also discussed on potential cooperation activities related to different research topics of interests between ZMT and MOI.



Presentation by Dr Hauke Reuter

Visit of High Commissioner of India for Mauritius

His Excellency Mr. Tanmaya Lal, the High Commissioner of India to the Republic of Mauritius, visited the Mauritius Oceanography Institute on the 15th of July 2019.



Visit of MOI research facilities

Visit of Delegation from Saudi Arabia

Mr . Ali Mohammed AL Shaikhi, CEO of the National Fisheries Development Program, NFDP and Mr. Naif Ghazi Alshammari, D.G of the Department of International Relations from Saudi Arabia visited the Mauritius Oceanography Institute on the 15th of July 2019. They were given a brief on the projects being carried out at the Institute and this was followed by a visit of the laboratory facilities.



Visit to MOI different laboratories

Visit of Prof. Christine Erbe - Curtin University

Professor Christine Erbe, Director, Centre for Marine Science & Technology (CMST), Curtin University, Australia gave a presentation on “Underwater Acoustics - A Powerful Tool for the Blue Economy” on Tuesday the 30th July of 2019 at the MOI.



Presentation by Professor Christine Erbe

Visit of Mega Bio Pharma team

A meeting with a team from Mega Bio Pharma as well as a representative of the Economic Development Board was held with the Director and respective staff at the MOI on the 1st of August 2019. The aim of the meeting was to seek avenues of collaboration for setting up an oyster farm in Mauritius to eventually use the oyster shells for extraction of specific molecules that could be used for bone and skin regeneration.



Meeting with MOI Team

Visit of Chief Executive Officer of POGO

Dr. Sophie Seeyave, Chief Executive Officer of POGO visited the MOI research facilities following a meeting with the Director on the 1st of August 2019. The objective was to discuss of any potential future collaboration with MOI on ocean observations.



Meeting with MOI Team