MAURITIUS OCEANOGRAPHY INSTITUTE

Annual Report

January 2016 - June 2017

Contents

ISSN 1694-0377

MAURITIUS OCEANOGRAPHY INSTITUTE

Chairman's Letter

To The Honourable Sudheer Maudhoo
Minister of Blue Economy,
Marine Resources, Fisheries and Shipping
Republic of Mauritius

In accordance with the provision of the Mauritius Oceanography Institute Act 1999 Section 22, I have the honour to submit to you the Annual Report of activities and accounts of the Mauritius Oceanography Institute for the Financial Year January 2016 to June 2017.

Yours sincerely

Mr. Nadeem NAZURALLY
Chairman

Officer in Charge's Report

It is with much pleasure that I am reporting on the activities of the MOI for the period January 2016 to June 2017. The main achievements of the MOI over and above its undertakings as an Oceanographic Research Institution is its endowment with a brand new building comprising research labs and office spaces in December 2015. The shifting of the MOI research facilities to this new building will surely enhance its capacity and capability in developing oceanographic research to fulfil the functions detailed in the Mauritius Oceanography Institute Act and at the same time become responsive to the Government Programme 2016-2019 and Vision 2030.

During the period 2016-2017, there have been a lot of research activities which the MOI has undertaken in line with its mandate. Also, there have also been activities where MOI has been called upon to provide its expert advice and technical assistance to other institutions being the sole oceanographic institution of the country.

The Ministry of Blue Economy, Marine Resources, Fisheries and Shipping (known as the Ministry of Ocean Economy, Marine Resources, Fisheries, Shipping and Outer Islands in 2016) has the responsibility to develop the ocean economy and one of the sectors which the ministry envisions to develop further is aquaculture. As per the Budget Speech 2016-2017, Paragraph 117, the MOI was tasked to survey all the earmarked sites where aquaculture activities could take place. To attract investors towards the development of sea-based aquaculture, those sites needed to be promoted as potential aquaculture sites. It was along that endeavour that the MOI was solicited through the budgetary measure to characterise those earmarked aquaculture sites. The characterisation of those sites includes bathymetric and benthic mappings, water quality analysis and current pattern mapping. These data are of great importance for an investor to decide on the sites that could potentially be used to develop aquaculture. To date, the website of the Institute displays an interactive map showcasing all the characterised aquaculture sites.

Disasters from the sea come in different forms and in 2016 the country was horrified by the grounding of MV Benita on the southern coast of Mauritius and the resulting oil spill. MOI provided the necessary data such as bathymetric and current pattern charts which were of tremendous importance for the salvage operation and in the protection of the delicate and fragile ecosystem located in the vicinity of the casualty site. MOI also participated in the ecological surveys following the accident evaluating the damage imparted to the environment as a result of the oil spill.

Along the same vein, MOI was tasked with the responsibility to prepare the Tsunami Preparedness and Inundation Maps for the National Disaster Risk Reduction Management Centre (NDRRMC). The inundation maps provide the necessary information about the extent to which sea water will inundate the coastal regions in the event of a Tsunami. These maps will assist the NDRRMC in the preparation of an evacuation plan for the country.

The scarcity of fresh water in the country has triggered the MOI to investigate the Submarine Groundwater Discharge (SGD) phenomenon. SGD are fresh-water sources oozing from the sea bed of our lagoons. The fresh water permeates through the lava sheets forming the aquifers and flows to the sea through underground pathways.

The study was undertaken in collaboration with the National Environment Laboratory (NEL) and the Water Resources Unit (WRU) with the technical and financial support of the renowned and Nobel Prize winner, the International Atomic Energy Agency (IAEA). The properties of naturally occurring radioactive isotopes and remote sensing were used to identify the sources of fresh water in the lagoons and to distinguish SGD from river flows, respectively. It was hence evidenced that there are 28 such SGD sites around the island of Mauritius.

Satellite Oceanography which resorts to satellite imagery to observe processes on the earth's surface is gaining ground in the world. The MOI has been involved in such projects for more than a decade now and in the Western Indian Ocean (WIO) region, MOI is known for its expertise in that field of Oceanography. The Monitoring for Environment and Security in Africa (MESA) project used much of Earth Observation (EO) data to produce tools as science-to-governance for evidenced-based decision in fisheries and coastal development management.

As a matter of fact, we all know that the conservation of our marine resources is of paramount importance if we want to build our ocean economy on a solid base and thereby making it sustainable. The first step towards the protection and preservation of our diverse life forms is to do an inventory of the biota which constitute our marine biodiversity. This is why the MOI has embarked on the DNA barcoding project. The study aims at identifying the main groups of animals found in our waters, starting with those having commercial potential, by applying genetics as a tool to identify the animals. We are now working on the fish guide and have completed the genetic identification of the sea cucumbers this year.

Last but not least, invasive species can change the physical, chemical and biological characteristics of the ocean and coastal zones, affecting the quality, productivity and resilience of marine ecosystems. One of the ways by which marine invasive species can get into our ecosystem is through ship ballast water. We have undertaken Port Biological Baseline Surveys in Port Louis and Port Mathurin. The surveys aimed at setting up a baseline in terms of organisms present in our port areas and thereby identify those that might have been introduced through ballast water.

Dr. Pierre Edgard Daniel MARIE
Officer in Charge

Corporate Governance

Vision and Mission Statement

The Mauritius Oceanography Institute (MOI) established in January 2000 by the proclamation of the Mauritius Oceanography Institute Act (Act No. 24 of 1999) is a parastatal body functioning under the aegis of the Ministry of Blue Economy, Marine Resources, Fisheries and Shipping (known as the Ministry of Ocean Economy, Marine Resources, Fisheries, Shipping and Outer Islands in 2016) which advises Government on the formulation and implementation of policies and programmes in respect to oceanography.

The objectives of the MOI, as spelt out in the Act, are:

- to foster interest in research and development in relation to oceanography,
- to advise Government on the formulation and implementation of policies and programs in respect to oceanography and related aspects,
- to coordinate, collaborate and co-operate with other institutions, agencies and persons on national, regional and global issues within its field of interest, and to assist any organisation, body or person in creating sustainable research and development programs in areas of interest and activity related to oceanography,
- to demonstrate and communicate to the scientific community and the public at large the results and the importance of oceanography in the conservation, maintenance, management, utilisation and development of resources based on marine and coastal ecosystems,
- to manage and optimise the use of funds and other resources for the purpose of this Act.

Vision

To become a centre of excellence in Oceanography in the Indian Ocean region.

Mission

To undertake oceanographic and coastal research and development for the sustainable management of resources in support of the ocean economy of the Republic of Mauritius.

Functions of the Institute

The Institute shall have such functions as, in its opinion, are necessary to further most effectively the objectives of the Institute, and in particular:

- to initiate, encourage, launch, facilitate, support, undertake, participate in, rationalise and coordinate research and development in relation to oceanography having regard to the national, regional and international interests of Mauritius, its needs and priorities,
- to arrange for carrying out such research and development,
- to provide any other institution, body or person with facilities for carrying out such research and development,
- to maximise opportunities and arrangements for such research and development on a collaborative basis,
- to encourage and facilitate the application and use of the results of such research and development,
- to prepare, fund, implement and periodically update and monitor programmes relating to the sustainable development of marine resources,
- to collect, coordinate, store and disseminate information relating to oceanography and to publish reports and other material relating to oceanography,
- to identify training needs in the field of oceanography,
- to make available to other institutions, bodies or persons, on such items and conditions as it thinks fit such as knowledge, expertise, equipment or facilities of the Institute,
- to do anything incidental or conducive to the performance of any of its functions under this section.

Statement of Compliance

The Board of Directors of the MOI ensures that the principle of good corporate governance, as applicable in Mauritius, are fully adhered to and form an integral component in the manner the activities and projects of the Institute are conducted.

Board of Directors and Committees

The Board consists of fifteen Directors and is led by the Chairman with a Director who shall be appointed, with the approval of the Minister, by the Board on such terms and conditions as it may determine and who shall be the Chief Executive Officer of the Institute. A list of Directors is on page 74 and 75 of this Annual Report. The Board has met on ten occasions during January to December 2016 and nine times during January to June 2017. Its principal functions include the following:

- Ensures that the institute has clear goals and policies in matter related to oceanography.
- Ensures the institute's objectives are adhered to and carried out efficiently.
- Approves acquisition and disposal as appropriate to the institute.

The Board has established a Research Advisory Council to assist in the discharge of its research functions. A list of the Research Advisory Council's meetings held between January 2016 and June 2017 is provided at page 75.

The Board has also appointed a Staff Committee. A list of the Staff Committee's meetings for the year January 2016 and June 2017 is also provided at page 76. A list of the Finance Committee's meetings is also provided at page 76.

The Board of Directors of MOI acknowledge their responsibilities for:

1. adequate accounting records and maintenance of effective control systems,
2. the preparation of the Financial Statements which fairly illustrates the state of affairs of the MOI as at the end of the period January 2016 to June 2017 and the results of its operations and cash flows for that period and which complied with International Public Sector Accounting Standards (IPSAS), and
3. the selection of appropriate accounting policies supported by reasonable and prudent judgement.

The directors report that:

1. adequate accounting record and effective system of internal controls have been maintained,
2. appropriate accounting policies supported by reasonable and prudent judgement and estimates have been used consistently,
3. appropriate Accounting Standards have been adhered to, and
4. the code of corporate governance as applicable to state-owned enterprises has been adhered to.

Health and Safety

MOI is committed to providing and maintaining a healthy, safe and secured working environment. It believes in raising awareness on health issues that are imperative in the prevention of accident and improving the well-being of its staff.

The Board

The MOI is managed by a Board, consisting of a Chairperson appointed by the Prime Minister and senior representatives of different ministries and institutions. Sections 8 to 10 of the MOI Act of 1999 lay down the overall responsibility of the Board.

The composition of the Board for January 2016 to June 2017 was as follows:

1. Chairman of the MOI Board:
   - Raj H. Prayag, PDSM

2. The Secretary for Home Affairs, Prime Minister's Office, or his representative:
   - Mr. O. K Dabidin, Permanent Secretary

3. A representative of the Ministry to which the responsibility for the subject of Foreign Affairs is assigned:
   - Vacant

4. A representative of the Ministry to which the responsibility for the subject of Finance is assigned:
   - Mr. A. K. Kokil, Director of Finance

5. A representative of the Ministry to which the responsibility for the subject of Economic Development is assigned:
   - Vacant

6. A representative of the Ministry to which the responsibility for the subject of Environment is assigned:
   - Mr. S. Mooloo, Deputy Director
   - Mr. R. Seenauth, Divisional Environment Officer

7. A representative of the Ministry to which the responsibility for the subject of Fisheries is assigned:
   - Dr. S. P. Boodhun, Deputy Permanent Secretary
   - Mr. J. D. P. Labonne, Deputy Permanent Secretary

8. A representative of the Ministry to which the responsibility for the subject of Lands is assigned:
   - Mr. A. R. Gheeseeawon, Deputy Chief Surveyor

9. A representative of the Ministry to which the responsibility for the subject of Rodrigues is assigned:
   - Mr. D. Gopaul, Deputy Permanent Secretary
   - Mrs. K. Babajee, Deputy Permanent Secretary

10. The Executive Director of the Mauritius Research Council or his representative:
    - Dr. A. Suddhoo, Executive Director

11. The Vice Chancellor of the University of Mauritius or his representative:
    - Dr. M. Nowbuth, Associate Professor
    - Dr. S. Bhugwant, Associate Professor

12. The Director of the Mauritius Meteorological Services or his representative:
    - Mr. R. Mungra, Director

13. The Director-General of the Mauritius Ports Authority or his representative:
    - Captain L. G. Barbeau, Port Master
    - Captain T. Saugur, Assistant Port Master (Alternate)

14. The General Manager of the Outer Islands Development Corporation or his representative:
    - Mr. S. Norungee, General Manager

15. Members appointed by the Honourable Minister:
    - Professor S. Bhoojedhur
    - Mr. A. Venkatasami
    - Mr. M. Munbodh

Remuneration to Directors for the Period of January 2016 to June 2017

Board Members

Name	Ministry/Institution/Department	No. of Meetings	Total
Mr. H. R. Prayag			538,650.00
Professor. S. Bhoojedhur		13	15,600.00
Mr. A. Venkatasami		11	13,200.00
Mr. M. Munbodh		15	18,000.00
Mr. N. Soobratty	Ministry of Ocean Economy, Marine Resources, Fisheries, Shipping and Outer Islands	4	4,800.00
Mr. A. K. Kokil	Ministry of Finance and Economic Development	14	16,800.00
Mr. S. Mooloo	Ministry of Environment, National Emergency Centre and Beach Authority	6	7,200.00
Mr. S. Norungee	Outer Islands Development Corporation	11	13,200.00
Dr. A. Suddhoo	Mauritius Research Council	5	6,000.00
Mr. R. Mungra	Mauritius Meteorological Services	11	13,200.00
Captain L. B. Barbeau	Mauritius Port Authority	4	4,800.00
Professor A. Hussein Subratty	University of Mauritius	2	2,400.00

Mr. D. Gopaul	Prime Minister's Office (Rodrigues Division)	7	8,400.00
Dr. M. D. Nowbuth	University Of Mauritius	3	3,600.00
Mr. O.K. Dabidin	Prime Minister's Office	10	12,000.00
Captain T. Saugur	Mauritius Ports Authority	8	9,600.00
Dr. N. Gopaul	Mauritius Research Council	3	3,600.00
Mr. J. D. P. Labonne	Ministry of Ocean Economy, Marine Resources, Fisheries, Shipping and Outer Islands	5	6,000.00
Mr. R. Seenauth	Ministry of Environment, National Emergency Centre and Beach Authority	7	8,400.00
Mr. Gheeseeawon	Ministry of Housing and Lands	8	9,600.00
Dr. S. P. Boodhun	Ministry of Ocean Economy, Marine Resources, Fisheries, Shipping and Outer Islands	6	7,200.00
Mrs. U. Shewraj	Prime Minister's Office	1	1,200.00
Mrs. S. Gungadeen	Ministry of Ocean Economy, Marine Resources, Fisheries, Shipping and Outer Islands	1	1,200.00
Dr. S. Bhagwant	University of Mauritius	3	3,600.00
Mrs. S. Gowrydoss	Prime Minister's Office	1	1,200.00

Research Advisory Council

Name	Ministry/Institution/Department	No. of Meetings	Total
Professor S. Bhoojedhur		14	16,730.00
Mr. M. Munbodh		11	8,965.00
Mr. R. Mungra	Mauritius Meteorological Services	9	7,335.00
Dr. M. D. Nowbuth	University Of Mauritius	6	4,890.00
Dr. V. Bissonauth	Mauritius Research Council	5	4,075.00
Captain J. P. Rault		7	5,705.00
Dr. G. P. Khedun	University of Mauritius	1	815.00
Dr. C. Appadoo	University of Mauritius	2	1,630.00
Mr. K. Narrain	Mauritius Research Council	1	815.00
Lt. B. Puneet	National Coast Guard	2	1,630.00

Staff Committee

Name	Ministry/Institution/Department	No. of Meetings	Total
Mr. A. K. Kokil	Ministry of Finance and Economic Development	12	9,780.00
Professor A. Hussein Subratty	University of Mauritius	6	4,890.00
Mrs. S. Gowrydoss	Prime Minister's Office	1	815.00
Mr. M. D. Nowbuth	University Of Mauritius	1	815.00
Mr. O.K. Dabidin	Prime Minister's Office	10	8,530.00
Mr. J. D. P. Labonne	Ministry of Ocean Economy, Marine Resources, Fisheries, Shipping and Outer Islands	3	3,585.00
Dr. S. P. Boodhun	Ministry of Ocean Economy, Marine Resources, Fisheries, Shipping and Outer Islands	4	4,780.00
Dr. S. Bhagwant	University of Mauritius	1	815.00

Legal Fee

Name	Ministry/Institution/Department	No. of Meetings	Total
Mrs. G. Topsy	Attorney General's Office		63,000.00

Finance Committee

Name	Ministry/Institution/Department	No. of Meetings	Total
Mr. A. K. Kokil	Ministry of Finance and Economic Development	14	16,730.00
Mr. O.K. Dabidin	Prime Minister's Office	11	8,965.00
Mr. J. D. P. Labonne	Ministry of Ocean Economy, Marine Resources, Fisheries, Shipping and Outer Islands	7	5,705.00

Interview Panel

Name	Ministry/Institution/Department	No. of Meetings	Total
Mr. A. Venkatasami		2	6,000.00
Mr. M. Munbodh		1	3,000.00
Mr. S. Norungee	Outer Islands Development Corporation	1	10,000.00
Mrs. S. Gungadeen	Ministry of Ocean Economy, Marine Resources, Fisheries, Shipping and Outer Islands	1	8,000.00
Mrs. S. Mohit-Juliette	Ministry of Ocean Economy, Marine Resources, Fisheries, Shipping and Outer Islands	7	45,000.00
Mrs. R. Mohee	University of Mauritius	1	20,000.00
Dr. S. Saumtally	Mauritius Sugar Industry Research Institute	1	20,000.00
Mr. O. K. Dabidin	Prime Minister's Office	1	20,000.00
Mr. A. K. Kokil	Ministry of Finance and Economic Development	1	20,000.00
Dr. R. Nunkoo	University of Mauritius	1	8,000.00

Technical Committee

Mr. L. Mudali		1	6,000.00
Mr. S Dhuwal	Ministry of Ocean Economy, Marine Resources, Fisheries, Shipping and Outer Islands	1	3,000.00
Mr. D. Ramdewar	Ministry of Finance and Economic Development	1	30,000.00
Mr. D. Fangooa	Ministry of Finance and Economic Development	1	30,000.00
Mr. C. Chooramun	Ministry of Public Infrastructure	6	90,000.00

Key Management Personnel

Name	Post Held	Period	Monthly Gross Salary (Rs.)	Monthly Allowances (Rs.)	Others (Rs.)	Total (Rs.)
Dr. Ruby Moothien Pillay	Director	Jul16 to Jun 17	119,000.00	9,320.00	12,740.00	141,060.00
Dr. Daniel Marie	Deputy Director	Jul16 to Jun 17	89,000.00	6,130.00	11,500.00	106,630.00
Dr. Daniel Marie	Officer-in-Charge	Jan16 to Jun 16	74,350.00	45,150.00	11,500.00	131,000.00

Staff of the Institute

Management

Dr. K. R. Moothien Pillay, B.Sc., M.Sc. [Marine Ecology and Fisheries Biology], Ph.D. [Fisheries Science]	Director (as from 1st July 2016)
Dr. P. E. D. Marie, B.Sc. (Joint Hons.) [Chemistry and Environmental Studies], Ph.D. [Chemistry], Post Doc. [Chemistry]	Officer-in-Charge (as from 1st August 2015) Deputy Director (as from 1st July 2016)
Dr. M. R. Badal, Graduate Stat., M.Sc. [Applied Maths and Modelling], M.Sc. [Oceanography], Ph.D. [Physical Oceanography]	Officer-in-Charge (as from 13th April 2015 to 31st July 2015) Head of Ocean Matters Unit (as from 14 January 2013) (leave without pay as from 23rd October 2015) (resigned as from 22nd October 2016)

Scientific Staff

Mr. J. I. Mosaheb, B.Sc. [Marine Biology and Biochemistry]	Principal Research Scientist
Mr. M. Singh, B.Sc. [Physics and Geology], M.Sc. [Geology]	Research Scientist (on leave with pay as from 13th October 2014)
Mr. P. Mussai, B.Sc. [Zoology], M.Sc. [Marine Biology and Oceanography], M.Sc. [Project Management]	Research Scientist
Mr. B. A. Motah, B.Sc. (Hons.) [Physics with Environmental Science], M.Sc. [Sustainable Environmental Management]	Research Scientist
Mr. V. Ramchandur, B.Sc. (Hons.) [Physics], M.Sc. [Computer Security and Forensics]	Research Scientist
Mr. S. Bacha-Gian, B.Sc. (Hons.) [Biology with Plant Science], M.Sc. [Molecular and Cellular Biology]	Research Scientist
Mr. O. Sadasing, B.Sc. (Hons.) [Biology with Environmental Science], M.Sc. [Marine Biology and Oceanography]	Associate Research Scientist
Dr. H. Runghen, B.Sc. (Hons.) [Mathematics], Ph.D. [Numerical Modelling and G.I.S.]	Associate Research Scientist (on leave without pay as from 22nd June 2017)
Dr. A. Rawat, Ingénieur en Modélisation Mathématique et Mécanique	Associate Research Scientist (on leave without pay as from 1st April 2017)
Mr. G. Beedessee, B.Sc. [Chemistry, Zoology, Biotechnology], M.Sc. [Molecular Biology]	Associate Research Scientist (resigned as from 1st September 2016)
Mr. A. Ramanjooloo, B.Sc. (Hons.) [Chemistry], M.Sc. [Chemistry]	Associate Research Scientist

Mr. S. Curpen, B.Sc. (Hons.) [Biology with Environmental Science], M.Sc. [Bioinformatics]	Associate Research Scientist
Dr. P. D. Bissessur, Master 2 Recherche, DESS [Télédétection-Imagerie-Numérique], Ph.D. [Marine Geophysics]	Associate Research Scientist (on leave without pay as from 1st April 2017)
Mrs. R. Sooroojebally, B.Sc. [Biotechnology], M.Sc. [Aquaculture and Ocean Studies]	Associate Research Scientist
Mr. K. Ramdhony, B.Sc. [Medical Technology with specialisation in Clinical Laboratory Technology], M.Sc. [Biotechnology]	Associate Research Scientist
Mr. O. Pasnin, B.Sc. (Hons.) [Biotechnology], M.Sc. [Applied Marine Science]	Associate Research Scientist (on leave without pay as from 27th March 2017)
Mr. A. Nicolas, B.Sc. (Hons.) [Marine Science & Technology], M.Sc. [Applied Marine Science-Oceanography]	Associate Research Scientist
Miss. P. Roy, B.Sc. (Hons.) [Biotechnology (Enterprise)], M.Sc. [Molecular Medicine and Cancer Research]	Associate Research Scientist (on leave without pay as from 22nd October 2016)
Miss. K. Modoosoodun, B.Sc. (Hons.) [Marine Science and Technology]	Associate Research Scientist
Dr. Y. Neehaul, Master Chimie-Physique des Molecules et Interfaces, Ph.D. [Bio-physical Chemistry]	Associate Research Scientist
Ms. P. Oogarah, B.Sc. [Chemistry], M.Sc. [Pharmaceutical Analysis and Quality Control]	Associate Research Scientist
Ms. C. Lebrasse, B.Sc. (Hons.) [Marine Science and Technology]	Associate Research Scientist (On Leave Without Pay as from 1st August 2015)
Mr. O. Gooroochurn, B.Sc. (Hons.) [Biology with EVS]	Associate Research Scientist
Dr. D. Dumur, B.Sc. (Hons.) [Biology with Environmental Science], M.Phil. [Environmental Science], Ph.D. [Environmental Science]	Associate Research Scientist

IT Staff

Mr. E. Martial, B.Tech. (Hons.) [Computer Science and Engineering], M.Sc. [E-business]	Systems Administrator
Mr. P. Askoolum, B.Eng. [Computer Science], M.Sc. [Software Engineering Projects & Management]	IT Officer

Public Relations Office

Miss. R. Boyjoonauth, B.Sc. (Hons.) [Communication Studies], MA [Public Policy and Administration]	Public Relations Officer

Finance Staff

Mrs. R. Sobha, FCCA, MBA	Accountant (On Suspension as from 17th February 2017)
Mrs. N. Mudhoo, ACCA (Partly)	Accounts Clerk
Ms. M. Nuckchady, B.A (Hons.) [Applied Accounting]	Accounts Clerk
Ms. T. Kokil, B.Sc. (Hons.) [Human Resource Management], MBA [Financial Management]	Accounts Clerk
Ms. N. Gopal, B.Com. [Accounting and Finance]	Accounts Clerk

Administrative Staff

Mrs. L. Kureeman, B.Sc. (Hons.) [Public Administration and Management], MBA [Human Resource and knowledge Management]	Administrative Secretary
Mrs. M. Joyram, B.Sc. (Hons.) [Public Administration and Management]	Office Management Assistant (as from February 2017)
Mrs. A. Moonesawmy, B.A (Hons.) [Library and Information Science]	Management Support Officer Acting Documentation Officer
Mrs. N. Neermul	Management Support Officer (as from February 2017) (on leave without pay as from 31st March 2017)
Mrs. N. Tegally	Confidential Secretary
Mrs. S. Sukai	Front Desk Officer

Technical Staff

Mr. C. Samyan [PADI Dive master]	Technical Assistant/Senior Technical Assistant
Mr. S, Sunassee [Open Water Scuba Instructor, Emergency First Respond Instructor, Master Scuba Diver Trainer]	Technical Assistant/Senior Technical Assistant

Procurement & Supply Officer

Mr. K. Kutwaroo, Certificate in Procurement and Purchasing and Supply	Procurement and Supply Officer

Support Staff

Mr. D. Munsah	Driver/Office Attendant
Mr. V. Coopen	Driver/Office Attendant
Mr. V. Michel	Driver/Office Attendant
Mr. A. Beejan	Driver/Office Attendant
Mrs. M. Rajiah	Handy Worker

Operational Review

Monitoring for Environment for Security in Africa (MESA)

The Monitoring for Environment and Security in Africa (MESA) project utilises Earth Observation (EO) and satellite technologies to generate products and information services for the socio-economic development of African people as well as for a sustainable environmental management. The project promotes regional integration, enhances Africa's access to EO data, develops and disseminates products and services, encourages exchanges between the African and European experts and institutions, and also enhances the capacity of African institutions, policy makers and experts.

The MESA project has received funding from the European Union and is being implemented under the overall coordination of the African Union Commission and is steered by the Regional Economic Communities (CEMAC, ECOWAS, IGAD, IOC and SADC) and the ACP Secretariat, in close cooperation with the European Union Delegation to the African Union, and partners EUMETSAT and the Joint Research Centre of the European Commission.

For the Indian Ocean Commission region, the thematic action (THEMA) is on "Marine and Coastal Management" and the Mauritius Oceanography Institute is the Regional Implementation Centre.

The objective of the IOC THEMA is to help institutions and policy makers of the IOC member states and the neighbouring countries of the Mozambique Canal to make better use of Earth Observation data for an improved management of marine and coastal areas.

Two information services are being set-up by the Mauritius Oceanography Institute namely:

- Service 1: Marine Resources Management
- Service 2: Monitoring of Coastal Environment

The Marine Resources Management Service will provide oceanographic charts for the detection of Potential Fishing Zones (PFZ) and for monitoring the state of the ocean. The PFZ charts were developed using satellite high resolution data and the product was validated using Vessel Monitoring System data obtained from the Ministry of Fisheries. Statistical analysis revealed a good correlation between the PFZ chart and the fish catch location.

The Monitoring of Coastal Environment Service will provide operational marine information through the deployment of wave data buoys and will assess the vulnerability of the coastlines of the IOC countries using the Coastal Vulnerability Index (CVI). In the development of the CVI, SPOT 5 images were purchased and the shoreline were extracted for the island of Mauritius using ArcGIS for further analysis.

This third year of implementation of the "Marine and Coastal Management" thematic action saw the deployment of the first MESA stations in the Indian Ocean region and an improved level of MESA products usage at national level. In addition, awareness on the use of Earth Observation data and MESA Services has been created amongst high level officials in different beneficiary countries.
The different activities that took place in 2016 are highlighted below.

Data Access

While the deployment of MESA stations started in 2016, the MOI/IOC network of receiving stations was still operating mainly using the existing AMESD (African Monitoring of the Environment for Sustainable Development) stations. To ensure that the AMESD stations remained functional, the MOI has regularly monitored the status of the AMESD and PUMA stations and provided technical support to regional institutions. Besides, the MOI has also distributed Chlorophyll-a and Sea Surface Temperature charts on a monthly basis to the technical focal points in Comoros, Kenya, Madagascar, Mauritius, Mozambique, Seychelles and Tanzania.

Figure 1: New MESA Station at MOI

The new MESA Station was installed at the Mauritius Oceanography Institute in Albion on the 4th and 5th of April 2016.This new Station is a system for receiving, processing, displaying and analysing Earth Observation data for thematic applications concerning the "Marine and Coastal Management" theme. The Station receives data from the EUMETCast dataflow and additionally from FTP and HTTP servers.

Operational Information Service

The Peer Review of the Marine Resources Management and Monitoring of Coastal Environment services developed by the Mauritius Oceanography Institute took place during this reporting period. The three external reviewers who constituted the review panel were satisfied with the service definition, the quality of the products and the level of maturity of service.

The MESA-IOC project website was updated. Maps of Sea Surface Temperature and Chlorophyll-a have been disseminated regularly through the website. Also the MOI has provided Chlorophyll-a and Sea Surface Temperature products for the region of Tanzania to the Tanzania Fisheries Research Institute for them to generate Potential Fishing Zone advisories for their region. The satellite images for the Monitoring of Coastal Environment Service have been confirmed for Comoros, Mauritius, Madagascar and Seychelles.

Five countries (Kenya, Madagascar, Mauritius, Seychelles and Tanzania) have released bulletins and advisories during this period. Furthermore, MESA products have been disseminated to various Government institutions, scientists and projects in the different countries participating in the implementation of the action.

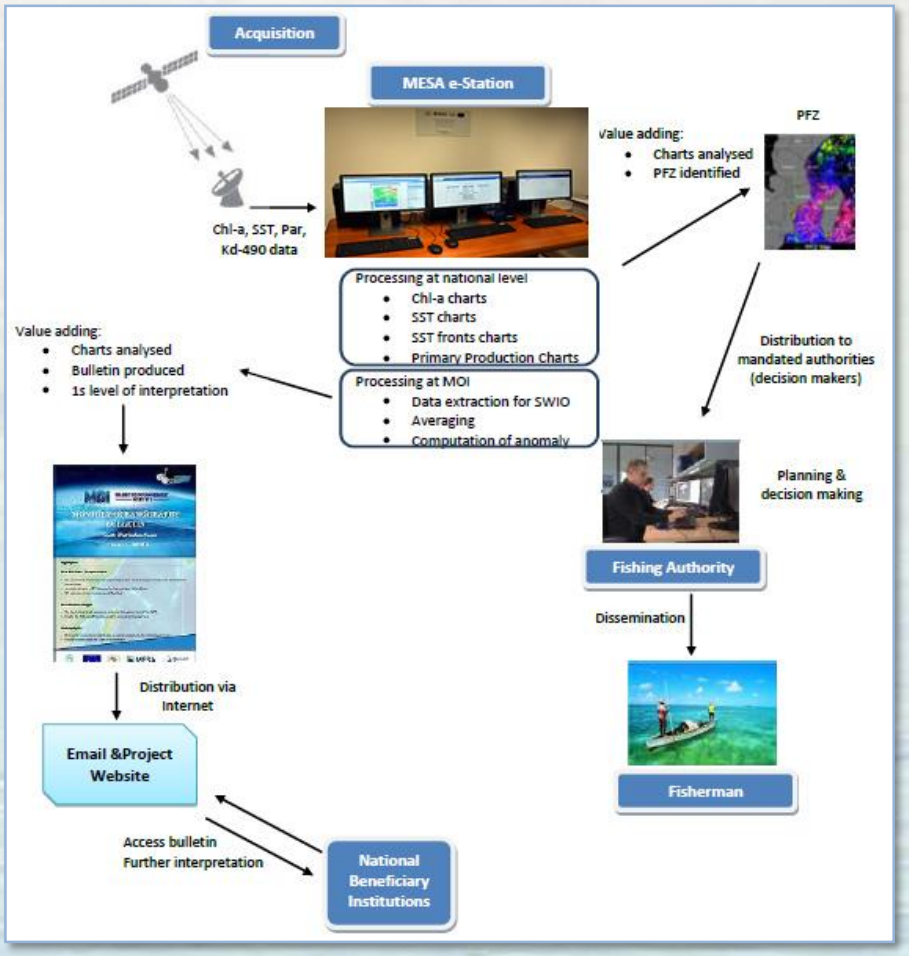

Figure 2: Service chain - marine resource management service.

Political and Policy Development Frameworks

Awareness on the use of EO data and MESA Services has been created amongst high level officials in most of the beneficiary countries. These included Directors, Permanent Secretaries and a few Ministers. In Mauritius awareness on MESA IOC Products has been created amongst the Ministry of Ocean Economy, Marine Resources, Fisheries, Shipping and Outer Islands, academia and students through exhibitions and presentations during the celebration of World Oceans Day 2016 by the MOI.

Figure 3: Awareness of mesa products and services during world oceans day 2016.

The third MESA-IOC regional steering committee meeting was held at the Indian Ocean Commission Conference Room in Ebène and was officially opened by the Deputy Director of the Mauritius Oceanography Institute, Dr. Daniel Marie, in the presence of the National Focal Points of the countries participating in the IOC THEMA and Mrs Gina Bonne chairperson of the Committee.

The second meeting of the MESA-IOC National Network for Mauritius took place on the 8th December 2016 at the Albion Fisheries Research Centre in Albion, Mauritius. Representatives from the Ministry of Tourism and External Communications; the Ministry of Housing and Lands; the Ministry of Ocean Economy, Marine Resources, Fisheries, Shipping and Outer Islands; the Ministry of Environment, Sustainable Development, and Disaster and Beach Management; Beach Authority and National Disaster Risk Reduction and Management Centre, the University of Mauritius and the Mauritius Oceanography Institute attended the meeting.

Capacity Building

Figure 4: "Communicating scientific information to policy makers."

As part of the capacity building activities of the MESA programme for the IOC thematic action, the Mauritius Oceanography Institute organised the MESA-IOC-MOI Regional Training Workshop on "Communicating Scientific Information to Policy Makers" from the 8th to 12th August 2016 at the Aanari Hotel in Flic en Flac, Mauritius.

A total of 27 participants coming from Comoros, Kenya, Seychelles, Madagascar, Mauritius, Mozambique, Seychelles and Tanzania attended the training workshop. These included the National Focal Points as well as the technical focal points of the countries participating in the Action.

The objective of this training was to improve decision making and the development of policies based on the scientific data, products and bulletins that are generated under the MESA-IOC theme. The training was conducted by Ms. Joy Owango from the Training Centre in Communication, University of Nairobi, Kenya.

The MESA-IOC project is managed by a team led by Mr. E. Martial and consisting of Mr. J. I. Mosaheb, Mr. V. Ramchandur, Mr. B. A. Motah, Mr. O. Sadasing, Dr. H. Runghen, Dr. D. Bissessur, Dr. A Rawat, Ms K .Modoosoodun, Mr. O. Gooroochurn, Ms. R. Boyjoonauth and Mrs. N. Mudhoo and technical assistance is provided by Mr. F Wernerus from the MESA Technical Assistance Team.

Characterisation of Earmarked Aquaculture Sites in Mauritius

Following the Budget Speech 2016-2017, the Government has reiterated its strong intent of making the Ocean, a pillar of its Economy and the Mauritius Oceanography Institute was tasked to fully characterise the 31 sites which have been identified for aquaculture development around mainland Mauritius. The MOI had therefore re-aligned its Strategic Plan with the Government Vision, and its prime focus was to characterize the oceanic and coastal environment of the Republic of Mauritius by studying the physical, chemical and biological properties of Mauritius waters with emphasis in the potential aquaculture sites and coastal development directed towards small and medium enterprises (SMEs). The earmarked aquaculture sites were characterized to provide spatial and temporal data on the marine environment given that there is very little oceanography data on the marine environment available. The parameters investigated were Bathymetry, Conductivity, Temperature, Salinity, Water Density, pH, pressure and Dissolved Oxygen, Nitrate, Nitrite, Ammonium, Phosphate and Silicate concentrations.

#	Sites completed	Data collected
	Site 1 - Bois des Amourettes	CTD, ECM, Localized Bathymetry, DO, Nitrite, Nitrate, Ammonia, Silicate and Phosphate
	Site 2 - Bois des Amourettes	CTD, ECM, Localized Bathymetry, DO, Nitrite, Nitrate, Ammonia, Silicate and Phosphate
	Site 3 - Pointe Bambous	CTD, ECM, Localized Bathymetry, DO, Nitrite, Nitrate, Ammonia, Silicate and Phosphate
	Site 4 - Pointe Canons	CTD, ECM, Localized Bathymetry, DO, Nitrite, Nitrate, Ammonia, Silicate and Phosphate
	Site 5 - GRSE	Localized Bathymetry, DO, Nitrite, Nitrate, Ammonia, Silicate and Phosphate
	Site 8 - Ilot Aigrettes	CTD, Localized Bathymetry, DO, Nitrite, Nitrate, Ammonia, Silicate and Phosphate
	Site 9 - Ilot Aigrettes	CTD, ECM, Localized Bathymetry, DO, Nitrite, Nitrate, Ammonia, Silicate and Phosphate
	Site 10 - Pointe Bambous	CTD, ECM, Localized Bathymetry, DO, Nitrite, Nitrate, Ammonia, Silicate and Phosphate
	Site 11 - Trou aux Biches	CTD, ECM, Localized Bathymetry, Nitrite, Nitrate, Ammonia, Silicate and Phosphate

**NB: Chemical parameters were collected at 5 distinct places covering all the 10 sites for GRSE*

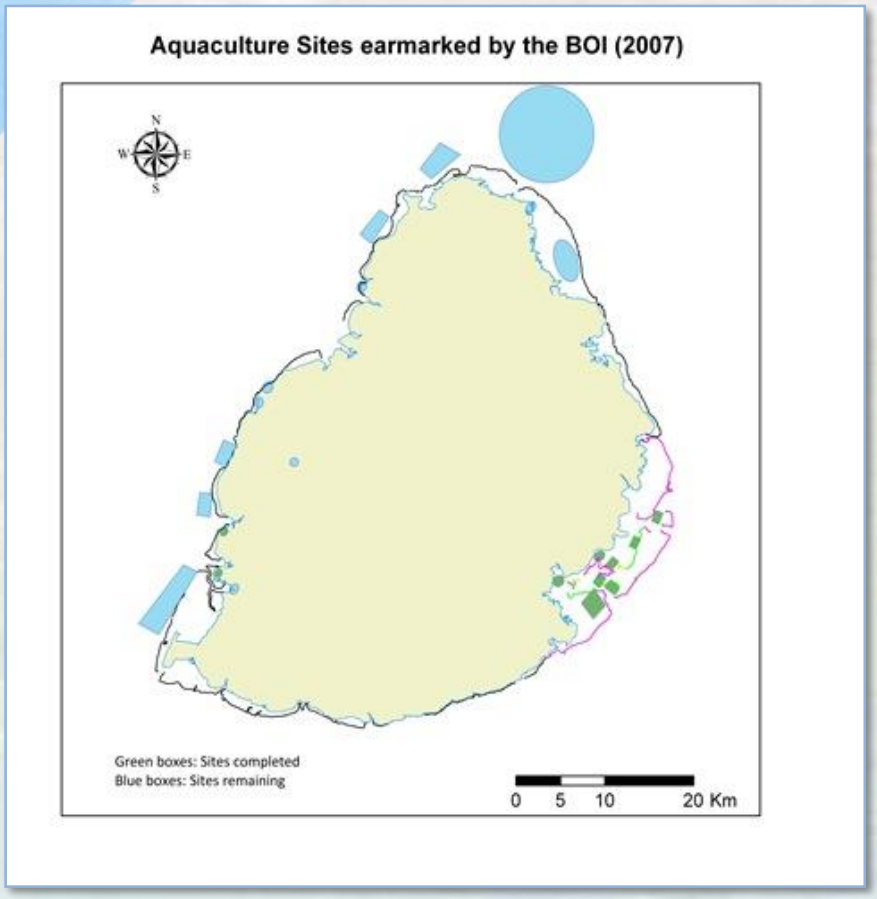

Figure 5: Aquaculture sites earmarked by the BOI (2007).

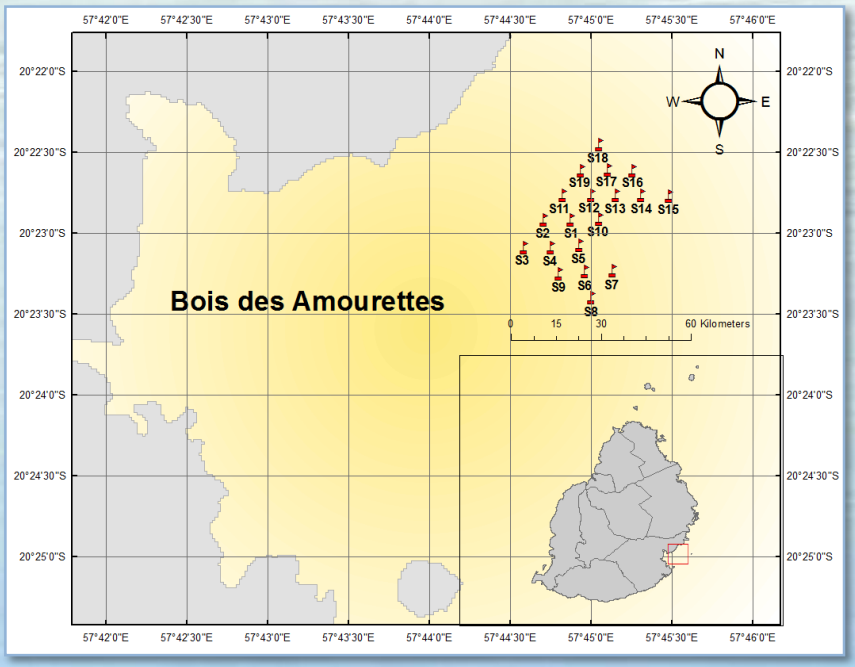

Figure 6: Stations at Bois des Amourettes.

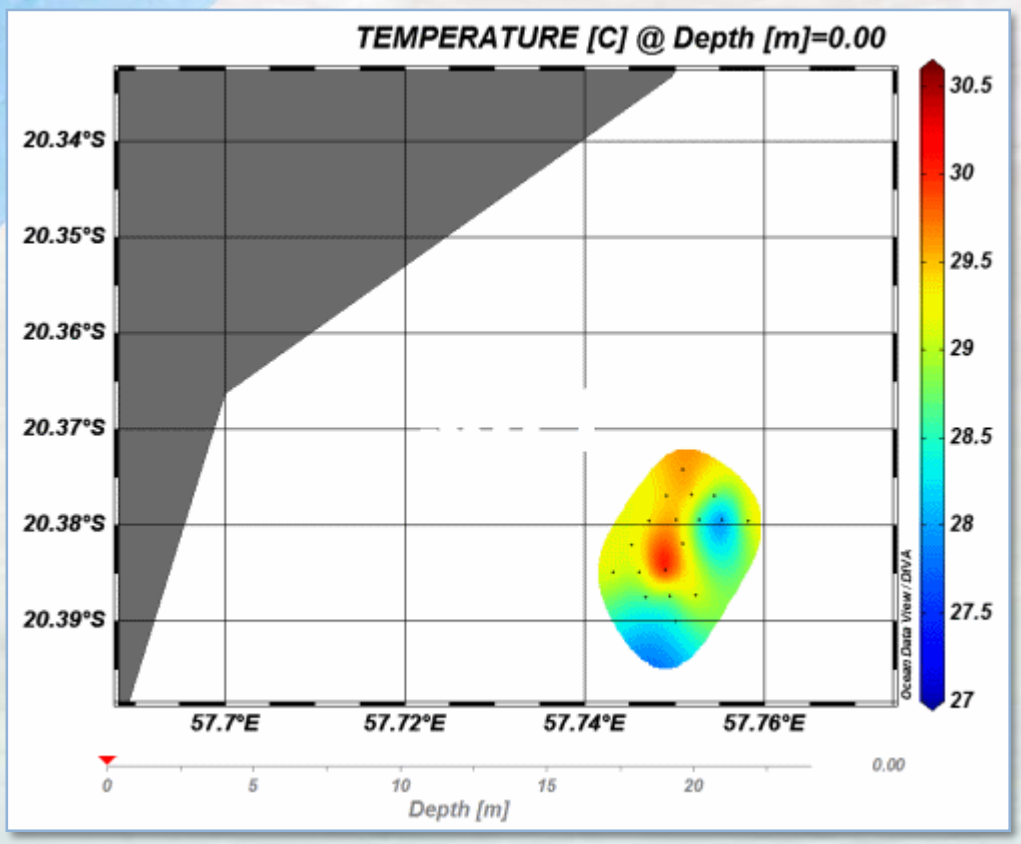

Figure 7: Temperature chart at Bois des Amourettes.

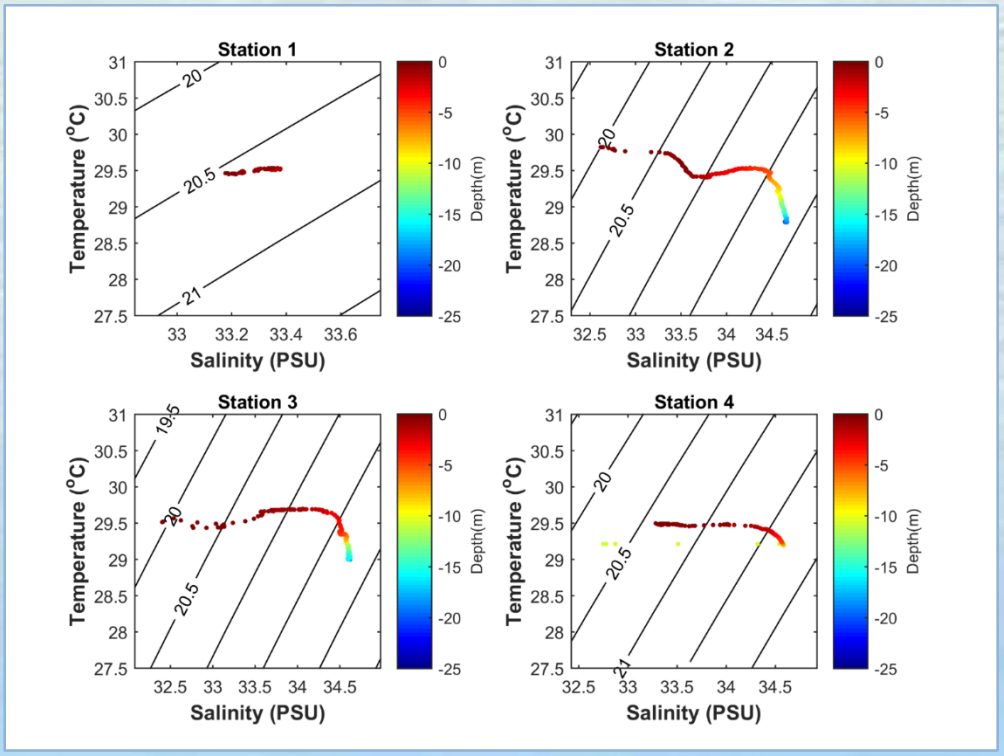

Figure 8: Temperature and salinity correlation.

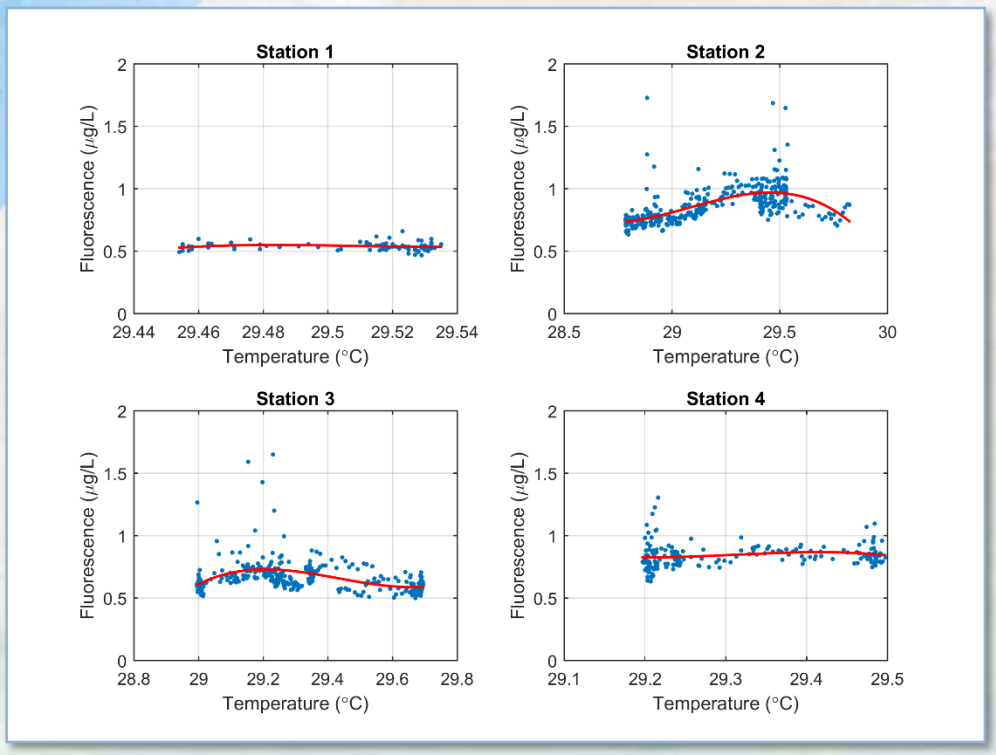

Figure 9: Temperature and fluorescence correlation.

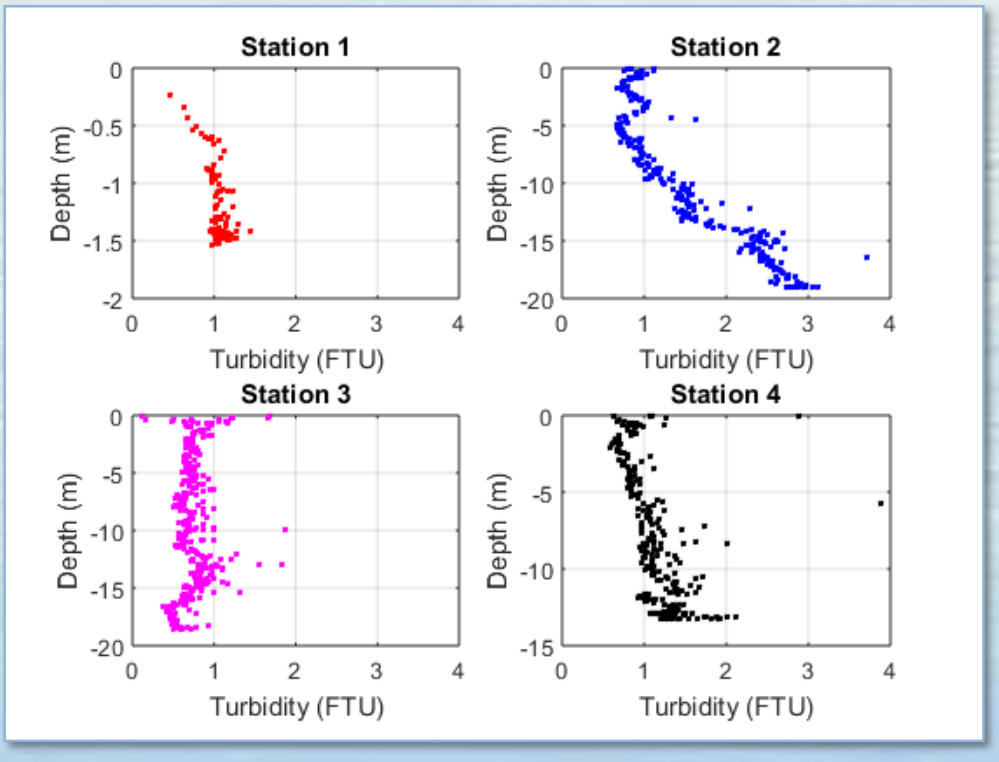

Figure 10: Depth and turbidity correlation.

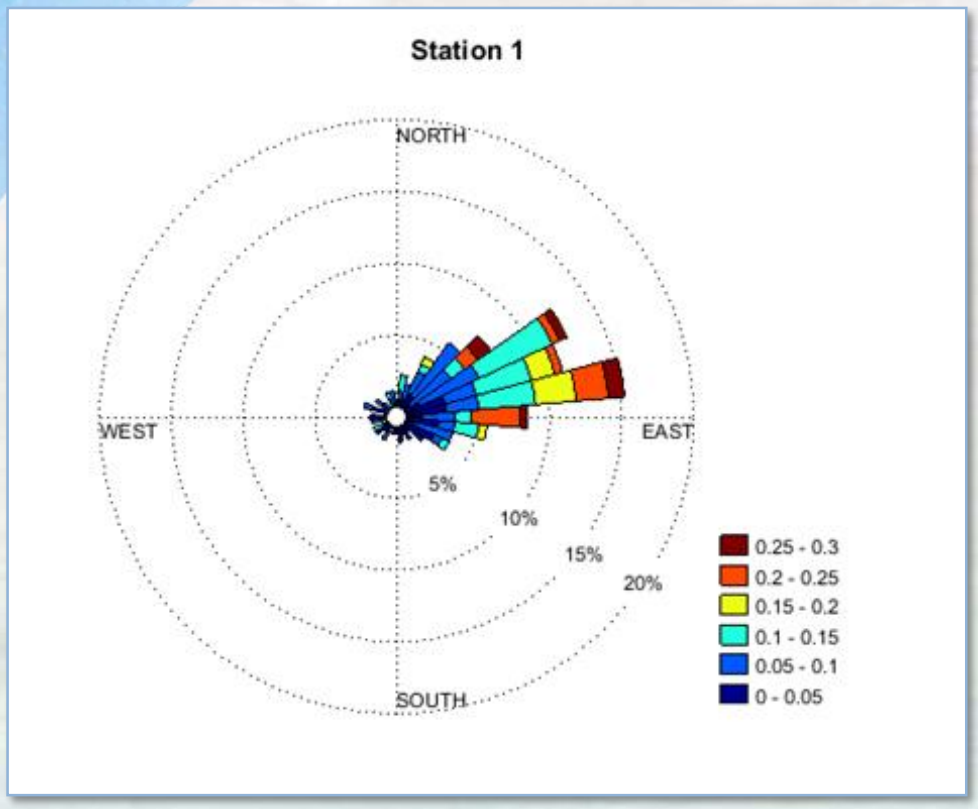

Figure 11: Rose plot for current speed and direction.

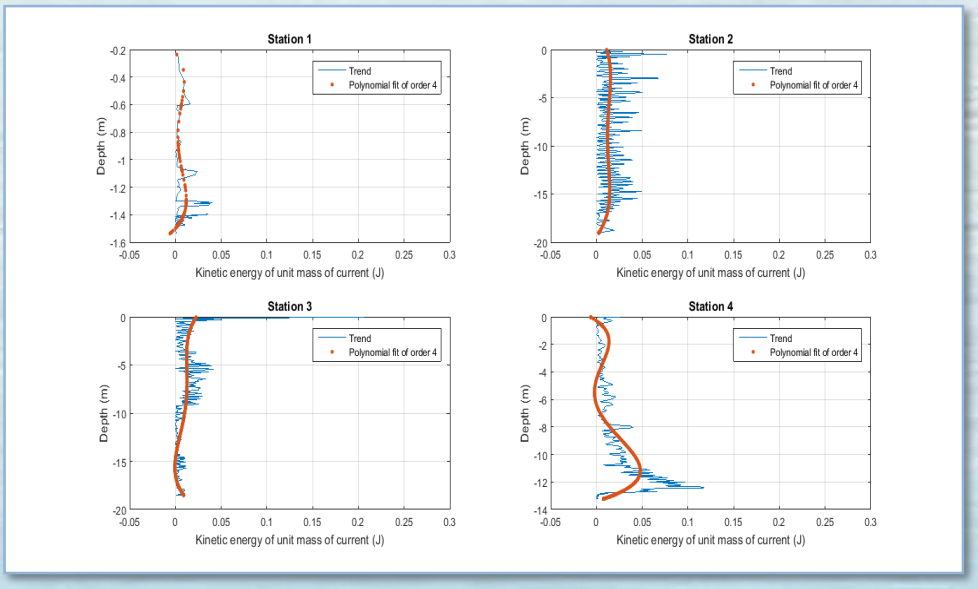

Figure 12: Kinetic energy (J) plots of current.

Development of an Inundation Map in case of Tsunami

The National Disaster Risk Reduction Management Centre (NDRRMC) has requested the Mauritius Oceanography Institute (MOI) to update the Tsunami preparedness Map based on new Digital Elevation Model (DEM) and bathymetric data they received. Following their request, MOI has carried out numerical modelling of tsunami events in the Indian Ocean. The MOI has already submitted to the NDRRMC two inundation maps of the island of Mauritius and Rodrigues based on the Makran Trench scenario. The MOI has also recently generated the latest version of inundation map based on numerical modelling for the 2004 Sumatra tsunami event at scale of 1: 75,000. Simulations for outer island of the Republic of Mauritius can only be carried out after acquisition of high resolution bathymetric and elevation data.

#	**Task completed**	**Remarks**
	Inundation map for the Island of Mauritius based on Makran Trench Scenario using new bathymetric and elevation data available.	Submitted to NDRRMC
	Inundation map for the Island of Rodrigues based on Makran Trench Scenario using new bathymetric and elevation data available.	Submitted to NDRRMC
	Inundation map for the Island of Mauritius based on numerial modelling on Sumatra 2004 event using new bathymetric and elevation data available.	Submitted to NDRRMC

Data Mapping Project

The collection of oceanographic data not only enables us to understand the ocean and the climate system but also helps us make the proper decisions for sustainable development and management of ocean resources. This is especially crucial for Small Island Developing States, including the Republic of Mauritius that relies heavily on their ocean resources themselves threatened by changes in climate and ocean conditions. Similarly, the development of sustainable ocean-related business activities including a mari-culture industry, which is a growing sector in many developing countries, also requires a good understanding of the ocean.

After its establishment in 2000 and through the various projects initiated since, the MOI has been generating large amounts of oceanographic data. These data include physical, biological and chemical measurements derived from in situ oceanographic observations.

The map below is a visual representation of the data available at different sites in Mauritius. By clicking on the interactive map available on the MOI website, the list of accessible parameters is displayed.

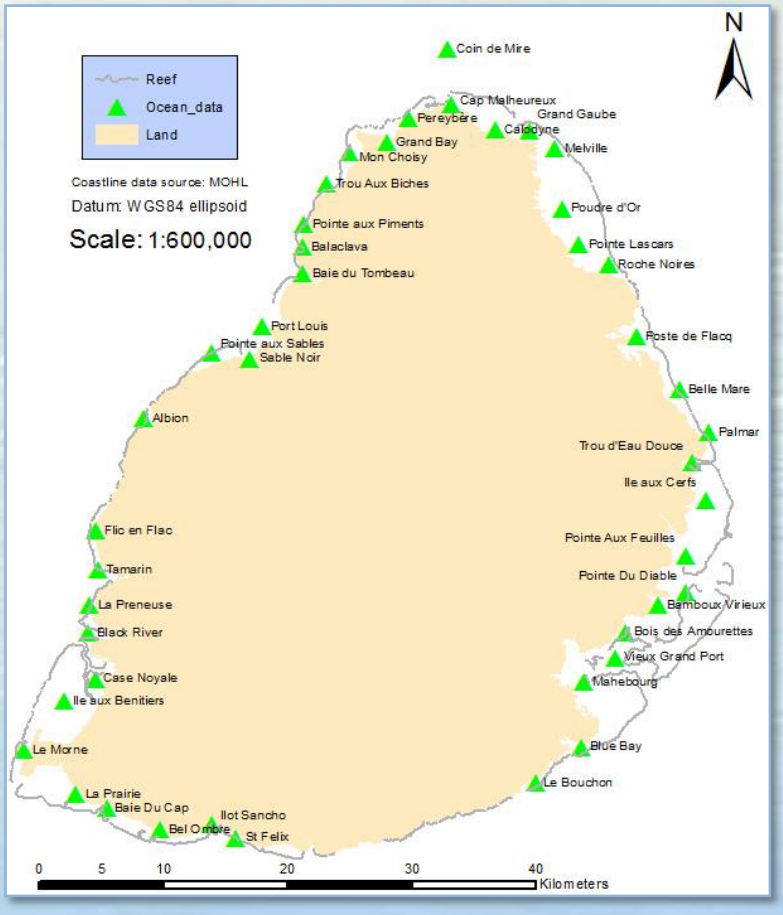

Figure 13: Data available around Mauritius.

Bois des Amourettes

Parameters	Period	No. of stations
Bathymetry	May 2016	-
Conductivity	May 2016	-
Current	May 2016	-
Density	May 2016	-
Fluoresence	May 2016	-
Pressure	May 2016	-
Sponge	2005-2012	-
Temperature	May 2016	-
Tide	May 2016	-
Turbidity	May 2016	-

Figure 14: Sample data.

#	Task Completed	Remarks
	Compilation of basic metadata for oceanographic data available at the MOI for the island of Mauritius.	To be followed by compilation of standardised metadata and data
	Development of a GIS map of basic metadata for oceanographic data available at the MOI for the Island of Mauritius	Available on the webpage on the MOI.

Ecological Survey of Nearshore Waters of Mauritius

From 2015 to 2016, the MOI continued the collection of spatio-temporal data for biological and chemical parameters at its established inshore and offshore permanent monitoring stations. Additionally, the MOI initiated a Bleaching Monitoring Programme for assessing the impacts of El Nino 2016 at several reef sites around the island. From February to May 2016, qualitative and quantitative surveys were undertaken at selected sites around Mauritius. At these sites, biological and physico-chemical parameters including *in-situ* temperature and water quality were monitored.

During the early months of 2016, *in-situ* sea-water temperature in the nearshore waters of Mauritius peaked above the seasonal average (29°C) (**Figure 15a**) causing mild to severe bleaching in several lagoon and off-lagoon sites around the island (**Figure 15b**). Overall, bleaching was widespread but at mild to moderate levels, with 40-50% of the island's live coral cover partially or totally bleached (**Figure 15c**). Qualitative surveys showed that 42% of live corals were partially bleached. Among the sites surveyed, Belle Mare, Flic en Flac and Ile aux Benitiers were the most affected with more than 65% of their live corals partially bleached. By contrast, Blue Bay, Bel Ombre and Mon Choisy were the least affected sites, with less than 15% bleaching (**Figure 15d**). Among Genera, *Acropora* (>80%) was the most affected, in particular the species *A.muricata* (>85%), *A.cytherea* (>70%) and *A.selago* (>60%). Post-bleaching rapid assessment surveys at several affected sites (i.e. Anse la Raie, Belle Mare, Grand Gaube) undertaken later in the same year showed recovery of partially bleached corals, with low cases of coral mortality.

Long-term data collected through this study are expected to help in (i) providing insight into ecological processes that underlie reef resilience, (ii) understanding human impacts on coral reef ecosystem, (iii) generating data for use in multidisciplinary coastal studies, (iv) providing a better understanding of climate change impacts on coral reef ecosystem on a short-term as well as on a long-term basis, and (vi) informed decision making to reverse the current trend in reef degradation.

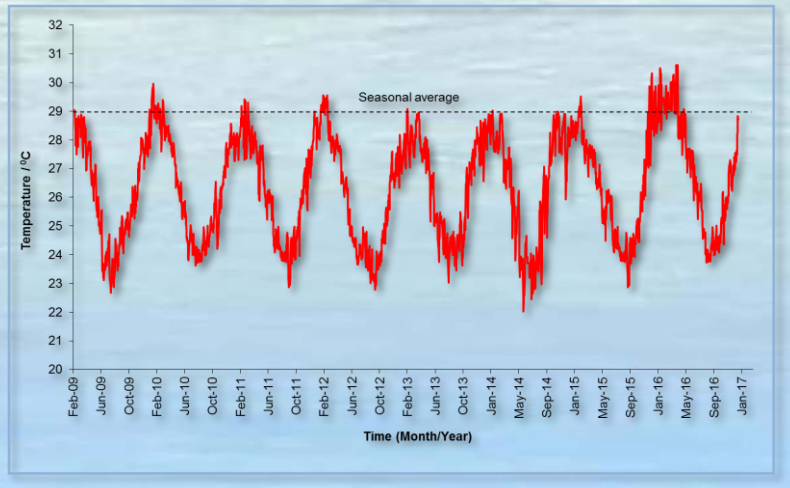

Figure 15a: Mean daily daytime temperature (°C) recorded by in-situ loggers at Grande Rivière Sud-Est (GRSE) (depth: <2.5m) from Feb-09 to Dec-16 (MOI, 2016).

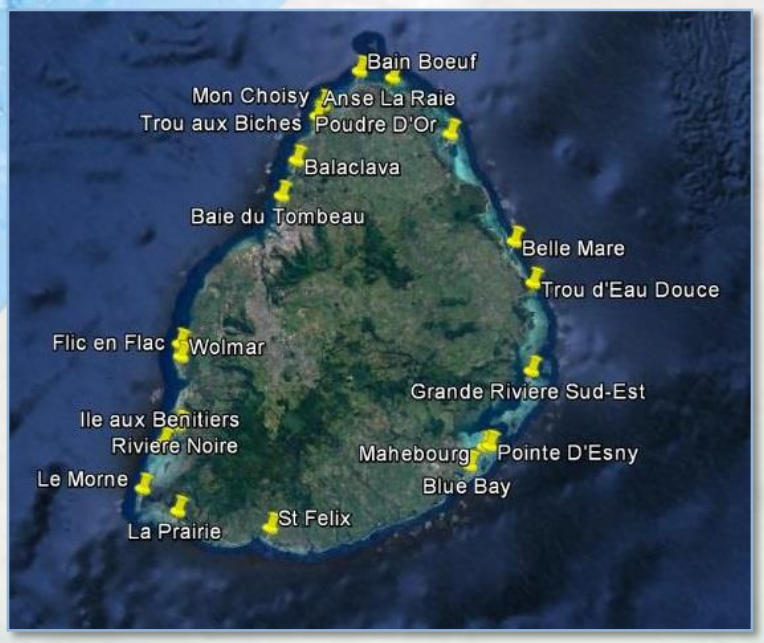

Figure 15b: Locations around Mauritius where bleaching surveys have been undertaken in 2016.

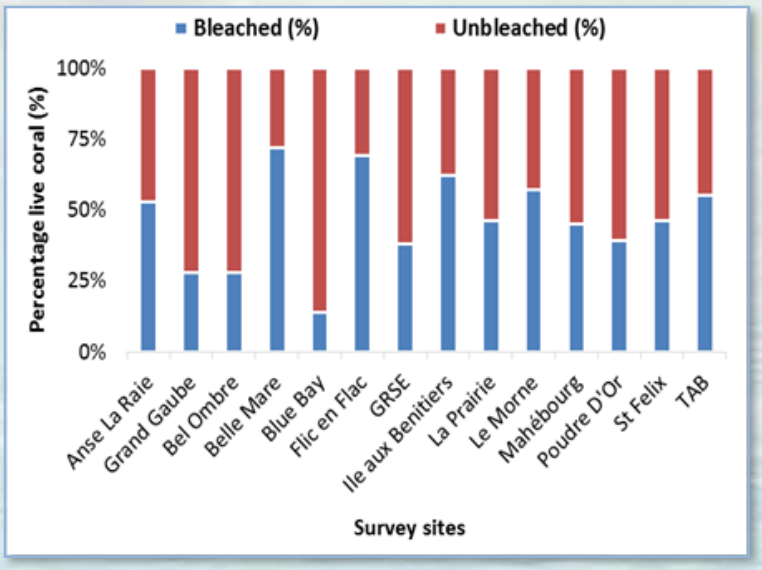

Figure 15c: Mean percentage bleached and unbleached corals recorded during quantitative surveys at selected reefs sites around Mauritius.

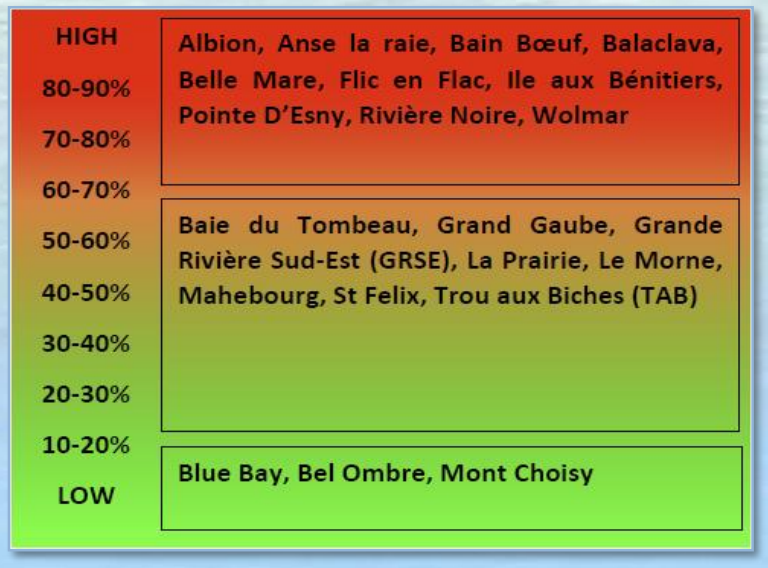

Figure 15d: Levels of bleaching recorded at surveyed sites (in lagoons & off-lagoon) around Mauritius.

Assessment of Marine Living Resources in the EEZ of Mauritius

Faced with global threats including over-exploitation, habitat loss, pollution, disease, invasive species and climate change, bio- and genetic diversity need to be properly assessed and conserved. This is in line with the Government programme 2015-2020 as well as with its Vision 2030, whereby protection and preservation of marine living resources is key to the establishment of a sustainable Ocean Economy.

The assessment of marine living resources aims to identify and inventory marine living resources in the Exclusive Economic Zone (EEZ) of the Republic of Mauritius, using both taxonomy and a DNA-based approach. While its initial focus has been on fish of commercial importance, the project is currently assessing sea cucumbers (holothurians) inhabiting the Mauritian waters.

The main outcomes/deliverables from this project so far have been (i) a list of commercial fish species and sea cucumber species with their DNA barcodes, (ii) an online marine diversity and genetic database (iii) market fish guides, and (iv) provision of services to the seafood industry for DNA-based identification of fish samples.

The MOI will undertake the inventory of other groups of marine organisms with commercial importance such as molluscs (2017-2019) and crustaceans (2019 and beyond). The information gathered during the project will be useful in fisheries management, regulation and enforcement and for conservation of biodiversity.

Inventory of Sea Cucumber (Holothurians)

Following DNA extraction from 83 sea cucumber specimens, several techniques to amplify the DNA barcoding gene Cytochrome *c* oxidase subunit I (COI), were tested. The amplified products were sequenced at the BGI genomic centre.

In 2016, 64 specimens have been successfully amplified and up to now 58 PCR products have been sequenced. The progress achieved so far is depicted in the bar chart (Table 1& Figure 16)

Following Bioinformatics analyses, the results indicate that the species belong mostly to the genera *Stichopus, Bohadschia* and *Holothuria* clustered within two major families, Stichopidae and Holothuriidae (Fig 2)

All data generated from the project are uploaded on the online marine diversity and genetic database. (https://www.mdgdb.com)

Provision of Services

With the technique acquired from the commercial fish DNA barcoding project, the MOI is providing its services to seafood industry for identification of frozen fish filet using DNA-based tools. For the year 2016, 21 DNA analyses from 7 samples have been undertaken for identification of fish filet.

Specimens collected	**83**
Specimens amplified	**64**
Specimens successfully sequenced and analysed	**58**

Table 1: Number of specimens collected, amplified and sequenced.

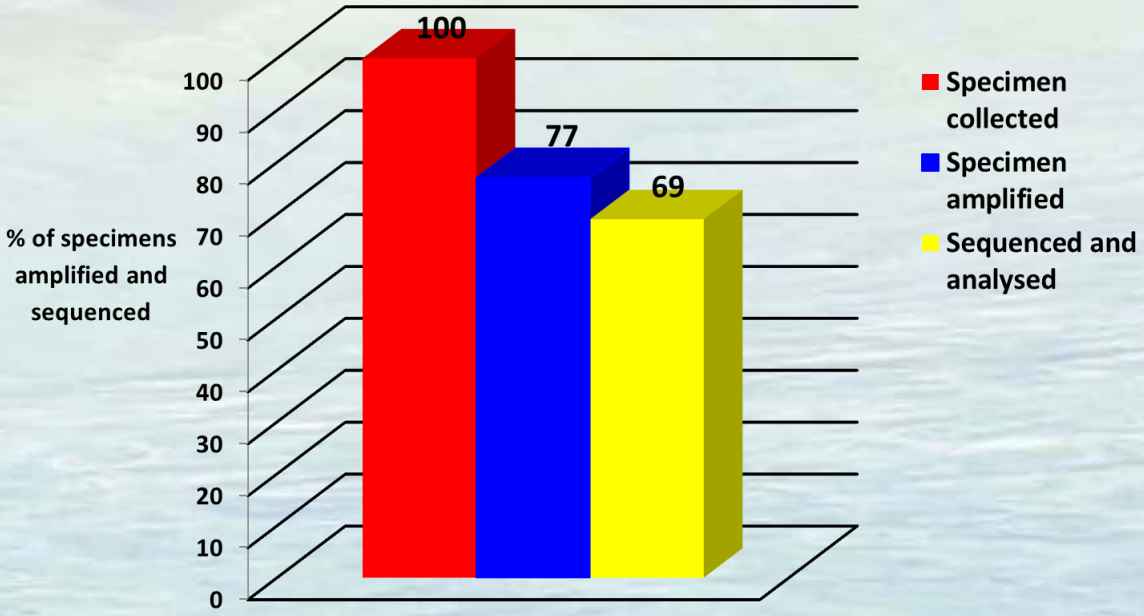

Figure 16: Bar chart showing % of specimens amplified and sequenced.

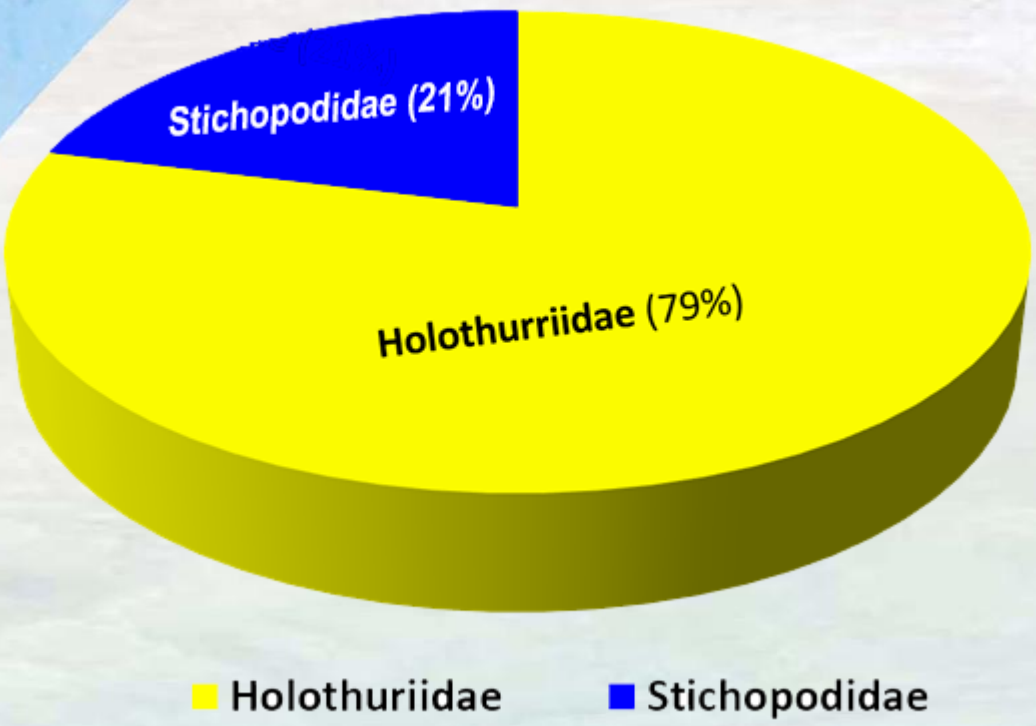

Figure 17: Family wise distribution of sea cucumber species identified using DNA techniques.

Bioprospecting of Mauritius Waters (Biological Activities of Marine Natural Substances from Mauritius Waters)

In our continuous effort for discovering novel compounds that can be developed into potent drugs, in 2016 we focused on the isolation of pure compounds from the extracts of four marine sponges namely *Echinodictyum sp, Pericharax sp* and Petrosia *sp1* & *Petrosia sp 2* which displayed anti-diabetic, anti-Alzheimer and anti-cancer properties respectively

The following activities were performed on these sponge extracts:

(i) Preparation of crude extracts by total and selective extractions;
(ii) Purification/fractionation of crude extracts using Medium Pressure Liquid Chromatography (MPLC);
(iii) Isolation of pure compounds by High Performance Liquid Chromatography (HPLC) from purified/fractionated extracts by MPLC; and
(iv) Biological testing of the fractions/pure compounds.

An example of part of the above activities is with the sponge Petrosia sp 2. Fractionation of the hexane extract of Petrosia sp 2 resulted in 5 main fractions (1-2), (3-5), (6-11), (12-17) and (18-21). MPLC of fraction (12-17) produced 110 fractions. Based on Thin Layer Chromatography (TLC) similar fractions were merged and resulted in 23 major fractions.

A number of pure compounds were isolated from some of these sponges. From the sponge *Petrosia sp 1*, six compounds were isolated of mass in the range of 1.2 to 8.8 mg and from the sponge *Echinodictyum sp* some isolates displayed significant anti-diabetic activity. However, the characterization part of this research has been delayed due to lack of the state-of-the-art equipment and collaboration with foreign institutes. To overcome this constraint, the MOI initiated discussions with the University of Cape Town (UCT) for a collaborative research work on Marine Natural Products (MNP). This collaboration was materialized through the signature of a Memorandum of Understanding (MoU) between MOI and UCT in January 2017. Moreover, under this MoU before undertaking any advanced laboratory research work for characterization at UCT, a Material Transfer Agreement (MTA) and Project Specific Agreement (PSA) have to be prepared and signed between both parties. The drafting of the MTA and PSA were done and submitted to the State Law Office (SLO) for vetting. With this agreement with UCT it is expected to fast-track this project in terms of characterization of pure compounds.

Figure 18: "Equipment at MOI for isolation of pure compounds from sponge extracts".

Assessing the Submarine Groundwater Discharge (SGD) Flux to Meet Potable Water Demand and Improve Domestic Water Supply in Coastal Regions

Following the identification of twenty-eight major submarine groundwater discharge sites around Mauritius by sea surface temperature temporal imagery and in-situ measurements of ^{222}Radon, a naturally occurring radio-tracers, the focus of the investigation is geared towards the determination of the flux of fresh groundwater and recirculated water in specific regions. With a non-negligible demographic increase and a constant growth of the tourism sector in the region of Trou aux Biches, the latter is elected as the prime site to evaluate the flux groundwater.

Six distinct springs as depicted in Figure 19 are present in the lagoon of Trou aux Biches with large volumes of water entering the lagoon. The flux can even be observed by the formation of a bulge at the surface as seen in Figure 20. Furthermore, dispersed discharge is also observed in the study area by the formation of small stream-like structures on the beach in low tide conditions as in Figure 21.

To evaluate the discharge of fresh water, the strategy adopted is to consider the lagoon of Trou aux Biches as a thermodynamically stable system with a certain amount of Radon entering and a certain amount of Radon leaving the system. Initially Radon inventory was performed in the lagoon with a total of 270 stations sampled and the Radon concentration was determined, resulting in a map of the radioactivity distribution in the lagoon.

Radon leaves the system via sea-air exchange which is estimated by the Weiss equation from the initial inventory. Radon also leaves the system through movement of water masses. The latter was estimated using an Acoustic Doppler Current Profiler (ADCP) to measure the current profiles and flushing of the area under study along transects seen in Figure 22.

^{222}Radon enters the hypothetically stable system through three main pathways; dispersed seepage in the lagoon, seepages seen on the beach and from the 6 distinct springs. To measure the dispersed seepages from the sea bed, seepage meters were used. The apparatus consisted of an 80 L barrel with an open end and a tap on the opposite end. The open end is squeezed in the sea bed. Using a plastic bag attached to the tap, water samples were collected at different time interval. Each sample was investigated for salinity, temperature, pH, volume and Radon content. The sampling stations are seen in Figure 23. Seepages on the beach were evaluated using push-point samplers each 20 m in the study zone as per Figure 24.

Furthermore, to distinguish between fresh groundwater and recirculation of seawater due to tidal changes, water samples were collected and analysed for another naturally occurring tracer ^{226}Radium. The samples were investigated at the University of Kiel, Germany by Dr. Jan Scholten.

Finally, to complete the set of data required to evaluate the flux of fresh groundwater entering the system and to quantify the flux of fresh water injection in the lagoon, 24 hours monitoring

of the Radon concentration needs to be performed on each of the 6 springs. Simultaneously to the 24 hours monitoring, water samples will be collected at a 30 minutes intervals for measurement of nutrients. These data will complement the investigation by providing a daily estimate for the input of these chemicals in the lagoon. In line with the investigation, MOI is setting up an analytical chemistry laboratory that will provide accurate data on seawater nutrient profiles. Before proceeding to the 24 hours monitoring, it is critical to have the capacity to measure the chemical properties of the water. The summary of the strategy used is depicted in Figure 25.

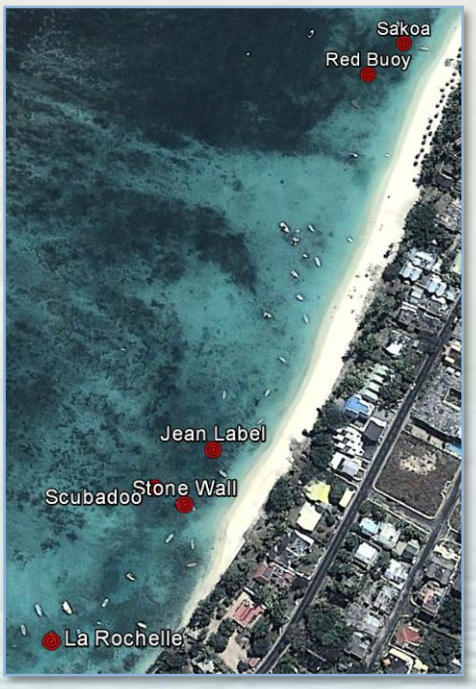

Figure 19: Six distinct SGD springs are seen in the lagoon of Trou aux Biches.

Figure 20: The flux of groundwater forms a bulge seen on the water surface at each of the six springs.

Figure 21: In low tidal conditions, small stream-like structures formed by the continuous flow of fresh water are seen on the beach.

Figure 22: The current profile was determined along the transects in red and yellow.

Figure 23: Seepage meters were deployed at six stations along four transects.

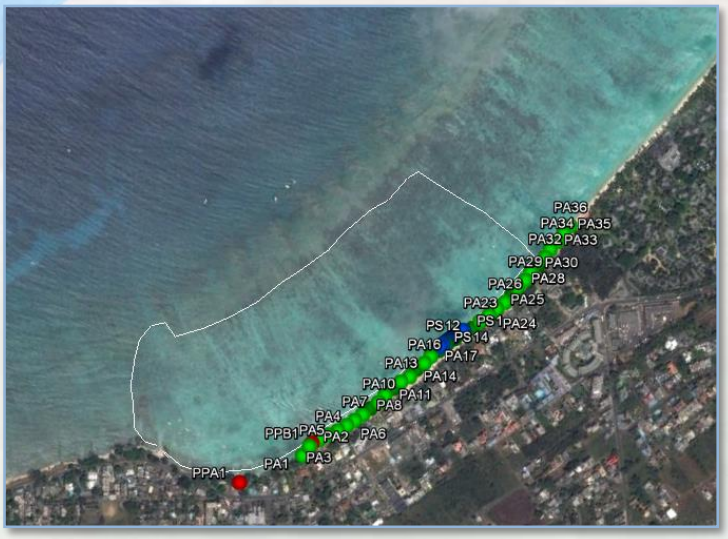

Figure 24: Location of push-point sampling stations on the beach of Trou aux Biches.

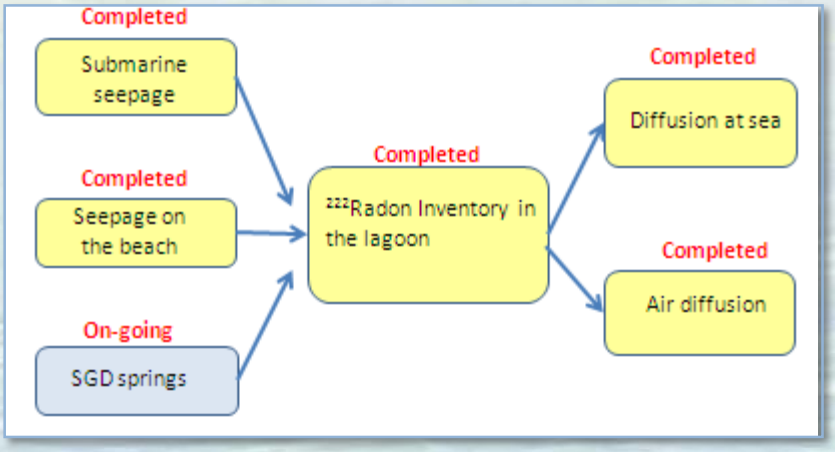

Figure 25: Summary of the technical approach to evaluate the flux of SGD. The missing element is the 24 hours monitoring of Radon concentration on each of the 6 spring springs.

Study of Local Seismicity around Rodrigues – Central Indian Ridge (CIR) Region Using Array Techniques

Seismic activity around the Rodrigues region has been a matter of concern for the local population for a long time. Located at a distance of approximately 250 km to the highly active Central Indian Ridge (CIR), it is always at risk of experiencing some ground shaking.

A joint project between Goethe-University, Frankfurt and the MOI was initiated in 2014 with the aim of deploying a dense array of seismic stations on the Rodrigues Island and using array techniques for the detection and location of earthquakes in the region with respect to intraplate seismicity. Currently, MATLAB code has been developed to use array methods to locate the detected events. The final report will be submitted by January 2018.

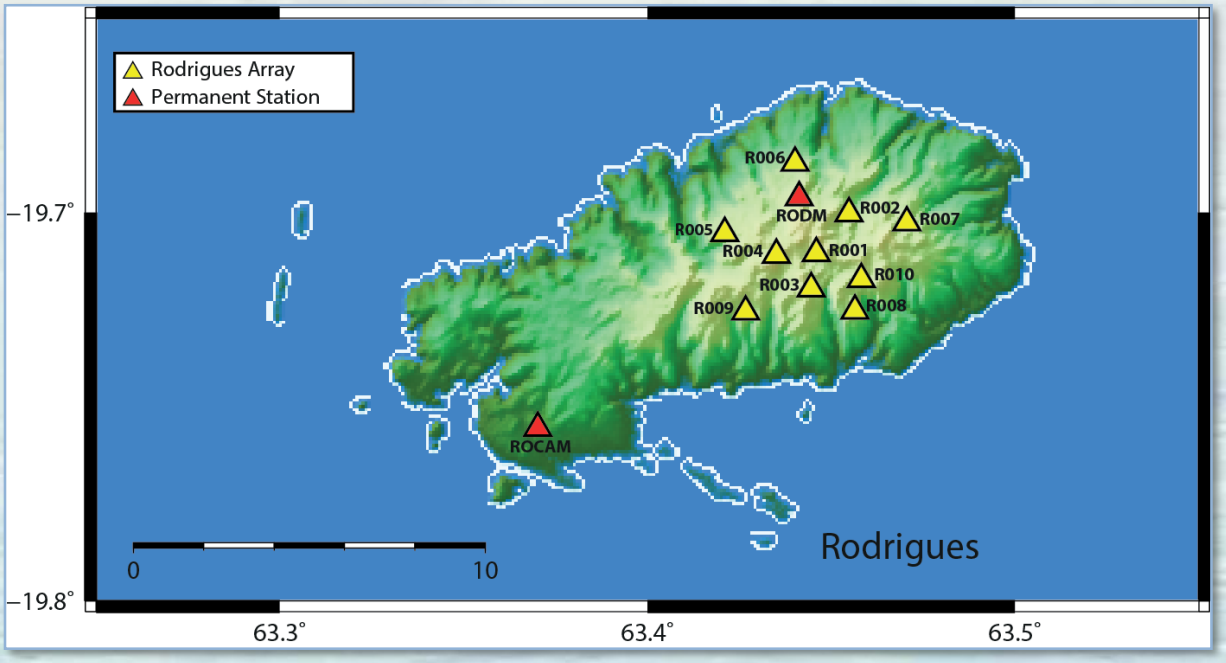

Figure 26: Seismic station locations on Rodrigues Island.

Activities Undertaken

Year 1 (2014-2015)	Year 2 (2015-2016)	Year 3 (2016-2017)
• Field survey. • Seeking Permission for deployment of seismometers. • Installation of Seismometers. • Collection of first dataset.	• Collection of data. • Pre-processing and processing of data • Analysis of data.	• Field work for removing seismometer. • Compiling collected data from the array. • Pre-processing and processing of data • Analysis of data. • Developing MATLAB codes for array analysis

Nearshore Hydrodynamics Studies at Albion

The Partnership for Observation of the Global Oceans (POGO) is a consortium of major oceanographic institutions around the world to promote global oceanography capacity building. The Nippon Foundation-POGO Centre of Excellence (NF-POGO CoE) provides world class education and training courses in the field of observational Oceanography. The NANO (NF-POGO Alumni Network for Oceans)-Africa Group was created in 2012 and focusses mainly on Nearshore Hydrodynamics-Erosion studies.

With the aim of strengthening the observation of coastal zone hydrodynamics and promoting long-term collaborations between its members, two Associate Research Scientists from the Mauritius Oceanography Institute (MOI) participated in the NF-POGO CoE and joined the NANO-Africa Group. The latter provided the MOI with a weather station (Gill instrument, UK; parameters measured: wind speed, wind direction, air temperature, relative humidity, barometric pressure) [installed on MOI rooftop] and a pressure sensor wave recorder (RBR Virtuoso, Canada; parameters measured: significant wave height, wave period, tide, sea level height) [deployed offshore at Albion]. Under this collaborative programme, the MOI is carrying out nearshore hydrodynamics studies at Albion on the western coast of Mauritius.

The objective of the study is to provide accurate long-term wave, tide and wind data on an operational basis and to help build capacity in ocean and coastal observation, and to eventually come up with nearshore hydrodynamics modelling studies in the study area. Consequently, modelling results will help have a better understanding of wave and tide characteristics, sediment transport and dynamics in the western region of Mauritius. This will in turn assist local institutions and policy makers to plan future development and provide best management practices and services for the benefit of society at large. Selected wave parameters recorded from December 2016 to April 2017 are shown in Figure 1. High significant wave heights were recorded in February and March which was due to the influence of cyclones Carlos and Enawo respectively in the region.

Figure 27: Weather station installed at Albion.

Figure 28: Pressure sensor wave recorder deployed at Albion.

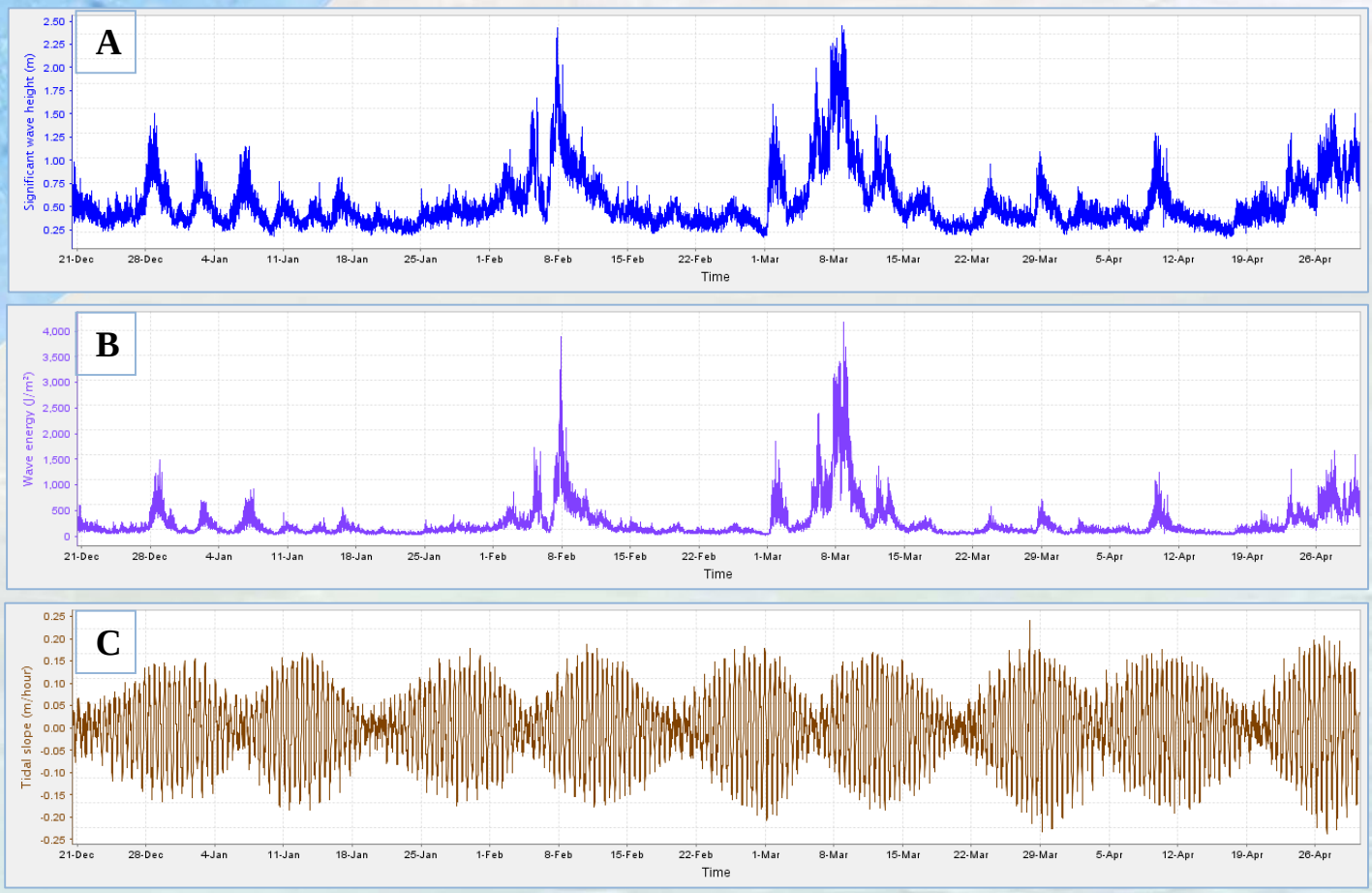

Figure 29: (A) Significant wave height (m), (B) wave energy (J/m^2) and (C) tidal slope (m/hour) measurements recorded at Albion for the period Dec 2016-April 2017.

Biological Survey to Detect Introduced Species

Figure 30 (a): Biological sampling of organisms on wharf piling; (b): Mauritius Container Terminal Quay situated at Mer Rouge; (c): Biological sampling of fouling assemblages using quadrat scraping method.

Shipping is vital to intercontinental trade and global economy. According to the International Maritime Organization (IMO), 90% of the world's commodities are transported annually around the globe in ships. However, shipping has been recognized as a major vector for the global transfer of non-indigenous marine species. The introduction and establishment of non-indigenous and invasive aquatic species to new environments via ships' ballast water and hull fouling has been identified as one of the major threats to marine biodiversity. In an effort to address the risk posed by the discharge of ballast water, the IMO adopted the International Convention for the Control and Management of Ships' Ballast Water and Sediments in 2004. This convention aims to prevent, minimise and ultimately eliminate the risks to the environment, human health, property and resources arising from the transfer of harmful aquatic organisms and pathogens via ships' ballast waters.

The Republic of Mauritius, over the past few years, has been actively pursuing the development of a Ballast Water Management Programme for our ports so as to increase our adherence to international regulations and also to improve the corresponding protection of our national marine resources. As part of our effort, the MOI has carried out a biological port baseline survey of Port Louis at 27 locations (23 quantitative and 4 qualitative sites) which has established the extent of existing marine invasive species. In line

with the IMO Guidance on Port Biological Baseline Surveys different sampling methods employed were sediment corers, quadrate scrapes, traps, beach seines and plankton tows. In addition, a Ballast Water Risk Assessment Decision Support system was developed around the precautionary principle in order to synthesise data about environmental similarity, shipping and ballast water movements and known invasive species. The final project report has been submitted at the level of then parent Ministry of the Shipping Division, the Ministry of Public Infrastructure, Land Transport and Shipping which has established the extent of existing marine invasive species. In addition, a Ballast Water Risk Assessment Decision Support system was developed around the precautionary principle in order to synthesise data about environmental similarity, shipping and ballast water movements and known invasive species.

Currently, the MOI is drafting two pipeline projects for the Ministry of Ocean Economy, Marine Resources, Fisheries, Shipping and Outer Islands (Shipping Division) with focus on the International Convention for the Control and Management of Ships' Ballast Water and Sediments (2004) and Guidelines for the Control and Management of Ships' Biofouling: To minimize the transfer of invasive aquatic species (2011). These two projects are:

a) Biological Survey of Port Mathurin Harbour to Detect Introduced Species

Port Biological Baseline Survey is a multidisciplinary scientific survey conducted periodically to assess a port's biological communities and ecology, with focus on the identity, distribution and abundance of Non-Indigenous Species (NIS), some of which may be ecologically damaging and invasive. This project will aim at conducting the first port baseline survey of Port Mathurin, Rodrigues, so as to provide an inventory of the natural populations, including a catalogue of existing introduced species. This will contribute, for instance, to the development of Ballast Water Management strategies and measures for our ports.

b) Ships' Biofouling in Port Louis Harbour

Marine biofouling occurs mainly through attached, or sessile, marine species. Shipping has been identified as the major vector for the spread of invasive aquatic species on a global and regional scale, and the resulting transfer and introduction of invasive aquatic species through ship's biofouling threatens the conservation and sustainable use of biological diversity. In context and pertinent to the 2011 Guidelines for the Control and Management of Ship's Biofouling to Minimize the Transfer of Invasive Aquatic Species, this project aims at developing a standardized template for hull inspection as a decision support tool and its application to survey invasive aquatic species related to biofouling.

It is anticipated that the outcomes of these undertakings will not only increase our adherence to international regulations, but also improve the corresponding protection of our national marine resources.

Survey at Agaléga Islands

From the 19th to the 25th of September 2016, MOI staff, namely Mr. Oocheetsing Sadasing, Mr. Arnaud Nicolas and Mr. C. Samyan participated in an expedition to the Agaléga Islands (Figures 31 and 32) on board of the Coast Guard Ship Barracuda (Figure 33). The main objective of the Agaléga expedition was to collect oceanographic baseline data. A Conductivity-Temperature-Depth (CTD) device (Figure 34) and an Electromagnetic Current Meter (ECM) (Figure 35) were deployed in the Port Area of the North Island of Agaléga in order to determine the temperature, salinity, fluorescence and ocean current variations.

Additionally, a permanent reef monitoring station was established in the lagoon, west of North Island to study the long-term evolution of benthic cover (Figure 36) in response to environmental change. Two in-situ temperature loggers were deployed inshore close to the main village Vingt-Cinq and offshore the Port Area respectively, with the aim of extending MOI's existing Temperature Network up to the Outer Islands of the Republic of Mauritius. Furthermore, tissue samples from 3 sea cucumber specimens were collected and preserved in ethanol for DNA based identification. The DNA-barcoding gene from the 3 specimens were successfully amplified and bioinformatics analysis of the sequenced amplicons indicated that they were *Stichopus chloronotus*. Spicules examination of the tissue samples revealed the presence of table-like spicules.

The MOI would like to thank the NCG and the OIDC for providing logistics facilities during the expedition.

Figure 31: Agaléga Islands [10° 40' S, 56° 55' E]. Source: Google Earth.

Figure 32: La Fourche – North Island, Agaléga.

Figure 33: Coast guard ship barracuda anchored at North Island, Agaléga.

Figure 35: ECM deployed at 6.5m depth.

Figure 34: CTD deployed at 6.5m depth.

Figure 36: The coral species *Heliopora coerulea* found at the permanent reef monitoring station.

RHUM-RUM Project

RHUM-RUM aimed at imaging the mantle structure beneath La Réunion from crust to core, in order to determine the origin and the geometry at depth of a possible mantle plume beneath La Réunion and its possible interaction with the overlying lithosphere. Such imaging should show the possible connections of this plume with the South-African super-plume and with the neighbouring hotspots (Comores, Marion, Kerguelen, Amsterdam), but also with the Central and South West Indian ridges. It should also show the possible feeding of the Central Indian ridge by the material rising and spreading beneath the Réunion hotspot.

To reach these objectives, 57 seismological stations have been deployed on the ocean bottom over an area of 2000x2000 km^2 around La Réunion, between October 2012 and December 2013. The ocean-bottom network has been supplemented by floating seismic stations (MERMAIDS) and by terrestrial networks in Madagascar, the Seychelles, Mauritius, Rodrigues, the îles Éparses but also in La Réunion Island.

This project was ambitious by the scientific objectives, by the number of instruments deployed, and by the size of the network. It was spear-headed by a French-German collaboration that allowed sharing the scientific expertise, the technical means (ocean bottom and terrestrial seismic stations) and the logistics (oceanic vessels) to make this experiment possible.

The local and global seismicity has been passively recorded by land and ocean bottom stations in order to perform 3D imaging of the crust and mantle by complementary techniques. Imaging is made first at crustal and lithospheric scale, down to depth of about 70 km by using temporary and permanent seismic stations on La Réunion that recorded the local and regional seismicity. Upper mantle is then imaged down to 300 km depth by using surface waves. Finally, body waves are used to perform global tomography of the whole upper and lower mantle, down to the core-mantle boundary at 2900 km depth. Flow in the upper mantle is mapped by using seismic anisotropy derived from surface wave tomographies and from teleseismic shear wave splitting.

Seismic imaging is complemented by analog modelling of the whole mantle convection, by numerical modelling of plumes at the global scale, and by numerical modelling of the plume-lithosphere interaction at the upper mantle scale.

By selecting more than 4000 waveforms, the surface-wave tomography reveals a pronounced low velocity zone beneath the Mascarene basin, at 150-300 km depth between Madagascar and La Réunion that could be the source of the Réunion hotspot (A. Mazzullo, PhD thesis, IPGP). By using more than 500 global earthquakes, and the associated P-waves recorded at all the stations, the global tomography reveals a low velocity anomaly connected in the lower mantle with the large anomaly beneath South-Africa (Maria Tsekhmistrenko, PhD thesis, Oxford), suggesting a deep-seated origin of the Réunion volcanism. Seismic anisotropy shows a clear flow at asthenospheric depth, linking the Réunion hotspot and the Central Indian ridge, suggesting that a physical link might have been preserved for several tens of million years (John-Robert Scholz, PhD thesis, IPGP-La Réunion).

The high data quality, ocean bottom recordings have also been used intensively for investigating environmental issues: swell seismic monitoring, cyclone tracking, whale detection and ship tracking.

RHUM-RUM is a French-German project dedicated to fundamental research, led by Guilhem Barruol (IPGP & Univ. La Réunion) and Karin Sigloch (Universities of Munich and Oxford) and co-funded by ANR and DFG. It associates the Geoscience Lab in Montpellier, FAST Orsay, Geosciences Azur, but also the Universities of Munich, Frankfurt, Muenster, Bremerhaven, Bonn and Oxford. The project started in January 2012 and extended over 60 months. It benefited from ANR funding of 792 K€ for a global cost of about 5 M€.

Manvendra Singh, Research Scientist from MOI did his PhD from Goethe-Universität Frankfurt am Main, Germany between October 2014 and September 2017 under Prof. Dr. Georg Rümpker. The title of his thesis was “Seismic Anisotropy, Crustal Thickness Variations and Intraplate Seismicity in the South-West Indian Ocean”. He was awarded Doctorate in December 2017.

MOI Undertakings with regard to the Grounding of MV Benita

Figure 37: Survey sites, sediment collection and grounding of MV Benita on Ilot Brochus at Le Bouchon.

On the 17th June 2016, the Cargo ship MV Benita was grounded on Ilot Brochus at Le Bouchon (Figure 37). The ship grounding resulted in the leakage of oil (HFO) from the vessel into the sea, which eventually found its way to the lagoon and shore of the region. The Mauritius Oceanography Institute (MOI) being an active stakeholder in crisis situations was called upon to assist through collection of physico-chemical and biological parameters/samples for analysis.

The involvement of MOI in the different surveys is detailed below:

1. Surface current surveys were carried out on 13th and 15th July 2016 in collaboration with Albion Fisheries Research Centre (AFRC) and the National Coast Guard (NCG) at three sites namely (i) Le Bouchon off-lagoon, (ii) Le Bouchon lagoon and (iii) Blue Bay lagoon. The primary aim of the surveys was to characterize surface current pattern in order to evaluate potential zone prone to oil spill;

2. Sediment samples were collected on the 27th June 2016 at Le Bouchon (affected site) and at Gris Gris, La Cambuse, Blue Bay, Pointe d'Esny for geographical area coverage. These samples were submitted to the National Environmental Laboratory (NEL) for Polycyclic Aromatic Hydrocarbons (PAH), Heavy Metals and Total Hydrocarbon analyses;

3. From 11th to 15th July 2016, the MOI in collaboration with AFRC and International Tanker Owners Pollution Federation (ITPOF) undertook ecological surveys in the lagoon of Le Bouchon and nearby regions, as well as at the Blue Bay Lagoon;

4. The MOI has also actively participated in different meetings of the crisis committee regarding the operations linked to the grounding of MV Benita, ecological surveys and sediment/water analyses.

Survey reports (comprising maps, charts and results) produced by the MOI were submitted to the crisis committee. These reports helped in decision-taking process. The MOI also provided assistance to AFRC and ITOF for the preparation of a Preliminary Ecological Impact Assessment Plan (PEIAP).

Staff Training

Dates	Title	Venue	Name of Attending Officer	Relevance to MOI	Perceived Benefits
22nd August to 25th August 2016	Hands-On Training in Marine Metagenomics	Pwani University, Kilifi, Mombasa, Kenya	Mr. S. Curpen, Associate Research Scientist	• During the training, participants were shown various techniques for sampling of seawater and sediments for microbial DNA extraction. In addition, the precautions to minimize the risk of DNA contamination from cells of eukaryotic origin were also being demonstrated. • As part of the training-ship, both seawater and sediment were collected from sampling stations and immediately analysed. In the laboratory, participants were provided with hands-on experience on the steps to follow for efficient DNA extraction from marine microbiome in both seawater and sediment samples. • As the techniques for	• The techniques acquired during the training can be applied to current and future projects of MOI namely in: (a) Aquaculture related research and services whereby micro-biological data will be collected at potential aquaculture sites. (b) Marine biotechnology research for screening of marine micro-organisms harbouring biotechnological applications mostly those dwelling in extreme environment. (c) Submarine ground-water discharge (SGD) for identification of microbial communities that may be associated with SGD. • The skills and bioinformatics workflow

Dates	Title	Venue	Name of Attending Officer	Relevance to MOI	Perceived Benefits
				DNA extraction vary on the type of samples collected and the environment prevailing at the sampling sites, participants were given practical experience on how to modify protocols for efficient extraction of microbial DNA. The laboratory work was followed by a working group session whereby participants analysed the results obtained and discussed on the various procedures to follow for yielding better microbial DNA quality. • For the Bioinformatics sessions, participants were lectured on the concept behind metagenomics, the various techniques utilized to generate high-throughput data and also an introduction on algorithms for analyzing metagenomics dataset. A hands-on practical session	developed during the workshop can be applied to initiate metagenomics work in Mauritius. In understanding the repertoire of microbes present in various marine environments, an indication of their potential biotechnological properties will be obtained. • Moreover, a metagenomics approach can be used to determine the various uncultured pathogenic microbes which may be of detriment to aquaculture.

Dates	Title	Venue	Name of Attending Officer	Relevance to MOI	Perceived Benefits
				on how to use the Unix/Linux command and various programming algorithms for accessing metagenomics packages were introduced to participants. • Good networking among the participants.	
22nd to 27th August 2016	Third Ocean Forecasting for the Western Indian Ocean Region	IMTR/KMD, Nairobi, Kenya	Dr. A. Rawat, Associate Research Scientist	• The main goal of the workshop is to enhance regional collaboration between the ocean and climate experts to facilitate generation of seasonal ocean state forecasts for the WIO region. Several points were discussed during the workshop namely: i. Prepare seasonal ocean forecasts for the WIO region during the SOND season ii. Hold joint discussions with climate scientists to develop a consensus ocean forecast for the season. iii. Assess ocean state	• Several datasets was provided to the workgroup, namely the 1km PML MODIS SST dataset from the MESA project, the ESA/CCI L4 GHRSST-SST dataset and the AVHRR Pathfinder SST dataset. • A presentation was made about the MESA project and potential use of additional MESA datasets for meeting the overall objectives. Focus was made on the 1993-2011 GLORYS reanalysis dataset which could be very useful in the analysis of several climatic parameters.

Dates	Title	Venue	Name of Attending Officer	Relevance to MOI	Perceived Benefits
				forecast products generated and the likely impacts for the upcoming SOND season. iv. Disseminate ocean information and model products to users of ocean information and other stakeholders after validation. v. Ultimately, enhance regional collaboration between the ocean, climate and fisheries communities to facilitate the generation of more accurate seasonal ocean and pelagic fisheries forecasts for the GHA and WIO regions.	

Participation in International Conferences, Workshops and Meetings

Dates	Title	Venue	Name of Attending Officer	Relevance to MOI	Perceived Benefits
13th to 17th April 2016	Maritime India Summit 2016 and Visit and meetings at the National Institute of Oceanography (NIO), the National Centre for Antarctica and Ocean Research (NCAOR), the National Union of Seafarers India Maritime Institute (NUSI) and the University of GOA	India	Mr. Raj H. Prayag, Chairman of MOI	• To seek potential avenues of collaboration.	• Established MoUs for implementation of research projects, capacity building and technology transfer.
17th to 19th May 2016	Regional workshop of WIO GCRMN Coral Reef Status Report drafting	Fumba Beach Lodge Hotel, Zanzibar	Mr. S. Bacha Gian, Research Scientist	Information Missing	
6th July 2016	Regional Steering Committee: Restoring Marine Ecosystem Services by Rehabilitating Coral Reefs to meet a Changing Climate Future	Seychelles	Dr. D. Dumur-Neelayya, Associate Research Scientist	• Enable large-scale restoration of an identified reef site, which will surely benefit Mauritius by restoring its aesthetic value, fisheries (biodiversity) and coastal protection; • Provision of an	• To obtain consensus on the draft of the Concept Note. • To present past experience and research undertaken by MOI and AFRC on coral farming and reef restoration in the Republic of Mauritius.

MAURITIUS OCEANOGRAPHY INSTITUTE

Dates	Title	Venue	Name of Attending Officer	Relevance to MOI	Perceived Benefits
				alternative livelihood to the local fisher community. • Enhance partnership between local stakeholders and foster new partnerships with regional stakeholders; • Facilitate research in coral reefs: restoration and genetics; • Enhance visibility of MOI and therefore, the Republic of Mauritius on the Regional front.	
12th to 16th September 2016	12th EUMETSAT User Forum in Africa	Lemigo Hotel Kigali, Rwanda	Mr. J. I. Mosaheb, Principal Research Scientist	• The ongoing MESA Programme is presently using data from EUMETSAT and the Forum was an appropriate platform to strengthen the already excellent relationship that MOI has with this organization. • With the GMES Programme starting in 2018, the MOI is well positioned to continue the programme. • The exploitation of the	• Visibility of our Institution internationally- MOI being the Regional implementation centre a presentation was made on the Status of the MESA Project. • Acquaintance with new development in the field of Earth Observations. • Use of satellite data for the eventual production of Coastal Vulnerability Index • Monitoring of Coastal Erosion thru Earth

Dates	Title	Venue	Name of Attending Officer	Relevance to MOI	Perceived Benefits
				new Copernicus Sentinel 3 marine mission will deliver data which will be useful for the monitoring of the coastal ecosystem and of the updating of the services started in MESA.	Observation. • Networking with other scientists in the region.
29th August to 2nd September 2016	"RHUM-RUM" workshop	Reunion Island	Dr. D. Bissessur, Associate Research Scientist		• Update on the work that has been carried out on the acquired data. • Increased visibility for the MOI by interaction with other participants: potential regional and international collaboration. • Progress on the future publication of scientific paper in international journals. • Additional information to understand the structure of the seafloor around Mauritius and its evolution • Information / data on the offshore seafloor around Mauritius to be provided to the Government for decision making.

Dates	Title	Venue	Name of Attending Officer	Relevance to MOI	Perceived Benefits
24th to 25th November 2016	"Innovation and Sustainable Development" workshop	Le Voila Hotel, Bagatelle	Dr. A. Rawat, Associate Research Scientist	• Research and Development for a sustainable ocean Economy and the related undertakings of the MOI	• Capacity Building to address innovation, Innovation and Sustainable Development as well as Industry and Innovation.
20th to 21st June 2017.	Third Regional Steering Committee for the AFD Coral Restoration	Seychelles	Mr. Bacha Gian Suraj, Research Scientist	• To help the project team in the finalisation and validation of the AFB full project proposal (AFB Project Formulation Grant Restoring marine ecosystem serves by rehabilitating coral reefs to meet a changing climate future). • To provide sufficient information for the consultants to complete the AFB proposal and annexes, by making full use of the body of knowledge and experience available at the steering committee.	

MESA Activities

Dates	Title	Venue	Name of Attending Officer	Relevance to MOI	Perceived Benefits
19th to 21st January 2016	Peer Review Meeting of the Marine Services	Mash Park Hotel in Nairobi, Kenya	Mr. E. Martial, Systems Administrator/MESA Project Leader and Dr. Francois Wernerus MESA TA-TE	The MESA technical assistance team conducted an independent assessment of the MESA services, developed by the each regional implementation centre including the MOI with regards to service maturity, quality and relevance.	The Peer Review Panel made recommendations to MOI on how to improve the product usage at national and regional levels.
14th to 24th March 2016	Training of Trainers (TOT) on MESA System Application (eStation-2)	Institute Meteorological Training and Research, Nairobi, Kenya	Mr. E. Martial, Systems Administrator/MESA Project Leader and Mr. V. Ramchandur, Research Scientist/Thematic Expert	• The MOI as the Regional Implementation Centre of the "Marine and Coastal Management" THEMA for the Indian Ocean Commission region will be involved in the delivery of MESA system application training to national beneficiary institutions participating in the IOC THEMA. • Also MOI is the first point of contact for partner institutions in the region with respect to how to use the MESA eStation for service delivery.	• The presence of the MOI staff at this Training of Trainers session was an opportunity for them to better understand the functioning of the MESA e-Station for products and service delivery. The MOI staff were apprised of the methodologies and tools to be used in teaching systems administration and application. • Furthermore, the MOI was able to participate in the harmonisation of the training materials and provided valuable inputs as

Dates	Title	Venue	Name of Attending Officer	Relevance to MOI	Perceived Benefits
					regards hands on exercises/practicals and the adaptation of existing materials to suit the marine theme.
4th to 5th April 2016	Installation of the MESA Station	MOI, Albion		The MOI, being the regional implementation centre for MESA received a set of 3 PCs as donation from the EU funded MESA programme.	• Upgrading of existing MOI satellite receiving • Higher processing and storage capacities with the new station • New functionalities on the MESA station
11th to 15th April 2016	MESA Continental Environmental Bulletin preparation	Gaborone, Botswana	Mr. V. Ramchandur, Research Scientist/MESA Thematic Expert	• The role of the MOI was to develop charts for the past six months in the Indian Ocean on Sea Surface Temperature and Chlorophyll data. • During the five days meeting, with the help of expert from the Joint Research Centre (JRC) MOI and the other participants managed to come up with a twelve pages bulletin for the region of Africa.	• The April 2016 edition of the MESA Continental Environmental Bulletin highlighted current locations in Africa where vegetation growth conditions are very bad, bad and very good; potential reduction and potential increase in fish abundance; and flooding.
8th June 2016	Awareness on MESA activities during the celebration of World Oceans Day 2016	MOI, Albion		MOI demonstrated its work in the field of satellite remote sensing.	• Visibility of MOI through MESA Project
8th to 12th August 2016	MESA System Application (eStation-2)	Institute for Meteorological	Mr. O. Gooroochurn, Associate Research	MOI staff received training on the MESA E-Station 2.0 System and	MOI staff was trained on how to use the MESA

Dates	Title	Venue	Name of Attending Officer	Relevance to MOI	Perceived Benefits
	Training for Station Users	Training and Research (IMTR) in Nairobi, Kenya.	Scientist/ Thematic Expert	Marine Applications.	applications with a focus on the customisation of the MESA system, data processing and specific functionalities for the marine theme.
8th to 12th August 2016	MESA-IOC-MOI Regional Training Workshop on "Communicating Scientific Information to Policy Makers"	Aanari Hotel, Flic en Flac, Mauritius	Mr. E. Martial, Systems Administrator/MESA Project Leader, Mr. J. I. Mosaheb, Principal Research Scientist/Project Assistant, Mr. V. Ramchandur, Research Scientist/Thematic Expert, Mr. O. Sadasing, Associate Research Scientist/ Thematic, Mr. O. Gooroochurn, Associate Research Scientist/ Thematic Expert, Ms. R. Boyjoonauth, Public Relations Officer/MESA Communication Officer	• Training on how to produce different bulletins, advisories and briefs for distribution to decision-makers, policy makers and the general public. • Given the importance of the role of scientific information in these different products developed under the MESA-IOC-MOI theme and the difficulty that scientists/technical people find in effectively sharing and communicating their findings with managers, decision makers and policymakers, it is important to provide scientists/technical people with the necessary tools for them to overcome the challenges they encounter in sharing their results. • The training workshop which consisted of lectures, practicals and discussions improved the ability of MOI scientists in communicating	• Training on different ways to communicate scientific information contained in MESA products/bulletins to decision makers and policy makers • Formulation of policy briefs • Identification of the most appropriate policy audience • Preparation of policy presentations • Preparation of written communication materials

Dates	Title	Venue	Name of Attending Officer	Relevance to MOI	Perceived Benefits
				about their work and results with a diversity of audiences, including decision makers and policy makers.	
19th to 20th September 2016	Mesa Policy Dialogue Workshop/Training		Mr. J. I. Mosaheb, Principal Research Scientist/Project Assistant	• To reach out to policy makers and senior decision makers in order to promote MESA services that support informed decision making; • To promote policy dialogue and use of information derived from EO at different levels (Continental, Regional and National levels); • To facilitate effective communication between senior technical experts and policy makers and political leaders; • To enhance appropriate understanding and usage of information derived from MESA services and products by policy and decision makers in Africa. • To appreciate transformation of MESA products and services to policy input and decision making.	• MESA services support to decision making are promoted. • Policy dialogue on the use of EO and its products in formulation and monitoring of continental, regional and national policies were undertaken. • Communication between senior technical experts and policy makers were facilitated. • Presentation of MESA Services in such a way that they are understandable by Policy and Decision makers. • Training on how to communicate MESA scientific data to the decision and policy makers.
28th to 30th September 2016	7th Technical Experts Meeting	Flic en Flac, Mauritius	Mr. E. Martial, Systems Administrator/MESA Project Leader; Dr A. Rawat, Associate Research	• MOI as the Regional Implementation Centre for the IOC theme is contractually obliged to participate in the TEM discussions	• MOI was informed of the status of the supply and deployment of receiving

Dates	Title	Venue	Name of Attending Officer	Relevance to MOI	Perceived Benefits
			Scientist / Thematic Expert and Dr Francois Wernerus MESA TA-TE	and to report on the progress of the project implementation during that meeting.	stations and other MESA equipment • MOI was apprised of the Copernicus/Sentinel marine data products and services • Best practices regarding the development of policy briefs were shared by colleagues from the African Centre of Meteorological Applications for Development • Visibility on the worked carried out by MOI under the project during a technical visit organised at the institute
27th to 30th September 2016	MESA Geoportal Workshop	Flic en Flac, Mauritius	Mr. O. Gooroochurn, Associate Research Scientist	The MESA Geoportal is part of the AUC Continental Information Management that was donated to the MOI under the MESA programme.	• MOI was trained on how to configure and use the geoportal software • The strategy for data publication was explained • Good practices in the use of geo-catalogues were shared with MOI • The Geoportal can be used by MOI to publish the

Dates	Title	Venue	Name of Attending Officer	Relevance to MOI	Perceived Benefits
					data collected by the Institute
9th to 10th November 2016	3rd IOC Regional Technical Working Committee Meeting	MOI, Albion, Mauritius	Mr. E. Martial, Systems Administrator/MESA Project Leader, Mr. V. Ramchandur, Research Scientist/Thematic Expert, Mr. O. Gooroochurn, Associate Research Scientist/ Thematic Expert,	The Regional Technical Working Committee meeting is an annual meeting organised by MOI with technical focal points from the different institutions in the six countries participating in the MESA project. During this meeting, the participants have the opportunity to discuss challenges, share solutions and take stock of the implementation status of the MESA programme in each of the six countries.	• MOI had the opportunity to discuss about the status of MESA station delivery and installation in the different countries • The status of service development, implementation and usage at national level was examined • MOI shared information about the status of the MESA station software with the participants.
17th to 18th November 2016	3rd Regional Steering Committee Meeting	Ebène, Mauritius	Mr. E. Martial, Systems Administrator/MESA Project Leader	• MOI reported on the progress and achievement of MESA at regional level • MOI received feedback from countries on the status of the project at national level • The steering Committee provided appropriate guidance to the MOI and the national focal points on the way forward.	• MOI communicated to national focal points and technical focal points on the implementation of data collection/validation campaigns through pilot projects. • MOI received information on the status of the MESA project at national level.

Dates	Title	Venue	Name of Attending Officer	Relevance to MOI	Perceived Benefits
					• Application of EO in Socio economic sectors and collaboration IOC projects were examined • Ways for improving information sharing on MESA products/service usage were discussed.
22nd to 25th November 2016	Sixth Meeting of the MESA Steering Committee	Brazzaville, Congo	Dr. D. Marie, Deputy Director	• The participation of the representative of MOI, the Regional Implementation Centre of the MESA project, in the last PSC demonstrated the professional engagement of the MOI in the MESA project and its commitment to fulfill its contractual responsibilities. • In addition, the MOI was apprised of the overall progress of the MESA programme and the plan for the remaining period. The MOI was also informed of the decisions and recommendations of the MESA Project Steering Committee for the successful implementation of the programme. • The MOI took note of the start of the new GMES and Africa initiative programme which is a	• The visibility of the MOI has been strengthened over the years due to its involvement and engagement in AMESD and MESA projects.

Dates	Title	Venue	Name of Attending Officer	Relevance to MOI	Perceived Benefits
				continuation of the MESA project.	
March 2017	IOC MESA TA mission to Comoros and Madagascar	Comoros and Madagascar	Dr Francois Wernerus MESA TA-TE	To collect the outstanding data that were required for the elaboration of Coastal Vulnerability Index maps for Comoros and Madagascar	The MESA TA Expert managed to secure some of the available data for the Coastal Vulnerability Index maps from the different institutions in Comoros and Madagascar.
17th to 21st April 2017	Regional Training Workshop on "Coastline Mapping using Satellite Imagery"	MOI, Albion, Mauritius		• In the context of the MESA project, the MOI and its regional partners from Comoros, Madagascar and Seychelles are producing Coastal Vulnerability Index Maps. • This workshop conducted by a resource person from France provided the participants with the necessary knowledge to the use a shoreline indicator to extract the shoreline position using satellite imagery and the tools to automatically detect and extract shoreline and also calculate the rate of change of shoreline based on different sets of satellite images. • The information thus produced will be used to generate the Coastal Vulnerability Index Map for Mauritius.	• The training workshop which consisted of lectures, practicals and discussions improved the ability of MOI scientists in using different pre-processing techniques for satellite images, satellite image compositing and digital mapping methodologies. The staff trained will be able to contribute to other MOI projects that will use satellite imagery. Furthermore, the workshop was an opportunity to provide visibility to MOI in this specialised field of oceanography through the coverage of the event by the media and the opening of

Dates	Title	Venue	Name of Attending Officer	Relevance to MOI	Perceived Benefits
					the training workshop by the Minister.
24th April to 28th April 2017	Second MESA Forum	King Fahd Hotel, Dakar, Senegal	Mr. E. Martial, Systems Administrator/MESA Project Team Leader and Ms. R. Boyjoonauth, Public Relations Officer/MESA Communication Officer	• The MOI as the Regional Implementation Centre of the "Marine and Coastal Management" THEMA for the Indian Ocean Commission (IOC) was invited to present the status of the programme implementation in the Indian Ocean Region. • The MOI also illustrated how the services and products developed are providing support to decision and policy making at national and regional levels. • Furthermore, the example of how the MESA data are being used in Tanzania to help fishermen find potential fishing grounds and increase their catch. • The MOI had an exhibition booth to display the Marine and Coastal Management products and services and a short video on the activities carried out under the Indian Ocean Commission thematic action. • The 2nd MESA Forum gathered representative of the 48	• The presence of the MOI at the 2nd MESA Forum was an opportunity to provide visibility on MOI's work as the regional coordinator of the MESA project for the Indian Ocean Commission theme not only to the stakeholders in the South West Indian Ocean region but also to the African Union Commission (the contracting authority) and the European Union (the funding agency).

Dates	Title	Venue	Name of Attending Officer	Relevance to MOI	Perceived Benefits
				participating African countries including users of the MESA-IOC Services. This was an appropriate platform for MOI to meet and interact with representatives from the different regional institutions involved in MESA.	

Scientific Expeditions

Dates	Title	Venue	Name of Attending Officer	Relevance to MOI	Perceived Benefits
17th to 26th January 2016	"Ocean transforms fault effects on mid-ocean ridge process and hydrothermal activity along the Central Indian Ridge 13°-18°S."		Dr. D. Bissessur and Ms. P. Roy, Associate Research Scientists	Information Missing	

Events

Mission to Rodrigues

The MOI hosted a consultative workshop in collaboration with the Commission for Environment on the 28th of January 2016. The workshop, entitled "Research and Development for a Sustainable Ocean Economy", was held at the Mon Plaisir leisure centre. Presentations made by the Officer-in-Charge of the MOI and by the Manager of the South East Marine Protected Area (SEMPA) were followed by discussions.

The MOI also attended a meeting under the Chairmanship of the Commissioner for Environment to discuss ways through which the MOI could help Rodrigues in the development of its Ocean Economy. Additionally, the MOI carried out site visits at SEMPA, at Pointe La Gueule (following the request of one workshop participant) and at the desalination plant at Anse Quitor. The following projects have been identified for the development of the Ocean Economy in Rodrigues:

1. Fish stock assessment on the two fishing banks close to Rodrigues Island.
2. Genetic connectivity of fish and octopus to track their larval transportation.
3. Studies/Monitoring in relation to impacts of desalination plants.
4. Fish stock assessment within the MPA's and reserve areas.
5. Potential of the commercial production of algae, oyster and sea cucumber in Rodrigues.
6. Possibilities of off-reef aquaculture.
7. Monitoring of seawater quality in lagoons at the waste water discharge points.
8. Baseline survey around Rodrigues Island.
9. Studies for policy decision on the banning of extraction of sand in certain parts of Rodrigues Island.
10. Research to determine reproduction maturity octopus.
11. Sensitisation programme/sessions in Rodrigues on Oceanographic research.
12. Research to support policy decision on net fishing season.
13. Monitoring of SEMPA-Executing the existing monitoring plan.

MOI Strategic Plan 2016 - 2020 Validation Workshop

Figure 38: Welcome remarks by Dr. D. Marie, Officer - in- Charge.

Figure 39: Opening speech by Mr. R. H. Prayag, Chairman of MOI.

Figure 40: Speech by Dr. M. Bhikajee, former Director of MOI.

The Government of Mauritius envisages to make the ocean economy a major pillar for its economic development, by sustaining economic diversification, wealth generation and most importantly, job creation. This has been duly emphasised during the speech of the Right Honourable Prime Minister on "Achieving the Second Economic Miracle and Vision 2030" and highlighted in the Government Programme 2015-2019.

The MOI is required under the MOI Act to prepare periodic Strategic and Action Plans. In this framework, a validation workshop was held on the 12th of April 2016 at the MOI in consultation with its sister institutions, organisations and departments from both the public and private sectors. The views and concerns expressed by the participants have been taken onboard for finalising the MOI's Strategic Plan and Action Plan 2016-2020.

Following this workshop, the MOI developed its Strategic Plan and Action Plan 2016-2020 in line with the Government's Policy on Ocean Economy, with the assistance of two external experts, namely Dr. M. Connor, Fulbright Scholar and General Manager at East Bay Dischargers Authority in San Francisco, USA and Dr. M. Bhikajee, former Director of MOI.

The Strategic plan 2016-2020, as per the provision of the MOI Act (2009), will be presented to the Minister prior to its implementation.

Marine Invasive Species Survey Scoping and Planning Workshop

Figure 41: Group photo of local and international participants at the Rajiv Gandhi Science Centre.

Figure 42: International participants visiting MOI laboratory facilities.

Figure 43: Site visit to Port Louis Harbour.

Within the scope of the above referenced "Biodiversity Project", the Indian Ocean Commission (IOC) is implementing a component on the assessment of Marine Invasive Species (MIS) in the region. In 2015, the project updated the existing knowledge on marine invasive species in the participating countries and raised awareness on the various related issues.

The MOI was invited by the IOC to host a workshop from the 25th to the 27th of May 2016 at the MOI in Albion to share its experience on the survey of marine invasive species with the participating countries. The main aim of the workshop was to train the national survey coordinators in the planning, preparation and initial implementation phases for conducting port surveys. This allowed for discussions and local contributions towards the following outputs:

i. Assessment and identification of likely survey locations;
ii. Identification of the initial pilot survey demonstration site;
iii. Provisional national survey team compositions;
iv. Overview and assessment of technical survey requirements; and,
v. Initial scoping and drafting of survey plans (including limitations).

The workshop ran over 3 days, including 2 days of 'classroom' sessions and a final day with a site visit to the port. The port visit aimed to demonstrate the various field considerations and complexities. The workshop gathered around thirty participants comprising of one trainer, two (or three in some cases) international delegates from Comoros, Kenya, Madagascar, Seychelles and Tanzania/Zanzibar as well as representatives from the Mauritius Ports Authority, the Shipping Division, the National Coast Guard, the University of Mauritius and MOI staff.

World Oceans Day 2016

Figure 44: Visit by high school students.

Figure 45: Opening address by Hon. Premdut Koonjoo, Minister for Ocean Economy, Marine Resources, Fisheries, Shipping and Outer Islands.

Figure 46: Visit of Hon. Premdut Koonjoo at the MOI booth.

Initially proposed at the Earth Summit in Rio de Janeiro in 1992, the 8th of June was officially recognised as the World Oceans Day (WOD) at the United Nations General Assembly in December 2008. Under the theme of "Healthy Oceans, Healthy Planet", special emphasis was this year laid on plastic pollution which is a serious threat to the oceanic environment and subsequently to marine life, due to its slow rate of degradation and subsequently to marine life. The laudable initiative taken by the Government of Mauritius to ban plastic bags will undoubtedly have a positive effect on the marine environment in this regard.

To mark this year's celebrations, the MOI, in collaboration with the Ministry of Ocean Economy, Marine Resources, Fisheries, Shipping and Outer Islands, and other stakeholders, organised a series of activities on the new premises of the Institute at Albion. This joint initiative aimed to promote public awareness on the ocean, to highlight the current challenges it is facing, and to reach out to youngsters to become caretakers of our oceans.

During the opening ceremony, the Minister of Ocean Economy, Marine Resources, Fisheries, Shipping and Outer Islands, Honourable Premdut Koonjoo, emphasised on the importance of the ocean in regulating the climate, as a source of food, as a major contributor to most of the oxygen we breathe, as a home to an incredible array of wildlife and as a source of important medicines. He stressed the need to protect the oceans, so as to ensure the health and safety of our communities and of future generations. He also urged the population, in particular the youth, to reflect on actions each of us could take to safeguard vulnerable ocean communities.

The activities organised on that day consisted of film shows, exhibitions and displays showcasing ocean research, marine conservation and safety at sea amongst others. Talks were given on various topics namely: (1) hydrographic services in Mauritius; (2) safety at sea and services, business opportunities in the ocean economy; (3) coastal ecosystems, mangroves, seagrass and coral reefs; (4) marine renewable energy; (5) submarine ground water discharge; (6) observing the ocean from space and geophysical mapping of the seafloor.

This event attracted secondary and tertiary students from different regions of the country and participating stakeholders included: the Ministry of Environment, Sustainable Development, Disaster and Beach Management, the Mauritius Research Council, the Department of the Continental Shelf, Maritime Zones Administration and Exploration, the Mauritius

Meteorological Services, the Albion Fisheries Research Centre, the Shipping Division, the National Coast Guard, the Rajiv Gandhi Science Centre, the University of Mauritius, the University of Technology, the Hydrographic Unit of the Ministry of Housing and Lands, Reef Conservation and the Mauritius Marine Conservation Society.

Presentation on "Computational approaches to data in the life sciences - bringing computation and analytics to the scientist"

Figure 47: Presentation by Dr. Jochen Kumm.

The MOI hosted a talk on "Computational approaches to data in the life sciences – bringing computation and analytics to the scientist" by Jochen Kumm, Ph.D on Friday 15th July 2016 in the MOI Lecture Theatre at Albion. This talk explored the potential use of novel technologies and algorithms in data-rich life sciences and examined practical considerations of what analytics can and should be. Specifically, he discussed adaptations of "big data" approaches to biological, oceanographic and geographically explicit data analysis. As petaflops of computational power become available in portable data centres, massively parallel computation, deep learning and analytical efficiency play an important role in the way we approach systems biology and its applications.

Dr. Kumm used genomics problems, such as flu epidemiology, pathogen diagnostics and clinical decision support as reference points for evaluating the potential of artificial intelligence and machine learning in the life sciences – including opportunities for simplification and cost reduction of "applied computation" – namely prediction, classification and analysis in near-real time that is relevant and useable in the clinic/field

Presentation on DNA Barcoding of Corals


Figure 48: Talk and presentation by Dr. Angus Macdonald.

Dr. Angus Macdonald, lecturer from the University of KwaZulu-Natal, South Africa was on a working visit to the MOI from the 27th to the 28th of July 2016. On the morning of the 28th of July, Dr. Macdonald made a presentation on the DNA barcoding of corals. His talk focused on the ways through which coral diversity of the Western Indian Ocean could be re-evaluated using a combination of molecular and taxonomic methods. The talk was attended by officers from other Ministries and the scientific staff of the MOI. In the afternoon of that day, Dr. MacDonald and some researchers from the MOI surveyed the lagoon of Flic en Flac to take stock of the diversity of hard and soft corals.

Presentation on "The Mascaregne Region: Tales of Mid-Ocean Ridges, Oceanic Basins, a Hotspot and Islands"

Dr. Jerome Dyment and Dr. Christine Deplus, both, geophysicists at the Institut de Physique du Globe de Paris (IPGP, France), and having a strong research interest on the Mascarene and Central Indian Ridge regions, were on a working visit to the MOI from the 20th to the 28th of August 2016. On the 26th of August 2016, Dr. Dyment, who is also a Senior Researcher at Centre National de la Recherche Scientifique (CNRS), made a presentation on "The Mascarene region: tales of mid-ocean ridges, oceanic basins, a hotspot and islands" in the MOI Conference Room.

Figure 49: Visit of Dr. Jerome Dyment, Dr. Christine Deplus, geophysicists at the Institut de Physique du Globe de Paris and Mr. Yuvan Beejadhur, World Bank Expert.

During the presentation, Dr. Dyment talked about the formation of the Mascarene region and Western Indian Ocean, by seafloor spreading at the midocean ridge separating the African and

Indian plates since 83 Million years (Ma). The presentation also included detailed explanation of how this complex area had been shaped by the Reunion hotspot which appeared at 65 Ma, forming the Deccan traps in India and triggering a major spreading reorganisation. This resulted in the two large submarine volcanic plateaus - the Chagos - Laccadive Ridge and the Mascarene Plateau - and finally Mauritius and Reunion islands. As a result, the formation of Rodrigues Island and the Rodrigues Ridge was possible due to the interaction with nearby spreading centers. During their volcanic construction, oceanic islands are eroded and often affected by destabilization and mass wasting events. Dr. Dyment reported that some evidence suggests that a major mass-wasting event affected the Mauritius West Coast four million years ago.

Deep Dive Session on Marine Spatial Planning Workshop

Figure 50: Presentation by Dr. Joanna Smith.

In the context of the African Ministerial Conference on the Ocean Economy and Climate Change, a workshop on the "Potential for Marine Spatial Planning (MSP) in Mauritius Ocean economy and Climate change', co-hosted by the World Bank and the MOI, was held on the 8th of September at the MOI research centre in Albion . The workshop was facilitated by Dr. J. Smith from TNC Canada (Nature Conservancy) and attended by World Bank experts, Mr Yuvan Beejadhur and Dr Kieran Kelleher. The MOI also had the privilege to welcome Dr. Nirmal Shah, CEO of Nature Seychelles and the President's special envoy for Environment and Climate Change on that occasion. Three very interesting topics were developed during the workshop (a) MSP and Global Practices (b) Guiding principles for MSP and (c) the opportunities and constraints for MSP in Mauritius for the Ocean economy and climate change. This interactive workshop gathered around 40 participants from different Ministries, departments, NGOs, the Chairman of MOI's Board and MOI scientists.

MESA Regional Workshop on "Communicating Scientific Information to Policy Makers"

Figure 51: Opening speech by Hon. Premdut Koonjoo, Minister for Ocean Economy, Marine Resources, Fisheries, Shipping and Outer Islands.

Figure 52: Group photo of participants.

Given the importance of the role of scientific information in the different products developed under the MESA-IOC-MOI theme and the difficulty that scientists/technical people find in effectively sharing and communicating their findings with managers, decision makers and policymakers, it is paramount to provide scientists/technical people with the necessary tools for them to overcome the challenges they encounter in sharing their results with policymakers.

In the above framework, the Mauritius Oceanography Institute organised the MESA-IOC-MOI Regional Training Workshop on "Communicating Scientific Information to Policy Makers" from the 8th to the 12th of August 2016 at the Aanari Hotel in Flic en Flac, Mauritius. The organisation of this training workshop was part of the capacity building activities of MESA programme for the IOC thematic action. The objective of this workshop was to improve decision making and the development of policies based on the scientific data, products and bulletins that are generated under the MESA-IOC theme.

Participants received training on:

1. The different ways of communicating the scientific information contained in MESA products/bulletins to decision makers and policy makers;
2. The formulation of policy briefs;
3. The identification of the most appropriate policy audience;
4. The preparation of policy presentations; and,
5. The preparation of written communication materials.

The main results from this workshop were:

1. A better understanding of science communication concepts.
2. An improved knowledge on how to produce and market policy briefs.
3. Knowledge gained on how to produce key messages and fact sheets.
4. Innovative approaches for sharing scientific/thematic information were discussed.
5. Tips for media interviews were discussed.

This training workshop gathered about 30 participants including the National Focal Point from IOC member states and Eastern African countries as well as the technical focal points from the National Beneficiary Institutions.

MOI Participation in Ocean AdvocaSea Bootcamp at Tamarin

Figure 53: Ms. K. Modoosoodun, Mr. K. Ramdhony and Mr. O. Pasnin, Associate Research Scientists participating in the Ocean AdvocaSea Bootcamp.

The MOI, represented by four scientists, participated in an Ocean AdvocaSea Bootcamp on Saturday 6th August 2016. This initiative of the Port Louis Shapers Hub and the SYAH-Mauritius was organized by SeeingBlue at Tamarin Hotel. The aim was to motivate young people to develop solutions for the challenges facing our oceans.

While Ms. Modoosoodun talked about Marine Science as a career, Mr. Ramdhony presented the prospects of Marine Biotechnology. Mr Nicolas then made an enriching presentation on Marine Biodiversity and Mr. Pasnin concluded with a presentation on marine conservation issues in Mauritius.

Press Conference Workshop for the African Ministerial Conference on Ocean Economy and Climate Change

Figure 54: Presentation by Dr. A. Rawat and Dr. Y. Neehaul, Associate Research Scientists at MOI.

Figure 55: From left to right: Dr. Y. Neehaul and Dr. A. Rawat, Associate Research Scientists, Dr. R. Moothien Pillay, Director and Dr. D. Marie, Deputy Director.

A team from the MOI made a presentation on the role of the MOI in the development of the Ocean Economy during a press working session, organized at the Westin Resort and Spa on the 30th of August 2016, in the context of the African Ministerial Conference on Ocean Economy and Climate Change. The team comprised Dr. Moothien Pillay, Director of the MOI, Dr. Marie, Deputy Director and two scientists namely, Dr. Neehaul and Dr. Rawat. The workshop was attended by local press reporters along with their counterparts from participating countries.

During the presentation, the MOI was introduced and its role as the technical arm of the Government of Mauritius in the development of a sustainable Ocean Economy was highlighted. Research objectives and main achievements of the MOI since its establishment were also presented. The presentation concluded with the concise description of the research activities of the institute with respect to the vision of the Government of Mauritius of making the Ocean sector a pillar of its economy.

During her interview with local and regional Press, the Director explained further the crucial and challenging role that the MOI will have to play to meet the Government's Vision and Programme 2015-2019. Dr. Moothien Pillay also spoke on various environmental stressors and their impacts on the marine ecosystem. She highlighted the need for more informed and careful management of existing marine resources, and therefore the necessity for better and increased monitoring of our coastal and open waters.

Participation in National Institute for Cooperative Entrepreneurship (NICE) Initiative

Mr. O. Sadasing and Mr. O. Gooroochurn, Associate Research Scientists participated as resource persons in the National Institute for Co-operative Entrepreneurship (NICE) initiative at the Bambous Social Welfare Centre and the Allée Brillant Community Centre on Wednesday the 29th of June 2016 and Friday the 26th of August 2016 respectively.

The objective of the training was to create awareness of the opportunities in the aquaculture sector and promote entrepreneurship, and presentations on the following topics were given:

- Importance of Aquaculture and opportunities in the sector;
- Creating an aquaculture farm -edible oyster farm; and,
- Legal requirements and other conditions with respect to aquaculture.

The training gathered around 50 to 100 participants, including potential small and medium entrepreneurs.

Talk on "GIS Model Integration for Environmental Applications"

Ms. Nussaibah Raja-Schoob, who holds a master's degree in Physical Geography from the Ankara University, with a background in dealing with environmental data and geospatial analysis gave a talk on "GIS Model Integration for Environmental Applications" at the MOI on Friday the 21st of October 2016. The talk emphasised the increasing pressure on environmental scientist/modellers to both, undertake good science in an efficient and timely manner under increasing resource constraints, and ensure that the science being performed is immediately relevant to a particular environmental management context.

To support this modelling, tools and technologies from the field of mathematics and computer science are being transferred to applied environmental science fields, and a range of new modelling and software development approaches are being pursued. This presentation provided some ideas about such statistical and computational integrations into GIS, using Ms Raja-Schoob's own research as example. Topics that were covered included modelling and forecasting of environmental phenomena, and risk analysis of environmental hazards.

Working Session by Scientists from Ocean Sector in Mauritius and the Commonwealth Scientific and Industrial Research Organisation (CSIRO)

Figure 56: Group photo.

Figure 57: Presentation by Dr. B. A. Motah, Research Scientist at MOI.

Figure 58: Presentation by Dr. Mat Vanderklift.

On the occasion of the visit of Dr. Mat Vanderklift and Dr. Andy Steven from the Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia, the Australian High Commission in collaboration with the MOI, organised a half day working session on Tuesday the 22nd of November 2016 from 09 30 to 12 30 hours in the MOI Conference Room. The aim of this working session was to foster scientific collaboration among key agencies operating within the Ocean Sector in the Indian Ocean. The working session included presentations from CSIRO representatives as well as local scientists on main projects being undertaken by their respective organisations, namely the University of Mauritius, the Albion Fisheries Research Centre and the MOI. The discussions included comments from Non-Governmental Organisations (NGOs) involved in the marine sector on research projects, priorities and possible areas of collaboration between CSIRO and other agencies.

Presentation on "The setup of coastal observatories and the numerical modelling of coastal processes"

Figure 59: Presentation by Dr. Houssem Smeti on "The setup of coastal observatories and the numerical modelling of coastal processes".

A presentation by Dr. Houssem Smeti on "The setup of coastal observatories and the numerical modelling of coastal processes" was held on Thursday the 12th of January 2017 in the MOI Conference Room with MOI Scientific Staff. Dr. Houssem Smeti holds a Doctorate degree in Oceanography from the Mediterranean Institute of Oceanography at Aix-Marseille University (France), a Post graduate diploma in Observational Oceanography from the Bermuda Institute of Ocean Sciences (Bermuda), a Master's degree in Hydrodynamics and Coastal Environments Modelling from the Tunis National School of Engineers (Tunisia) and a Bachelor's degree in Marine Biotechnology from the University of Monastir (Tunisia). He is also the regional coordinator of the NANO-Nearshore Hydrodynamics Group, a subgroup of the Nippon Foundation/Partnership for Observation of the Global Oceans (NF-POGO) Alumni Network for Ocean (NANO). Since the creation of NANO-NHG in December 2012, Dr. Smeti has been coordinating the observational and numerical modelling activities of the group members in Angola, Brazil, Ivory Coast, Mauritius and Tunisia, in collaboration with scientists from South Africa. The NANONHG research project (2013-2017) focuses primarily on the enhancement of the observational capabilities of the participating institutions and capacity building in the fields of observational oceanography and numerical modelling.

Presentation by scientist from National Centre for Antarctic and Ocean Research (NCAOR) – 9th Southern Indian Ocean Expedition

Figure 60: Presentation by scientist from National Centre for Antarctic and Ocean Research (NCAOR) – 9th Southern Indian Ocean Expedition.

A group of scientists from the National Centre for Antarctic and Ocean Research (NCAOR, Goa), headed by Dr. Sarat C. Tripathy (Chief Scientist) visited MOI on February 28th 2017. NCAOR is India's premier R&D institution responsible for the country's research activities in the Polar and Southern Ocean (SO) realms. The SO research programme is mainly focused on the "Role and response of Southern Ocean to the regional and global climate variability". The SO is a very challenging region compared to other oceans for accomplishing any scientific investigation due to its harsh climate inaccessibility and remoteness. Detailed studies on air-sea interactions, hydrodynamics, food web dynamics and biogeochemistry were carried out in the regions of the Indian Ocean sector of SO. The results obtained from these expeditions provided baseline data/information on various physical, biological and biogeochemical processes that are responsible in modulating the global warming and climate variability. During the SO expedition 2017, detailed observations were made in the Prydz Bay (PB) region during austral summe. However in the SO expedition 2017-18, the scientists are planning to deploy an under-ice mooring for a period of one year. The 10th SOE to the Indian Ocean sector of the SO will be launched in early December 2017. The samplings during this expedition will be made for physical, chemical, biological and geological studies. MOI scientists have been invited to join the next expedition.

Talk on "Marine Biodiscovery in Southern Africa: Finding Drugs from the Sea" by Dr. Suthananda Sunassee

Figure 61: Talk by Dr. Suthananda Sunassee.

A presentation by Dr. Suthananda Sunassee, Researcher from University of Cape Town on "Marine Biodiversity in South Africa: Finding Drugs from the Sea" was held on Thursday the 30th of March 2017 in the MOI Conference Room for the MOI's scientific staff. Dr. Sunassee presented an overview of the contribution of marine natural products, particularly from Southern Africa, in drug discovery. He highlighted the inherent challenges as well as the opportunities in the complex pharmaceutical drug discovery process. He also described selected research projects of the Natural Research Group (NPRG) at the University of Cape Town, directed towards exploring the unique biomolecular diversity of Southern Africa's marine invertebrate populations, with special emphasis given to the discovery of natural products that show promising activity against infectious diseases, pathogenic bacteria and non-communicable diseases such as cancer.

Talk by Professor Andrew Baird, ARC Centre of Excellence for Coral Reef Studies, James Cook University, Australia

Figure 62:Talk by Professor Andrew Baird.

On the 29th of May 2017, Professor Andrew Baird from the Australian Research Council (ARC) Centre of Excellence for Coral Reef Studies at James Cook University (JCU), Australia, delivered a talk on "The molecular revolution in coral systematics and the implications for coral reef ecology" in the MOI Conference Room at Albion.

This interactive talk which was organised by the MOI in collaboration with the High Commission of Australia, focussed on coral reef ecology, coral systematics, coral reef research programmes undertaken by the JCU and past experience/research from Prof. Baird. Invitees to this talk included representatives from the Ministry of Ocean Economy, Marine Resources, Fisheries, Shipping and Outer Islands, Albion Fisheries Research Centre (AFRC), Ministry of Social Security, National Solidarity, and Environment and Sustainable Development, University of Mauritius.

The High Commissioner of Australia, Her Excellency, Ms. Susan Coles graced the event with her presence.

Inauguration of new MOI Research Facility and Celebrations of World Oceans Day 2017

Figure 63: Unveiling of the Inaugural Plate by the Right Honourable Sir Aneerood Jugnauth, GCSK, KCMG, QC, Minister Mentor, Minister of Defence and Minister for Rodrigues in the presence of the Honourable Premdut Koonjoo, Minister of Ocean Economy, Marine Resources, Fisheries, Shipping and Outer Islands and Mr. Raj H. Prayag, PDSM, C.Eng, B.Sc., M.Sc., FIEM, RPEM, Chairman of MOI

To mark the celebrations of World Oceans Day 2017, the MOI in collaboration with the Ministry of Ocean Economy, Marine Resources, Fisheries, Shipping and Outer Islands organised the Inauguration Ceremony of the new MOI research facilities at Albion on Thursday the 8th of June 2017. The unveiling of the inaugural plate was done by the Right Honourable Sir Aneerood Jugnauth, GCSK, KCMG, QC, Minister Mentor, Minister of Defence and Minister for Rodrigues in the presence of the Honourable Ivan Leslie Collendavelloo, GCSK, SC, Deputy Prime Minister and Minister of Energy and Public Utilities as well as the Honourable Premdut Koonjoo, Minister of Ocean Economy, Marine Resources, Fisheries and Shipping. Other ministers, namely the Honourable Anil Kumarsingh Gayan, SC, Minister of Tourism; the Honourable Marie Roland Alain Wong Yen Cheong, MSK, Minister of Social Integration and Economic Empowerment; and the Honourable Dharmendar Sesungkur, Minister of Financial Services, Good Governance and Institutional Reforms, also attended the inauguration ceremony.

Concurrently, to celebrate World Oceans Day 2017, the MOI organized a series of multistakeholders' exhibits and displays, short film projections and presentations in collaboration with different ocean related stakeholders for secondary school students on Friday the 9th of June 2017 under the theme "*Our Oceans, Our Future*". Around 200 to 250 students from various state secondary schools participated in the above event.

The scientific team of the MOI had set up a series of exhibits to display the main functions of each unit and their respective projects at the MOI. Exhibits, which included posters, banners, short movies, slideshows and an aquarium display, were as follows:

1. Banner display: Biological Oceanography Unit: Mission, vision and main roles/functions.
2. Poster displays (for on-going projects) including; (a) Macrofaunal diversity as proxy for monitoring the health of marine ecosystem; (b) Sponge DNA Barcoding – Protocol Optimization for Sampling, DNA Extraction & PCR Amplification of Sponges of Mauritius; (c) Genetic Connectivity for Conservation; (d) Fish Market Guide: Family – Serranidae (Vielle).
3. Short movies on Land-Based Coral Farming and Small Scale Reef Rehabilitation.
4. An aquarium display illustrating marine life in a healthy coral reef ecosystem versus a degraded coral reef ecosystem.

Mr. Jay Doorga, the Service to Mauritius Programme (STM) intern, contributed with a model based on a combination of renewable energy resources which includes solar energy, wind energy and wave energy as shown below. A new solar energy technique for harnessing the solar resource potential of the island was included in the form of floating solar panels and presented to students. This technique has been adopted by China which just switched on the world's largest floating solar power plant with a capacity of 40 MW. The cooling system of the apparatus to improve overall efficiency was explained to students. He also demonstrated the fact that with the appropriate spatial marine planning and management of our large EEZ, such technologies could be implemented in near-shore regions in the long run to help reduce the island's heavy dependency on imported fossil fuel, thereby reducing costs.

Ms. Vidoushi Chinta, also an STM intern, built a model based on the theme of the "Evolution of Marine Pollution" for the World Ocean Day 2017 celebration at the MOI. The aim was to raise awareness among the population of the changes on the state of our ocean over time. The model consisted of three main parts representing the past, the present and the future conditions of our ocean.

Its objectives were to:

1. show how our ocean was before the interference of human activities,
2. illustrate how land development through industrialization has caused marine pollution for the past 50 years, and finally
3. demonstrate how the ocean will become in the eventuality that proper attention is not drawn to the problem of marine pollution and remedial actions not taken.

Collaborating partners included the Ministry of Ocean Economy, Marine Resources, Fisheries, Shipping and Outer Islands, the Ministry of Social Security, National Solidarity, and Environment and Sustainable Development (Environment and Sustainable Development Division), the National Coast Guard, the Mauritius Meteorological Services, the Outer Islands Development Corporation, the Hydrography Unit, the Shipping Division, the Fisheries Protection Service, the University of Technology, the Rajiv Gandhi Science Centre as well as NGOs such as the Reef Conservation and Lagon Bleu Project – ECOSUD.

Organisation of the Regional Training Workshop on Mollusc Taxonomy- The Prelude

The protection and preservation of marine living resources from both, local and global threats is key to a sustainable Ocean Economy. The on-going MOI project entitled, "Assessment of marine living resources in the Exclusive Economic Zone of the Republic of Mauritius" that aims to identify and inventory marine living organisms, is therefore in line with the Government's programme 2015-2020 and Vision 2030.

Following the success of the market fish survey initiated in 2010, the MOI received the approval of the MOI's Research Advisory Council (RAC) under MOI's Action Plan 2016-2020, to assess a wide range of marine organisms (e.g. sea cucumbers, molluscs, crustaceans, etc.) using both, conventional and DNA-based techniques. An inventory of sea cucumbers is currently being carried out and the marine genetic database is being continuously populated. However, with regards to assessment of molluscan diversity, the lack of required taxonomic expertise in the field prompted the MOI to explore potential collaborations with external institutes and organisations. Contacted through the Ministry of Foreign Affairs, the Indian Ocean Commission (IOC) expressed its interest to fund the inventory of molluscs by MOI under its own Biodiversity Programme.

Following the MOI's search for a molluscan expert, Dr. Mathew Kosnik, an experienced malacologist from Macquarie University in Australia responded positively. Since Macquarie University was willing to engage in a long-term collaboration with MOI that would focus mainly on capacity-building on marine molluscs, the signing of a Memorandum of Understanding (MoU) was proposed. The MoU was written up, legally vetted and eventually signed with Macquarie University in June 2016.

Given that MOI and IOC have been collaborating on several projects, a Guidance Note on the modalities of collaboration between the MOI and the IOC was prepared and signed in August 2016. As per the Guidance Note, it was required that MOI in collaboration with the IOC organises a regional training workshop on the taxonomic identification of marine molluscs in Mauritius waters. Dr Kosnik would facilitate the field survey exercises and workshop, with the close collaboration of a team of scientists and divers from the MOI.

Meetings to discuss the Terms of Reference as well as other activities were held during the course of 2016 but due to administrative delays at the level of the European Delegation regarding the disbursement of funds, the dates for the workshop initially planned for 2016 were postponed. With the establishment of new administrative procedures and policies in place at the IOC in 2017, a new expression of interest had to be submitted by MOI in order to request for funds for the same project. The MOI was then invited to fill a single tender document to act as a service provider or contractor for the organisation of the Regional Training Workshop on Mollusc taxonomy. The tender document comprised several parts, the filling of which required information from the scientific, administrative, financial and procurement levels. The setting up of an Operational Team facilitated the transfer of information which is currently being collated for the production of the Tender Document, which would then be submitted for legal review.

Visits

1. A group of undergraduate students in marine biology, visited the MOI on the 9th of March 2016, under the US Semester at Sea (SAS) programme. During their visit, MOI scientists gave an overview of the Institute and the research being undertaken by its scientists. The students later visited the Blue Bay Marine Park, accompanied by two scientists from the MOI.

2. Dr. Sue Wells visited the MOI on the 3rd of June 2016 with regards to the preparation of the concept note for the UNDP regional project proposal entitled 'Restoring marine ecosystem services by rehabilitating coral reefs to meet a changing climate future', to be submitted to the Adaptation Fund Board. The MOI, under the aegis of the Ministry of Ocean Economy, Marine Resources, Fisheries, Shipping and Outer Islands is the main executing entity and collaborating partners include the Fisheries Division, the Rodrigues Regional Assembly and UNDP-Global Environment Facility (GEF) Small Grants Programme.

3. The White House Science Envoy for the Ocean, Dr. Jane Lubchenco visited the MOI on Wednesday the 27th of July 2016. Dr Lubchenco gave a presentation which was followed by discussions on the sustainable growth of the Ocean Economy and the way forward for Mauritius. Members of the National Ocean Council and officials from the Ministry of Ocean Economy, Marine Resources, Fisheries, Shipping and Outer Islands also joined us on that occasion. The talk was later followed by a working session with the scientific staff of the MOI.

4. On the 5th of January 2017, the MOI received the visit of 10 international students under the AIESEC programme on Sustainable Environment of the Sustainable Development Goal (SDG) 13. AIESEC is the world's largest youth-led network creating positive impact through personal development and shared global experiences. AIESEC enables young people to build strong foundation of core values as they develop into responsible and entrepreneurial young leaders. Following a presentation on the activities undertaken by the MOI, a guided tour of the research facility was also carried out by members of the scientific staff.

5. The MOI received the visit of 15 SIDS Youth Aims Hub-Seychelles (SYAH) international students on Thursday the 12th of January 2017 as part of a Blue Economy exchange programme. They were welcomed by the MOI's Director, followed by a presentation on the main research activities of MOI by Mr. Motah. SYAH is a youth-led NGO promoting and advancing sustainable development through youth-led projects. During their visit, a presentation on the research activities of the MOI was held, followed by a guided tour of the research facility. The aim of the internship was to inspire young people to take up a career in the ocean-based economy tackling Sustainable Development Goals 14 (life below water) and 8 (Decent work and economic growth).

6. Dr. L. Dagorn, Director of L'Instiut de Recherche pour le Developpement (IRD) and currently the head of a research lab in France on Marine Biodiversity named MARBEC and Dr. Jean-Marc Fromentin, Director of IFREMER (Sète) visited the MOI on Tuesday

the 6th of December 2016. The visit included a presentation followed by a discussion on the possible collaboration between the MOI & IRD.

7. Visit of Dr. N. Anil Kumar, Group Director of the Indian Scientific expedition to the Southern Ocean/Antarctic Waters from the National Centre for Antarctic and Ocean Research (NCAOR), Goa, India, at the MOI in December 2016 to explain the objectives of the Indian expedition to the Southern waters and to discuss avenues of collaboration.

8. On the 3rd of May 2017, the MOI received the industrial visit of some 25 students from the Quartier Militaire State Secondary School. In an effort to apprise the students of the importance of oceanography and the research activities undertaken at the MOI, a powerpoint presentation was made by Mr. K. Ramdhony, who also described the career prospects in oceanography.

9. Scientists from Stanford University visited the MOI on the 15th of June 2017 in view of collaborating with the MOI with regards to Marine Archaeology in the region around Mauritius. They have carried archaeology works in other parts of the world, and they are already carrying some studies in the region of Flat Island regarding land archaeology. During this visit, a diving expedition was effected near the Sirius wreck. An agreement would soon be signed between both institutions for kick starting collaborations in areas of common interest.

Internships

1. Seven interns, namely Mr. J. Doorga, Mrs. L. Haree-Somah, Ms. G. Kallichurn, Ms. J. Rama, Ms. C. Doujhata, Ms. T. Voon Chung and Ms. Y Oozeeraully joined the MOI under the Service to Mauritius programme hosted by the Ministry of Finance and Economic Development of the Government of Mauritius. Most of these interns, having recently graduated, while others having postgraduate qualifications, were placed in the different departments depending on their educational fields. They are actively involved in the ongoing research activities and will be expected to participate in the implementation of any future projects developed by each department during their stay at the Institute.

2. The MOI has provided training to Ms. Houriiyah Tegally who holds a Bachelor Degree in Molecular, Cellular & Developmental Biology from Yale University. From January 2017 to July 2017, Ms. Houriiyah has been trained to work both in the molecular biology and natural product chemistry laboratories. Following her traineeships, she worked on the "Optimization of protocols for the identification of sponges using DNA-based techniques." The aim of the study was to identify marine sponges collected from the Bioprospecting of Mauritius Waters project with the aid of DNA-based tools.

   The main objectives were:

   i. To optimize the DNA extraction strategy for marine sponge (Porifera) by:
   a. Evaluating sponge sampling and storage procedures for best preservation of DNA;
   b. Testing and adapting existing DNA extraction protocols to sponge samples;
   ii. To undertake amplification using various protocols and primers; and,
   iii. To sequence amplicons and identify sponges using DNA techniques.

   The main deliverables were:
   i. A report depicting the different methods utilised to extract, as well as increase, the DNA yield from marine sponges.
   ii. Techniques to amplify DNA barcoding gene from marine sponges.
   iii. Identification of marine sponge using DNA.

   The techniques developed will help the MOI to identify marine sponges collected during the bioprospecting project and hence aid in the characterisation of bioactive compounds.

3. Currently following a Master's Degree in Environmental and Marine Ecological Sciences, Ms. Clara Diaz from the University Pierre and Marie Curie, France, followed an internship at the MOI from the 18th of April to the 16th of June 2017. During her two months' internship at the institute, Ms. Diaz worked on a pilot study entitled "Macrofaunal abundance and community in soft-bottom sediments from shallow waters of Mauritius". This multidisciplinary study which involved the Biological Oceanography, Chemical Oceanography and Marine Geoscience units of the MOI had the main objectives of:

   i. morphologically characterising macrofaunal communities inhabiting soft-bottom sub-tidal sediments from the shallow waters of Mauritius, and

ii. understanding what factors drove the structure of macrofaunal communities in the coastal waters of the island.

The main deliverables from the project included a report/review on macrofaunal diversity/identification from soft bottom sediments and the development of appropriate protocols for field sample collection, preservation and identification of macrofaunal communities.

The main results from this study were presented as a poster during the World Oceans Day 2017. Baseline data (including protocols) generated through this study will help the MOI in establishing in-depth studies for macrofaunal diversity assessment in sediments.

Strategic Plan 2016-2020

Strategic Objectives

For the past fifteen years, the MOI has contributed to many national, regional and international projects and assisted the Government in policy matters with regards to the ocean. In its pursuit to promote the sustainable development of the Ocean Economy, the MOI's activities can be grouped into three strategic approaches:

1. Characterise the Republic of Mauritius's oceanic and coastal environments.
2. Evaluate sustainable resource exploitation alternatives.
3. Evaluate environmental implications of ocean economy projects, global trends, and natural disasters.

Strategic approach 1

Fully characterise the geophysical, chemical, and biological attributes of Mauritius's oceanic and coastal environments.

Characterise the potential of the maritime and Extended Continental zones of Mauritius.

- Provide such support as may be requested by the Prime Minister's Office, Continental Shelf, Maritime Zones Administration and Exploration in the development and management of non-living resources in the EEZ, the Continental Shelf of the Republic of Mauritius as well as the management of living and non-living resources in the Mauritius/Seychelles Extended Continental Shelf in the Mascarene Plateau Region.
- Conduct and provide support for multidisciplinary surveys of the maritime zones of the Republic of Mauritius.

Characterise Mauritius's coastal and oceanic environments using a standard suite of oceanic and climatological indicators implemented with state-of-the-art remote-sensing technologies and operational oceanographic services.

- Develop operational oceanographic services using a standard suite of oceanographic measurements, including resource biomass, primary productivity, salinity, temperature, and water quality.
- Strengthen regional oceanographic observations (e.g., MESA, Monitoring of Environment and Security in Africa program).
- Maintain updated maps of the waters around the Republic of Mauritius.
- Conduct surveys of outer islands (e.g., Rodrigues baseline survey).

Strategic approach 2

Evaluate the feasibility of alternatives for the sustainable exploitation of the Republic of Mauritius's resources.

Aquaculture related research and services

- Characterise potential aquaculture sites.
- Conduct feasibility studies and research related to aquaculture activities (e.g., oysters, pearl oysters, mussels, sea urchins, sea cucumbers, ornamental fishes).
- Enhanced genetic diversity of aquacultured species.

Marine biotechnology research and applications

- Prospect the diverse marine community (e.g., sponges) for active compounds to treat cancer, diabetes, and cognitive diseases.
- Conduct feasibility studies for other pharmaceutical or cosmetic products (e.g., Spirulina).

Strategic approach 3

Evaluate the implications to the coastal environment of other approaches for the ocean economy, global economic and environmental trends, and natural disasters.

Implications of other local ocean economy ventures

Research and monitoring of:

- Port development and shipping.
- Land-sea interactions (e.g., groundwater nutrient discharges).
- Marine renewable energies.

Climate change impacts and adaptation strategies

Research and monitoring for:

- Adaptation to global climate change on marine resources.
- Adaptation to ocean acidification on calcifying organisms.
- Mitigation of impacts of sea level rise using past data and predictive models.
- Mitigation and adaptation measures to strengthen resilience (e.g., reef rehabilitation).
- Prediction of thermal stresses and coral bleaching.
- Prediction of the effects of air-sea interactions on local climate.

Disaster reduction strategies: ocean hazards management

Research and monitoring of:

- Hazard and risk mapping for safety and economic security.
- Ocean currents information for search and rescue operations at sea.

Report of the Director of Audit

REPORT OF THE DIRECTOR OF AUDIT TO THE BOARD OF THE MAURITIUS OCEANOGRAPHY INSTITUTE

Report on the audit of the Financial Statements

Qualified Opinion

I have audited the financial statements of the Mauritius Oceanography Institute, which comprise the statement of financial position as at 30 June 2017 and the statement of financial performance, statement of changes in net assets/equity, cash flow statement and statement of comparison of budget and actual amounts for the period then ended, and notes to the financial statements, including a summary of significant accounting policies.

In my opinion, except for possible effects of the matters described in the Basis for Qualified Opinion section of my report, the accompanying financial statements give a true and fair view of the financial position of the Mauritius Oceanography Institute as at 30 June 2017, and of its financial performance and cash flows for the period then ended in accordance with International Public Sector Accounting Standards.

Basis for Qualified Opinion

Trade and Other Receivables – Rs. 16,657,187

The trade and other receivables were overstated by Rs. 3,775,000 received during the period ended 30 June 2017 in respect of recurrent grant for the financial year 2015-2016.

Property, Plant and Equipment – Rs. 9,777,473

- The accuracy of this figure could not be ascertained. Differences were noted between the figures in general ledger and the financial statements.
- The fixed assets' register was incomplete as important details for identification of fixed assets were missing: The existence of these assets could not be ascertained.
- As at 30 June 2017, cost of PPE in the financial statements amounted to Rs. 70,138,246. Out of which, assets costing some Rs. 33 million were fully depreciated and economic benefits were being derived from their use.
- No disclosure was made of the five acres of land for the extension of the Mauritius Oceanography Institute's building.

Projects – Rs. 24,992,059

The accuracy of the funds available in respect of each projects could not be ascertained in the absence of supporting schedule.

Employee Benefits – Rs. 9,572,693

The Net Defined Benefit Pension Asset amounting to Rs. 1,980,907 was not accounted as Non-Current Asset in line with the requirement of IPSAS 25, Employee Benefits. It was offset against other items of Employee Benefits.

Accounting policies

The following accounting policies were not disclosed:

- No disclosure was made in the financial statements of accounting policy regarding the classification of exchange and non-exchange transactions in line with IPSAS 9, Revenue-from Exchange Transactions and IPSAS 23, Revenue from Non-Exchange Transactions (Taxes and Transfers).
- No accounting policies were disclosed about the recognition and measurement of financial instruments as required by IPSAS 29, Financial Instruments.

I conducted my audit in accordance with International Standards of Supreme Audit Institutions (ISSAIs). My responsibilities under those standards are further described in the 'Auditor's Responsibilities for the Audit of the Financial Statements' section of my report. I am independent of the Mauritius Oceanography Institute in accordance with the INTOSAI Code of Ethics, together with the ethical requirements that are relevant to my audit of the financial statements in Mauritius, and I have fulfilled my other ethical responsibilities in accordance with these requirements. I believe that the audit evidence I have obtained is sufficient and appropriate to provide a basis for my qualified opinion.

Key Audit Matters

Key Audit Matters are those natters that, in my professional judgment, were of most significance in my audit of the financial statements of the current period. These matters were addressed in the context of my audit of the financial statements as a whole, and in forming my opinion thereon, and I do not provide a separate opinion on these matters.

Except for the matters described in the Basis for Qualified Opinion section, I have determined that there are no key audit matters to communicate in my report.

Other Information

Management is responsible for the other information. The other information comprises the information included in the annual report of the Mauritius Oceanography Institute, but does not include the financial statements and my report thereon.
My opinion on the financial statements does not cover the other information and I do not express any form of assurance conclusion thereon.

In connection with my audit of the financial statements, my responsibility is to read the other information and, in doing so, consider whether the other information is materially inconsistent with the financial statements or my knowledge obtained in the audit or otherwise appears to be materially misstated. If based on the work I have performed, I conclude that there is a material misstatement of this other information, I am required to report that fact.

Responsibilities of Management and Those Charged with Governance for the Financial Statements

Management is responsible for the preparation and fair presentation of these financial statements in accordance with the International Public Sector Accounting Standards, and for such internal control as management determines is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, management is responsible for assessing the Mauritius Oceanography Institute's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless management intends to cease operations, or has no realistic alternative but to do so.

Those charged with governance are responsible of overseeing the Mauritius Oceanography Institute's financial reporting process.

Auditor's Responsibilities for the Audit of the Financial Statements

My objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes mu opinion. Reasonable assurance is a high level assurance, but is not a guarantee that an audit conducted in accordance with ISSAIs, will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.

As part of an audit in accordance with ISSAIs, I exercise professional judgement and maintain professional skepticism throughout the audit. I also:

- Identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for my opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one

resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.

- Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Mauritius Oceanography Institute's internal control.
- Evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by management.
- Conclude on the appropriateness of management's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or condition s that may cast significant doubt on the Mauritius Oceanography Institute's ability to continue as a going concern. If I conclude that a material uncertainty exists, I am required to draw attention in my auditor's report to the related disclosures in the financial statements or, if such disclosures are inadequate, to modify my opinion. My conclusions are based on the audit evidence obtained up to the date of my auditor's report. However, future events or conditions may cause the Mauritius Oceanography Institute to cease to continue as a going concern.
- Evaluate the overall presentation, structure and context of the financial statements, including the disclosures, and whether the financial statements represent the underlying transactions and events in a manner that achieves fair presentation.

I communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that I identify during my audit.

I also provide these charged with governance with a statement that I have complied with relevant ethical requirements regarding independence, and to communicate with them all relationships and other matters that may reasonably be thought to bear on my independence, and where applicable, elated safeguards.

From the matters communicated with those charged governance, I determine those matters that were of most significance in the audit of the financial statements of the current period and are therefore the key audit matters. I describe these matters in my auditor's report unless law or regulation precludes public disclosure about the matter or, when, in extremely rare circumstances, I determine that a matter should not be communicated in my report because the adverse consequences of doing so would reasonably be expected to outweigh the public interest benefits of such communication.

Report on Other Legal and Regulatory Requirements

Management's Responsibilities for Compliance

In addition to the responsibility for the preparation of the financial statements described above, management is also responsible to ensure that the Mauritius Oceanography Institute's operations are conducted in accordance with the provisions of laws and regulations, including compliance with the provisions of laws and regulations that determine the reported amounts and disclosures in an entity's financial statements.

Auditor's Responsibilities

In addition to the responsibility to express an opinion on the financial statements described above, I am also responsible to report to the Board whether:

a) I have obtained all information and explanations which to the best of my knowledge and belief were necessary for the purpose of the audit;
b) The Statutory Bodies (Accounts and Audit) Act and any directions of the Minister, in so far as they relate to the accounts, have been complied with;
c) In my opinion, and, as far as could be ascertained from my examination of the financial statements submitted to me, any expenditure incurred is of an extravagant or wasteful nature, judged by normal commercial practice and prudence;
d) In my opinion, the Mauritius Oceanography Institute has been applying its resources and carrying out its operations fairly and economically; and
e) The provisions of Part V of the Public Procurement Act regarding the bidding process have been complied with.

I performed procedures, including the assessment of the risks of material non-compliance, to obtain audit evidence to discharge the above responsibilities.

I believe that the audit evidence I have obtained is sufficient and appropriate to provide a basis for my qualified opinion.

Statutory Bodies (Accounts and Audit) Act

I have obtained all information and explanations which to the best of my knowledge and belief were necessary for the purpose of my audit.

As far as it could be ascertained from my examination of the relevant records, no direction relating to the accounts has been issued by the responsible Minister to Mauritius Oceanography Institute.

Late Submission of Annual Report

The draft annual report, excluding the financial statements, for the 18 - month period ended 30 June 2017 was submitted on 11 July 2019.

The financial statements of Mauritius Oceanography Institute for the 18 - month period ended 30 June 2017, was received on 31 July 2020.

Following audit, the annual report together with the amended financial statements were submitted to my Office on 10 June 2022, that is, some 54 months after the statutory deadline.

Except for the late submission of the Annual Report, the Mauritius Oceanography Institute has complied with the Statutory Bodies (Accounts and Audit) Act in so far as it relates to the accounts.

Based on my examination of the records of Mauritius Oceanography Institute, nothing has come to my attention that causes me to believe that:

a) Expenditure incurred was of an extravagant or wasteful nature, judged by normal commercial practice and prudence; and
b) The Institute has not applied its resources and carried out its operations fairly and economically.

Public Procurement Act

In my opinion, the provisions of Part V of the Act have complied with as far as it could be ascertained from my examination of the relevant records.

C. ROMOOAH
Director of Audit

National Audit Office
Level 14,
Air Mauritius Centre
Port Louis

16 August 2022

Financial Statement

Statement of Financial Position as at 30 June 2017

	Notes	Eighteen months ended 30 June 2017 (Rs.)	Year ended 31 December 2015 (Rs.)
ASSETS			
Current Assets			
Cash and cash equivalents	10	590,519	1,258,363
Trade and other receivables	11	16,657,187	33,171,551
Other current assets - car loan		1,215,327	865,599
Payment on Account - construction of building		-	163,416,234
Total Current Assets		**18,463,033**	**198,711,747**
Non-current assets			
Property, plant and equipment	13	9,777,473	10,190,683
Land and buildings	12	184,086,063	-
Intangible assets	14	414,809	586,160
Other - car loan	15	2,522,317	1,718,395
Total Non-Current Assets		**196,800,662**	**12,495,238**
Total assets		**215,263,695**	**211,206,985**
LIABILITIES			
Current liabilities			
Government Grant	28	-	2,700,568
Payables	16	3,108,628	29,565,397
Employee benefits	17	1,214,071	947,695
Projects		24,992,059	12,255,585
Short-term provision - car loan		**1,215,327**	865,599
Total Current liabilities		**30,530,085**	**46,334,844**
Non-current liabilities			
Long-term provision- car loan	16.1	3,122,317	1,718,395
Donation from AMESD project		2,868,200	2,868,200
Employee benefits	17	9,572,693	7,900,843
Total Non-current liabilities		**15,563,210**	**12,487,438**
Total liabilities		**46,093,296**	**58,822,283**
Net Assets		**169,170,399**	**152,384,701**
NET ASSETS/EQUITY			
General Fund		169,170,398	152,384,701
Total net assets/equity		**169,170,399**	**152,384,701**

.....
Mr N. Nazurally
Chairman

.....
Mr. R. Bunjun
Board member

Approved by Board on 29 September 2022.

MAURITIUS OCEANOGRAPHY INSTITUTE

Statement of Financial Performance for the Eighteen Months Ended 30 June 2017

	Notes	Eighteen months ended 30 June 2017 (Rs.)		Year ended 31 December 2015 (Rs.)
REVENUE FROM NON-EXCHANGE TRANSACTIONS				
Income	**18**	83,479,000		141,271,401
Research income		38,093,821		6,704,739
Total Revenue		**121,572,821**		**147,976,139**
EXPENDITURE				
Research Work	**19**	38,093,821		6,704,739
Salaries and Allowances	**20**	45,242,243		28,361,087
Office and Administrative	**21**	12,347,789		6,204,337
Legal and Professional fees	**22**	84,590		140,200
Training and Seminars	**23**	1,257,833		478,453
Depreciation & amortisation	**13**	10,399,970		5,718,472
Total expenses		**107,426,246**		**47,607,288**
SURPLUS FOR THE PERIOD		**14,146,575**		**100,368,851**

Cash Flow Statement for the Eighteen Months Ended 30 June 2017

		Eighteen months ended 30 June 2017 (Rs.)		Year ended 31 December 2015 (Rs.)
Cash flows from Operating activities				
Surplus		14,146,575		100,368,851
Non-cash movements				
Research Income understated in prior year		-		195,155
Depreciation & amortisation		10,399,970		5,718,472
Asset write off		204,590		
(Decrease)/Increase in payables		(26,456,769)		29,343,499
Increase/(Decrease) in provisions relating to employee costs		1,938,227		621,590
(Increase)/Decrease in receivables		16,514,364		(32,661,083)
Adjustment research income				
Donation from AMESD		-		(1,777,107)
Research work		12,736,474		(4,418,487)
Interest Income		-		(174,256)
Net cash flow from operating activities		**29,483,430**		**97,216,635**
Cash flows from Investing activities				
Purchase of property plant and equipment		(10,081,445)		(1,530,475)
Acquisition of Land and building		(184,086,063)		-
Disposal		-		-
Intangible Asset		-		(191,148)
Interest Income		-		174,256
Payment for construction of MOI building	**12.1**	163,416,234		(115,531,308)
Net cash used in investing activities		**(30,751,274)**		**(117,078,675)**
Cash flows from financing activities				
Release to Income- Donation from AMESD not accounted for		-		1,777,107
Recurrent Grant used to finance Non-Current Assets		-		150,402
Car Loan received from ministry		2,970,000		938,525
Car Loan paid to Staff		(2,370,000)		(938,525)
Car Loan reimbursed by staff		1,633,857		905,294
Car Loan refunded to Ministry		(1,633,857)		(905,294)
Net cash used in Financing Activities		**600,000**		**1,927,509**
Increase/(Decrease) in cash and cash equivalent		(667,844)		(17,934,531)
Cash and Cash Equivalents at beginning of period		1,258,363		19,192,894
Cash and Cash Equivalents at end of period		**590,519**		**1,258,363**
Note: The statement has been prepared under indirect method.				

Statement of Changes in Net Assets/Equity for the Eighteen Months Ended 30 June 2017

	30-Jun-17		31-Dec-15
	Rs.		Rs.
Balance at beginning of period	152,384,701		50,088,341
Adjustment for Capital Grant already utilized for acquisition/construction of NFA	2,700,568		-
Adjustment on amortization	(61,446)		-
Surplus/Deficit for the period	14,146,575		100,368,851
Adjustment for the year	-		1,927,509
Balance as at end of period	**169,170,398**		**152,384,701**

Statement of Comparison Budget and Actual Amounts for the Eighteen Months Ended 30 June 2017

Actual Amount (2015) Rs.		Budget Jan 16 to June 2017 Rs.	Actual Amount Rs.	Difference Between Budget and Actual Rs.	Notes
	Income				
30,375,000	Recurrent income	41,099,421	41,099,421	-	
174,256	Interest income	-	-	-	
78,493,987	Capital grant	58,517,238	58,517,238	-	
1,033,447	Car loan	3,254,196	3,254,196	-	
135,789	Other income	-	30,896	30,896	
2,570,793	MESA & other funds	-	26,337,672	26,337,672	
112,783,272	**Total**	**102,870,855**	**129,239,423**	**26,368,568**	
	Expense				
25,144,940	Salaries/Other Staff Related cost	33,401,593	43,962,344	(10,560,751)	a
	Other Charges - Recurrent			-	
1,997,470	Travelling and Transport	2,903,333	3,330,485	(427,152)	b
5,000	Training of Staff	208,333	64,816	143,517	
56,000	Uniforms	74,117	21,400	52,717	c
-	Staff Welfare	114,667	161,590	(46,923)	
107,075	Office Expenses & Incidentals	433,333	1,529,581	(1,096,248)	
434,690	Telephone, etc.	808,333	1,073,542	(265,209)	d
449,358	Maintenance & Running of Vehicles	760,000	874,225	(114,225)	e
150,403	Office Equipment & Furniture	681,667	718,493	(36,826)	
70,437	IT Equipment & Software	416,667	312,918	103,749	
2,213,750	Rent of Building	192,500		192,500	
16,375	Maintenance of Office Equipment	393,333	340,874	52,459	
1,136,037	Electricity & Water	2,505,550	3,843,059	(1,337,509)	f
47,026	Documentation	103,333	138,811	(35,478)	
235,772	Printing, Postages & Stationery	491,667	512,119	(20,452)	g
128,869	Insurance	291,667	270,441	21,226	
13,700	Security	943,333	1,429,861	(486,528)	
326,533	Linkages & Overseas Mission	196,667	278,280	(81,613)	
-	Advertising & Publicity fees	212,500	360,538	(148,038)	h
607,315	Board & Committees	838,740	1,058,151	(219,411)	i
140,200	Legal & Professional	170,000	159,590	10,410	
151,919	Conference, Workshop & Seminars	820,833	892,054	(71,221)	
36,975	Hospitality	116,667	191,620	(74,953)	
4,211	NCG	29,167	5,064	24,103	j
33,931	Cleaning	1,105,000	1,551,975	(446,975)	
33,507,986		**48,213,000**	**63,081,831**	**(14,868,831)**	
1,033,447	Car loan - advance	-	3,254,196	(3,254,196)	
7,744,374	Research	-	11,079,629	(11,079,629)	
87,597,996	Building	-	48,531,718	(48,531,718)	
96,375,817		**-**	**62,865,542**	**(62,865,542)**	
		-			
129,883,803	**Total Expenditure**	**-**	**125,947,373**	**(125,947,373)**	

Note: The statement has been prepared on a cash basis.

Statement of Reconciliation of Actual Amounts and Financial Statements for the Eighteen Months ended 30 June 2017

	Actual paid- cash (Rs.)	As per FS (Rs.)	Difference reconciled (Rs.)	Remarks
Salaries/Other Staff Related cost	38,554,149	39,834,469	1,280,320	Adjustment for provisions
Other Charges - Recurrent			-	
Travelling and Transport	3,330,485	3,324,608	(5,877)	Accruals adjustment
Training of Staff	59,203	59,203	-	
Uniforms	25,600	25,600	-	
Staff Welfare	-		-	
Other Goods & Services			-	
Office Expenses & Incidentals	1,417,705	1,008,616	(409,088)	Payment due to creditors
Telephone, etc.	2,380,790	2,397,961	17,171	Adjustment for arrears
Maintenance & Running of Vehicles	863,711	845,377	(18,334)	Adjustment for repayment insurance
Office Equipment & Furniture	1,470,673	2,071,632	600,959	Adjustment for Asset w/off, Creditors
IT Equipment & Software	426,379	33,977	(392,402)	Creditors & prepayment
Rent of Building			-	
Maintenance of Office Equipment	296,527	386,599	90,072	Adjustment for creditors
Electricity & Water	2,543,446	2,706,113	162,667	Adjustment for accruals
Documentation	68,850	68,926	76	Adjustment for prepayment
Printing, Postages & Stationery	418,937	483,853	64,916	
Insurance	296,087	605,496	309,409	Adjustment for prepayment
Security	1,428,757	1,408,058	(20,700)	Adjustment for accruals
Linkages & Overseas Mission	317,679	253,280	(64,399)	
Advertising & Publicity fees	387,103	405,809	18,706	
Board & Committees	2,059,967	2,057,566	(2,400)	
Legal & Professional	159,590	72,790	(86,800)	Adjustment for accruals
Conference, Workshop & Seminars	945,350	945,350	-	
Hospitality	67,955	119,882	51,927	
NCG	3,293	3,293	-	
Cleaning	1,546,506	1,643,534	97,028	Payment due to creditor
	59,068,741	**60,761,993**	**1,693,251**	

Notes to the Financial Statements for the Eighteen Months Ended 30 June 2017

1. Reporting Entity

The Mauritius Oceanography Institute (MOI) is a parastatal body under the aegis of the Ministry for Ocean Economy, Marine Resources, Fisheries, Shipping and Outer Islands. MOI advises Government on the formulation and implementation of policies and in respect to oceanography.

The Institute also undertakes and coordinates research and programs development in that field. The financial statements have been prepared in a spirit of adherence to the good governance of principles of accountability and transparency.

The MOI was established in January 2000 by the proclamation of the MOI Act (Act No 24 of 1999).

The address of the registered office is Avenue des Anchois, Morcellement de Chazal, Albion.

2. Basis of preparation

The financial statements of MOI have been prepared in accordance with the International Public Sector Accounting Standards (IPSASs) issued by the International Public Sector Accounting Board (IPSASB) which is a Board of the International Federation of Accountants Committee (IFAC).

Where an IPSAS does not address a particular issue, the appropriate International Financial Reporting Standards (IFRSs) and International Accounting Standards (IASs) of the International Accounting Standards Board (IASB) are applied.

The financial statements have been prepared on a going-concern basis and the accounting policies have been applied consistently throughout the period. The financial statements have been prepared on the historical cost basis, except for the revaluation of certain properties and financial instruments. The preparation of financial statements in conformity with IPSAS which requires the use of estimates and assumptions that affect the reported amounts of assets and liabilities at the date of the financial statements and the reported amounts of revenue and expenses during the reporting period.

1.1 IPSAS issued but not yet effective

The financial statement complies in all material aspects with applicable IPSAS. The following standards had already been issued but not effective.

IPSAS	Title	Date Issued	Effective Date
IPSAS 39	Employee Benefits	July 2016	1 Jan 2018
IPSAS 40	Public Sector combinations	Jan 2017	Jan 2019

3. Measurement Base

The accounting principles recognized as appropriate for the measurement and reporting of the financial performance, cash flows, and financial position on an accrual basis using historical cost have been followed in the preparation of the financial statements

4. Revenue Recognition

(a) Income

Income is measured at the fair value of the consideration received.

(b) Government Grant

The revenue necessary to finance the expenditure of MOI is derived from the government under the Ministry for Ocean Economy, Marine Resources, Fisheries, Shipping and Outer Islands vote for the period ended 30 June 2017.
Government grant consists of recurrent grant and capital grant stated in the statement of financial performance under revenue from non-exchange transactions.

(c) Employee Entitlements

Employee entitlements to salaries, pension costs, and other benefits are recognized when they are earned. Employees are allowed to accumulate sick leave and vacation leaves as at 30 June 2017. Provision has been made for both sick leave and vacation leave.
A provision is made for the estimated liability for passage benefits. The passage benefits for each staff are valued at end of reporting period and is included as long term payables.

(d) Retirement Benefit Obligation - Defined Benefit Plan

Provisions for retirement benefits for the entity are made in accordance with the Statutory Bodies Pension Act 1978 as amended and in accordance with the IPSAS 25 (Employee Benefits).

The MOI/pension are managed by the State Insurance Company of Mauritius Ltd (SICOM Ltd). The cost of providing the benefit is determined in accordance with the actuarial valuation.

Defined Contribution scheme

In PRB 2013, a defined contribution scheme has been recommended for which all staff employed have to contribute 6% and the employer MOI 12% of gross salary. This sum is accounted separately from the defined benefit plan.

5. Property, Plant and Equipment

Property, Plant and Equipment are stated at cost or valuation, net of accumulated depreciation. Depreciation is the systematic allocation of funds representing the use of an asset over its useful life. The depreciation charged for each item and for each period shall be recognized in the Statement of Financial Performance for the period.

Depreciation is provided on the straight line basis so as to write off the depreciable value of the assets over their expected useful economic lives.

The estimated useful lives of plant and equipment are as follows:

	No. of years
Equipment (Scientific)	**5**
Furniture and fittings	**10**
Office Equipment	**6-7**
Computer Equipment	**4**
Motor Vehicle	**5**
Container	**10**

Land
Land consists of 3 Acres vested under the PMO.

Buildings
Building consist of office buildings and are initially recognized at cost, but are subject to revaluation to fair value on an ongoing basis.

6. Provisions

A provision is recognized when there is a present obligation (legal or constructive) as a result of probable that a past event, and it is an outflow of resources embodying economic benefits will be required to settle the obligation. And a reliable estimate can be made of the amount of the obligation.

Provisions are reviewed at each reporting date and adjusted to reflect the current best estimate.

7. Reporting Period

In line with the amendments brought to the Finance and Audit Act, the financial statement was prepared for the 18 months ended 30 June 2017 with comparative information for the 12 months ended 31 December 2015.

Current paid figures are for eighteen months' period ended 30 June 2017. The prior year figures are for the year ended 31 December 2015. The statement of Financial Performance, Statement of Financial Position and Cash Flow statement are not comparable as the length of the period is not the same.

7.1 Authorisation Date

The financial statements were authorized for issue on 29 July 2020 by the Board.

8. Reclassifications

Payment on Account for the construction of Building has been classified under Current Assets.

9. Risk Management Policies

Risk management refers to the process used by an organization to monitor and mitigate its exposures to risk. The MOI is responsible for the definition of the overall strategy for risk tolerance, to monitor management and the assurance process on risk management and to take corrective action where management or the assurance process is found to be inadequate. MOI communicates its risk management policies to management and all other employees as appropriate to their roles within the organization and satisfies itself that communication has been effective and understood.

The management of MOI is accountable to the MOI for the design implementation and detailed monitoring of the risk management process, which includes the systemic and continuous identification and evaluation of risks as they pertain to the organization followed by action to terminate, accept and mitigate each risk to an acceptable level, having regards to the objectives of the organization.

(a) Business risk
MOI is exposes to business risks which can adversely affect its ability to achieve its objective. The main business risks that MOI is exposed are:

- Fraud
- Internal control weaknesses
- Lack of segregation of duties

(b) Financial risk
MOI does not use derivative financial instruments to hedge risk exposures. MOI is not exposed to currency risk, interest rate risk and credit risk.

(c) Operational risk
Operational risk, which is inherent in all organizations activities, is the risk of financial loss instability arising from failures in internal control, operational processes or the system that supports them. It is recognized that such risks can never be entirely eliminated and the costs of controls in minimizing these risks may outweigh the potential benefits.

(d) Exchange rate risk

MOI is not faced with exchange rate risk with exchange rate risk as receipts and payments are in MUR, the functional currency. Receipts in foreign currencies, if any, are converted and credited to MUR account at time of receipt.

10. Cash & cash equivalents

	Year 2017 (Rs.)	Year 2015 (Rs.)
Bank	547,572	1,251,362
Cash	42,947	7,001
	590,519	**1,258,363**

At 30 June 2017, the cash and cash equivalent was Rs 547,572, during the period under review an Rs. 5,250,000 was received from shipping to be used as only for the project Ballast & Biofouling.

11. Trade and Other Receivables

	Year 2017 (Rs.)	Year 2015 (Rs.)
Prepayments	362,832	333,716
Debtor	16,294,355	32,837,835
	16,657,187	**33,171,551**

12. Land and Buildings

An amount of Rs 184,086,063 has been capitalized during the period under review. The buildings consist of office buildings situated at Albion.

12.1 An amount of Rs 48,446,334 was paid for the construction of MOI building for the current year. The amount of Rs 163,416,234 represent payment in respect of building previously accounted as payment on account.

13. Property, Plant and Equipment

	Scientific Equipment	Furniture & Fittings	Office Equipment	Computer Equipment	Motor Vehicle	Container	TOTAL
Cost	**Rs.**	**Rs.**	**Rs.**	**Rs.**	**Rs.**	**Rs.**	**Rs.**
Balance as at 1 January 2016							
MOI ASSET	38,905,230	2,790,250	1,859,849	12,707,726	3,718,539	279,797	60,261,391
Additions	4,614,999	2,071,632	595,201	2,799,613	-	-	10,081,445
Disposal/Scrap		(204,590)					(204,590)
As at 30 June 2017	**43,520,229**	**4,657,292**	**2,455,050**	**15,507,339**	**3,718,539**	**279,797**	**70,138,246**
Accumulated Dep'n	**Rs.**	**Rs.**	**Rs.**	**Rs.**	**Rs.**	**Rs.**	**Rs.**
At I January 2016							
MOI Assets	32,063,373	1,915,084	1,593,444	10,974,459	3,314,499	209,849	50,070,708
Charge for the period	6,922,233	533,643	243,328	2,245,861	303,030	41,969	10,290,065
Disposal/Scrap							-
As at 30 June 2017	**38,985,606**	**2,448,727**	**1,836,772**	**13,220,320**	**3,617,529**	**251,818**	**60,360,773**
Carrying amount at 30 June 2017							
MOI Assets	**4,534,622**	**2,208,565**	**618,278**	**2,287,019**	**101,010**	**27,979**	**9,777,473**
As at 31 December 2015.	6,841,857	875,166	266,405	1,733,267	404,040	69,948	10,190,683

14. Intangible Assets

Amount accounted under Intangible Assets comprised of cost of software purchased for research purpose and software for computers as well as software from AMESD project.

Accounting software is stated at historical cost less accumulated depreciation. Amortization is charged so as to write off the cost of intangible asset over its expected useful life using the straight line method. A full year amortization is charged on acquisition/additions during the year. The annual amortization rate for this purpose is as follows: Intangible assets 12.5%.

Intangible Asset	**(Rs.)**
Cost	
Balance as at 1 Jan 2016	586,160
Adjustment on amortization	(61,446)
Amortization	(109,905)
Net Book value at 30 June 2017	414,809

15. Long and Short Term Receivables - staff car loan

(Car loans bear interest at the rate of 7.5% p.a) As per PRB 2016 interest is at 4% p.a	**Year 2017 (Rs.)**	**Year 2015 (Rs.)**
Amount due at 30 June 2017	3,737,644	2,583,994
Amount falling due within 1 year	(1,215,327)	(865,599)
Amount falling due more than 1 year	**2,522,317**	**1,718,395**

16. Payables

	Year 2017 (Rs.)	**Year 2015 (Rs.)**
Creditors	1,451,074	28,863,267
Accruals	1,657,554	702,131
	3,108,628	**29,565,397**

16.1 Car Loan due to AG

Opening balance	2,583,994
Advance	3,170,000
Payment	(1,416,350)
Closing balance	4,337,644
Amount falling due within 1 year	(1,215,327)
Amount falling due more than 1 year	3,122,317

17. Employee Benefits

	Year 2017 (Rs.)	**Year 2015 (Rs.)**
Short term		
Provision for sick leave	614,071	547,695
Passage Benefit	600,000	400,000
	1,214,071	**947,695**
Long term		
Provision for Passage Benefits	1,563,099	1,209,421
Provision for Sick leave	5,632,157	4,385,025
Retirement Benefits obligations	(1,980,907)	(1,906,596)
Provision for vacation leave	4,358,344	4,212,992
	9,572,693	**7,900,842**

(a) Pension scheme

The assets of MOI are held independently and administer by the SICOM LTD. The amount recognized in the statement of financial position is as follows:

	18 months 2017 (Rs.)	Year 2015 (Rs.)
Present value of funded obligations	32,138,438	27,247,580
Fair value of plan assets	(21,062,062)	(17,143,525)
	11,076,376	10,104,055
Present value of unfunded obligation	-	-
Unrecognized actuarial gain/(loss)	(13,057,283)	(12,010,651)
Unrecognized transition amount	-	-
Liability recognized in balance sheet	(1,980,907)	(1,906,596)

(b) Amounts recognised in income statement

Current service cost	2,225,374	1,431,443
Employee contributions	(1,205,779)	(764,229)
Fund expenses	70,381	88,853
Interest cost	2,860,996	1,904,292
Expected return on plan assets	(1,935,329)	(1,212,547)
Actuarial loss/(gain) recognized	422,086	400,906
Past service cost recognized	-	-
Total, included in staff costs	2,437,729	1,848,718

(c) Movement in liability recognised in balance sheet

At start of year	(1,906,596)	(2,163,427)
Total staff cost as above	2,437,729	1,848,718
Contribution paid to employer	(2,512,040)	(1,590,939)
Actuarial reserves transferred in		(948)
At year end	(1,980,907)	(1,906,596)
Actual return on plan assets	1,540,923	202,895

(d) Main actuarial assumptions at end year

Discount rate	7.00%	7.50%
Expected rate of return on plan assets	7.00%	7.50%
Future salary increases	4.00%	5.00%
Future pension increases	3.00%	3.00%

18. Revenue from non-exchange transactions

	Year 2017 (Rs.)	Year 2015 (Rs.)
Recurrent Grant	22,461,800	34,150,000
Other income	2,282,454	415,016
Interest	217,508	174,256
Capital grant	58,517,238	106,682,531
Less:		
Recurrent Grant used to finance purchase NCA	-	(150,403)
	83,479,000	**141,271,401**

19. Research Work

	Year 2017 (Rs.)	Year 2015 (Rs.)
Tsunami modelling	4,240	-
Other Capital expenses	1,864,761	316,164
MASMA	1,709,720	633,252
MESA	14,860,169	3,353,977
Ballast	13,230,663	21,908
Bioprospecting	309,093	561,248
Coral farming	26,124	21,288
Bathymetric survey	859	-
Pearl Culture	29,502	8,136
ASCLME	-	3,000
Geology	162,278	299,181
DNA Barcoding	232,007	52,359
Spirulina	65,413	1,363,717
Lagoon and Beach erosion	-	16,266
MOI/COI	348,992	54,245
Biofiouling	5,250,000	-
	38,093,821	**6,704,739**

20. Salaries and Allowances

	Year 2017 (Rs.)	Year 2015 (Rs.)
Salaries	33,357,230	22,430,775
Other staff related cost	6,477,238	3,264,391
Travel/Subsistence	3,324,608	2,002,605
Board Meeting fees & others	2,057,566	607,315
Staff welfare- uniform only	25,600	56,000
	45,242,243	**28,361,087**

21. Office and Administrative

	Year 2017 (Rs.)	Year 2015 (Rs.)
Advertising	405,809	-
Documentation	68,926	88,805
Rent and rates		2,213,750
Security	1,408,058	170,560
Telephone	2,397,961	453,955
Postage	68,161	27,885
Stationery	242,708	101,752
Insurance	605,496	131,830
Other Office Expenses	1,008,616	708,215
Hospitality	119,882	42,445
Electricity and water	2,706,113	1,377,051
Printing	172,985	104,938
Repairs and maintenance	386,599	14,375
Cleaning expenses	1,643,534	168,236
Vehicle Running Cost	845,377	515,849
IT Software and expenses	33,977	70,437
NCG allowance	3,293	795
Bank charges	25,704	13,459
Asset written off	204,590	
	12,347,789.19	**6,204,337**

22. Legal and Professional Fees

	Year 2017 (Rs.)	Year 2015 (Rs.)
Legal	72,790	42,000
Audit fees		75,000
Other Professional fees	11,800	23,200
	84,590	**140,200**

23. Training and Seminar

	Year 2017 (Rs.)	Year 2015 (Rs.)
Staff training	59,203	5,000
Mission Overseas	253,280	326,533
Conference/Seminar	945,350	146,920
	1,257,833	**478,453**

24. European Union Funded Project

In March 2014, a new contract was signed with the European Union and the African Union Commission for the continuation of the AMESD project but now called the Monitoring of the Environment and Security in Africa (MESA). The project ended on the 31st October 2017. The audit of the project was conducted by Moore Stephens and Ernst & Young.

The breakdown budget is as follows:

Details	Amount (EUR)	
Total payment made by EU delegation to MOI		1,197,831
Amount spent by MOI	983,922	
Administrative cost allowed	68,875	
Ineligible cost incurred	(7,139)	
7% EU Administrative cost	(500)	
Net Eligible cost	1,045,159	
MOI contribution 5%	53,544	
EC contribution actual		991,615
Amount left that was return to EU		**206,216**

25. Related Party Transactions

Key management personnel – remuneration

The key management personnel of MOI as defined by International Public Sector Accounting Standard (IPSAS 20) are the Director, Deputy Director and Chairperson. During the year under review a total remuneration of Rs 5,301,628 was paid to the key management personnel.

Loan which are not widely available (and/or widely known) to persons outside the key management group.

Amounts of such loans advanced and repaid during the period, and the balances outstanding at the end of the period are outlined below:

Individual	Advanced	Repaid	Balance
	Rs.	Rs.	Rs.
Mrs. Ruby Moothien Pillay	1,200,000	Nil	1,200,000
Mr. D. Marie	700,000	700,000	Nil

Note that Dr. Moothien Pillay's deduction started as from July 2017 since car loan was paid to her in July 2019. As for Dr. Marie, his car loan for the financial year 2016/2017 ended on the 28th January 2017.

Terms and Conditions of the loan:

The employment packages of Dr. Moothien Pillay, Director and Dr. D. Marie, Deputy Director of MOI, allows them to take out a car loan for up to 5 years at 4 % per annum and car loan up to 7 years at 7.5 % to purchase a car respectively.

26. Explanatory Notes of Material Differences between Budget and Actual Amounts

(a) Salaries/other staff related cost
There was additional staff PRB 2016 paid in May 2016.

(b) Travelling and transport
An increase in staff led to an increase in mileage.

(c) Uniforms
Uniform allowance was paid only to 5 office attendant/drivers compared to previous years whereby uniform allowance was paid to admin staff as well.

(d) Telephone
Additional telephone lines upon moving to new offices Albion.

(e) Maintenance of office equipment
There has been increase in consumption of fuels for 3 vehicles

(f) Electricity and water
There has been increase in consumption of electricity in new building.

(g) Printing, postage and stationery
There has been increase in postage.

(h) Advertising and publicity fees
Advert for vacancies at MOI.

(i) Board and committees
There has been additional committee such as Finance and BEC set up.

(j) NCG
Boat hire was taken under capital projects.

27. Government Grant
Capital grant of Rs 2,700,568 recognized in the financial statement of previous years as 'Deferred Income' have been transferred to General Fund as the grant has effectively and wholly been used for the acquisition/construction of non- current assets.

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