MAURITIUS MARITIME WEEK 2018

THE IMPORTANCE OF OCEANOGRAPHIC RESEARCH IN THE SUSTAINABLE DEVELOPMENT OF THE OCEAN ECONOMY

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GREEN AND BLUE ECONOMY-ORIGIN

Our increasing understanding of the scale of environmental degradation and the changing climate have pushed the idea of a green economy up the global agenda in recent years. Some key events over the last few decades include:

1972 Stockholm conference

1987 Brundtland Report

1992 Earth Summit Agenda 21

2012 Rio+20 conference

Green and Blue Economy-Origin

- **In 1972 the Stockholm Conference** - One concrete move was the decision to establish a United Nations Environment Programme.
- **In 1987 Brundtland Commission-** famous definition of a sustainable society as one that "meets the needs of the present without compromising the ability of future generations to meet their own needs".
- **In 1992 the Rio de Janeiro Earth Summit,** which gave birth to UN conventions on climate change, biodiversity and desertification, and the Agenda 21 "roadmap" to sustainable development.
- **In 2012 Rio+20 UN Conference on Sustainable Development,** conceived the idea of the “blue economy”

Definitions

- *Green Economy-A system of economic activities related to the production, distribution and consumption of goods and services that result in improved human wellbeing over the long term, while not exposing future generations to significant environmental risks and ecological scarcities.*

- A blue economy is one in which our ecosystem bring economic and social benefits that are efficient, equitable and sustainable.

Key word: Sustainability

Sustainable Development Implies:

(i) Knowledge of the resources we are developing (Species Inventory, Stock Assessment, Spatial and temporal distribution of Species and Biomass (biogeography))

(ii) Protect and Preserve the Resources and their habitats (Ecological studies, Biotope mapping,)

(iii) Manage the Development of the Resources

(Understanding the Life Cycle/Ecosystem, Ecosystem-based Management, Identify, Nullify or attenuate threats, GIS mapping, Marine Spatial Planning, Science-based Policy making)

Inventory of the Marine Organisms of Economic Importance

❑ Resources Evaluation

1. **Inventory of marine organisms using DNA based techniques**
2. **Assessment of Development potential**

e.g. a. *Feasibility studies of Pearl Oyster culture*

e.g. b. *Sponge derived Marine Pharmaceuticals*

Assessment of marine biodiversity using taxonomy and DNA-based technique

- **Main outputs:**
  - Freely accessible marine diversity and genetic database which can be used by various stakeholders including aquaculture investors
  - List of commercial fish species with DNA barcodes.
  - Techniques developed for fish identification using DNA-based approach - provision of services to the Seafood Industry
  - Market guide for fish family in Mauritius
  - Online guide for sea cucumbers of Mauritius
  - Immediate: Inventory molluscs in the waters of Mauritius
  - **Future**: Inventory of crustaceans, soft/hard corals

WE CAN ONLY PROTECT WHAT WE KNOW!!

Online marine database

Market guide for fish family in Mauritius

Field photo for mollusk & sea cucumber

Assessment of marine biodiversity using taxonomy and DNA-based technique

Traceability of fish stocks and fish products

-Combat Illegal, Unreported and Unregulated fishing (IUU fishing)-Regional Provenance of species makes possible: Next generation sequencing and otolith (fish earstone) microchemistry

-Stock Assessment and Management on a geospatial scale

Science and Technology Involved: DNA sequencing, bio-informatics, microchemistry, satellite technologies and web-based geo-visualisation

2 a. Feasibility studies & research related to aquaculture activities

- **Main outputs:**
  - Study of the distribution and abundance of pearl oysters around Mauritius completed
  - Techniques developed (locally adapted) for set up of *in-situ* & *ex-situ* culture farms

- **Way forward:**
  - Conduct further feasibility studies & research related to aquaculture activities (e.g. life cycle of organisms having development potential)
  - Conduct research to enhanced genetic diversity of aqua-cultured species
  - Promote the setting up of a mollusc industry for SMEs

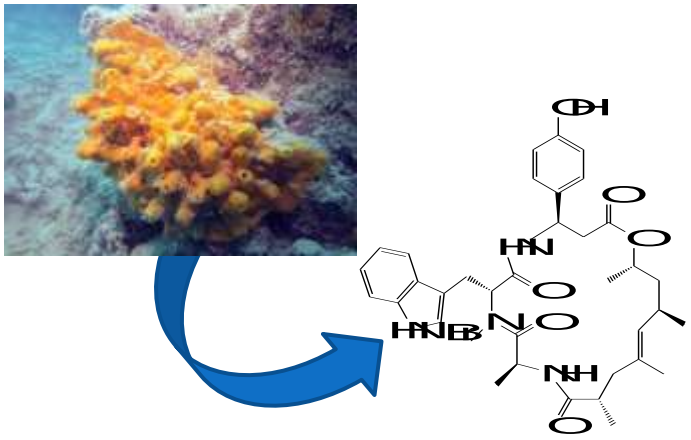
Oyster culture

Coral culture

Mollusc industry research

2 b. Marine Pharmaceuticals

- **Main outputs:**
  - On-going project: Biological Activities of Marine Natural Substances from sponges from the waters of Mauritius
    - Inventory of various sponge species around the island (Up to depth of 40m)
    - 100 specimens of sponges collected. 54 (162 extracts) tested against Cancer, Alzheimer & Diabetes
    - Isolation and characterization of bioactive compounds from selected marine sponges.
    - Initiating new bio-assays such as anti-bacterial assay



Isolation of Jaspamite from the sponge Jaspis sp.

Small scale cultivation of marine *microalgae-Spirulina* as a model organism

Conservation of marine biodiversity

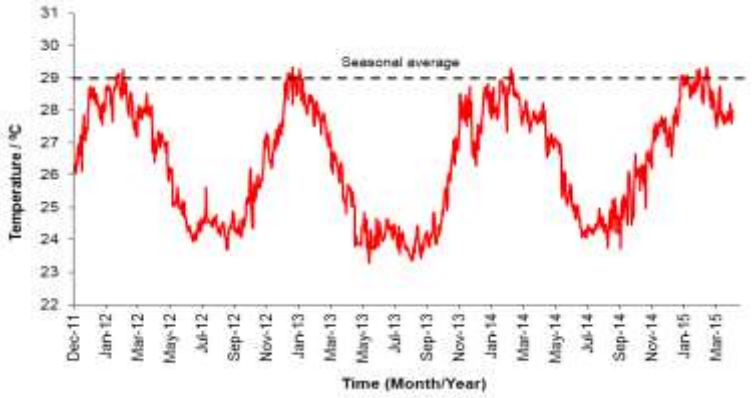
1. Coral reef monitoring
2. Reef Rehabilitation
3. Submarine Groundwater Discharge

Ecological study of the nearshore waters of Mauritius

- **Main outputs:**
  - Establishment of a Temperature Network around the Mauritius, through deployment of submersible data loggers at established stations
  - Availability of short-term data (temperature, coral cover etc.) at selected lagoon and off-lagoon sites
  - Assessment of the impacts of bleaching events on the marine environment

- **Way forward:**
  - Data generated through this on-going study is expected to help in:
    - Monitoring sea-water temperature before, during & after coral bleaching events
    - Future development of temperature prediction models (through long-term real-time data acquisition)
    - Better understanding of the impacts of Climate Change on natural resources on a short/long term basis
    - Informed decision making to reverse the current trend in reef degradation

Permanent monitoring stations established around Mauritius



Temperature (^{0}C) data recorded at Flic en Flac from 2011 to 2015

Small Scale Reef Rehabilitation

Main outputs:

- Locally adapted techniques developed for mass culture of corals & small scale reef rehabilitation
- Reef sites rehabilitated at Albion, Flic en Flac and Trou aux Biches
- Transfer of scientific know how to ELI Africa (NGO) for implementation of a "Community-based small scale reef rehabilitation at Trou aux Biches "

- **Budgetary Measures**
- Transfer acquired know-how to stakeholders & local communities for implementation of small scale reef rehabilitation projects at 4 selected sites
- Provision of alternative livelihoods to the Coastal Communities through reef restoration activities
- Implementation of a Large-scale reef rehabilitation programme (to enhance reef recovery, fisheries habitat, aesthetics for tourism)

Locally adapted multilayered rope nursery

Locally adapted artificial reef rehabilitation module

Submarine Groundwater Discharge (SGD)

- **Collaboration:** International Atomic Energy Agency (IAEA), Water Resources Unit WRU (Mauritius), National Environmental Laboratories NEL (Mauritius)
- **Main outputs:**
  - High definition sea surface temperature differential imagery of the waters around Mauritius depicting thermal anomalies associated to SGD
  - Identification of 28 major nearshore SGD sites around Mauritius through measurement of naturally occurring radio-tracers
  - These major SGD sites may be tapped for domestic/industrial use
- **Way forward:**
  - Evaluation of the fresh water flux through SGD at specific locations (i.e. TAB) of high water demand
  - Determination of the daily input of nutrients and heavy/trace metals through SGD in the lagoon of TAB

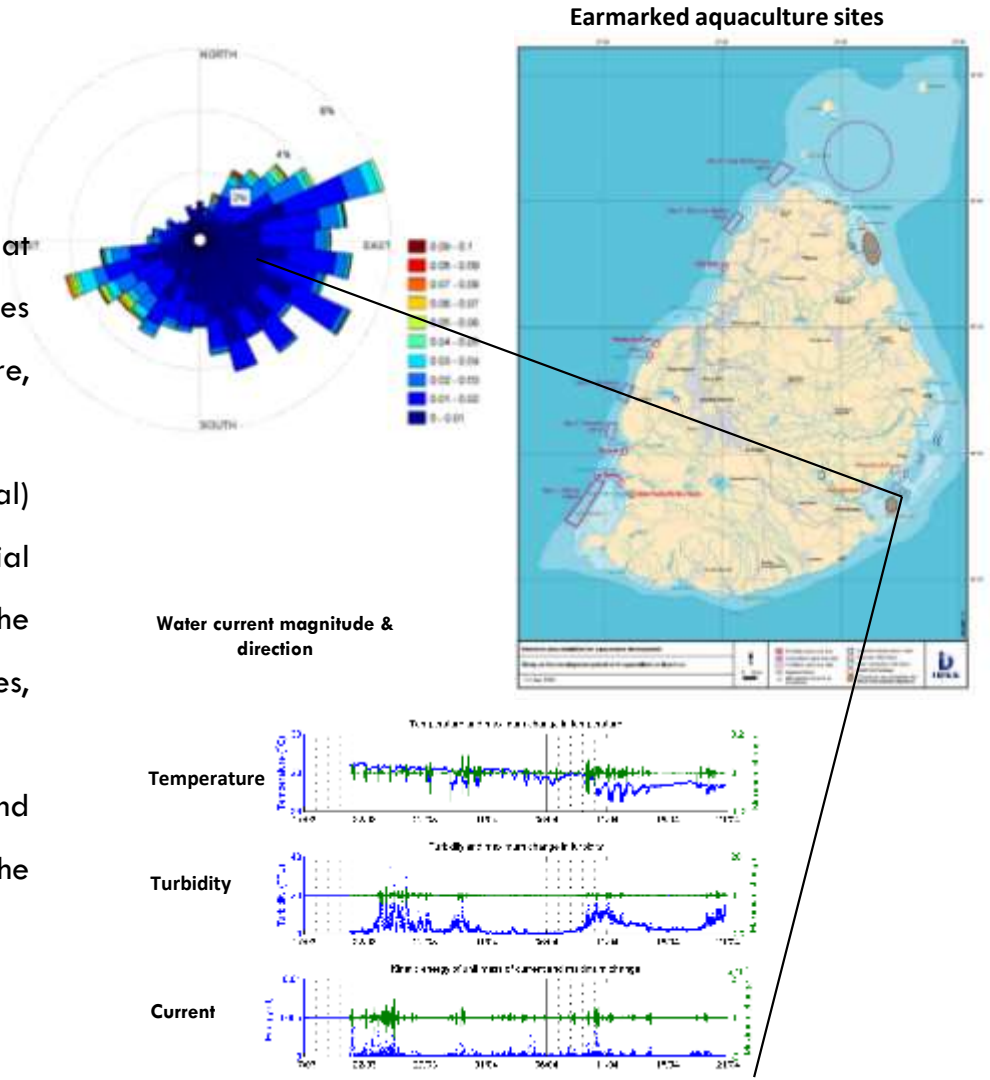
Confirmed SGD site Negative for Radon

Management of Resources

1. Characterisation of earmarked Aquaculture sites
2. Bathymetric Survey
3. Ballast water management

Characterisation of potential/earmarked aquaculture sites

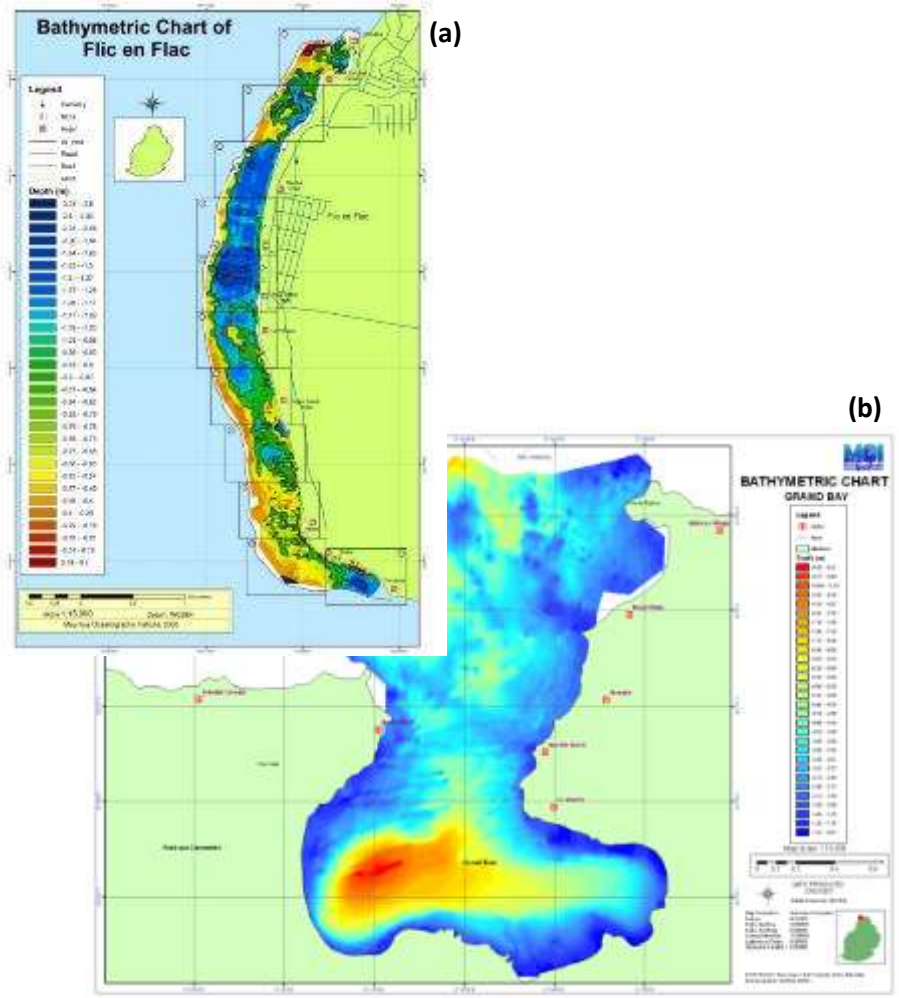
- **Location of action:** Rep. of Mauritius
- **Field of research:** Multidisciplinary
- **Main outputs:**
  - Provision of baseline physical oceanographic data at selected aquaculture sites to Government Authorities for investment in activities such as aquaculture, renewable energy, among others.
  - Full characterisation (biological, physical, chemical) of earmarked aquaculture sites & other potential sites for activities related to the development of the Ocean Economy (Aquaculture & Tourism industries, biodiversity protection & conservation sector)
  - Promote sustainable development / protection and conservation of marine living ecosystems through the conduct of multidisciplinary surveys



Bathymetric survey of the shallow lagoons of Mauritius and Rodrigues

- **Main outputs:**
  - Bathymetric characterisation of selected sites around Mauritius & Rodrigues (availability of raw data)
  - Skills developed in bathymetric profiling: bathymetric data acquisition, analysis & interpretation, bathymetric chart generation
  - Development of bathymetric maps that can be used by national, regional and international stakeholders

- **Way forward:**
  - Bathymetric characterisation of Rodrigues island & other outer islands (incl. St. Brandon & Agalega)

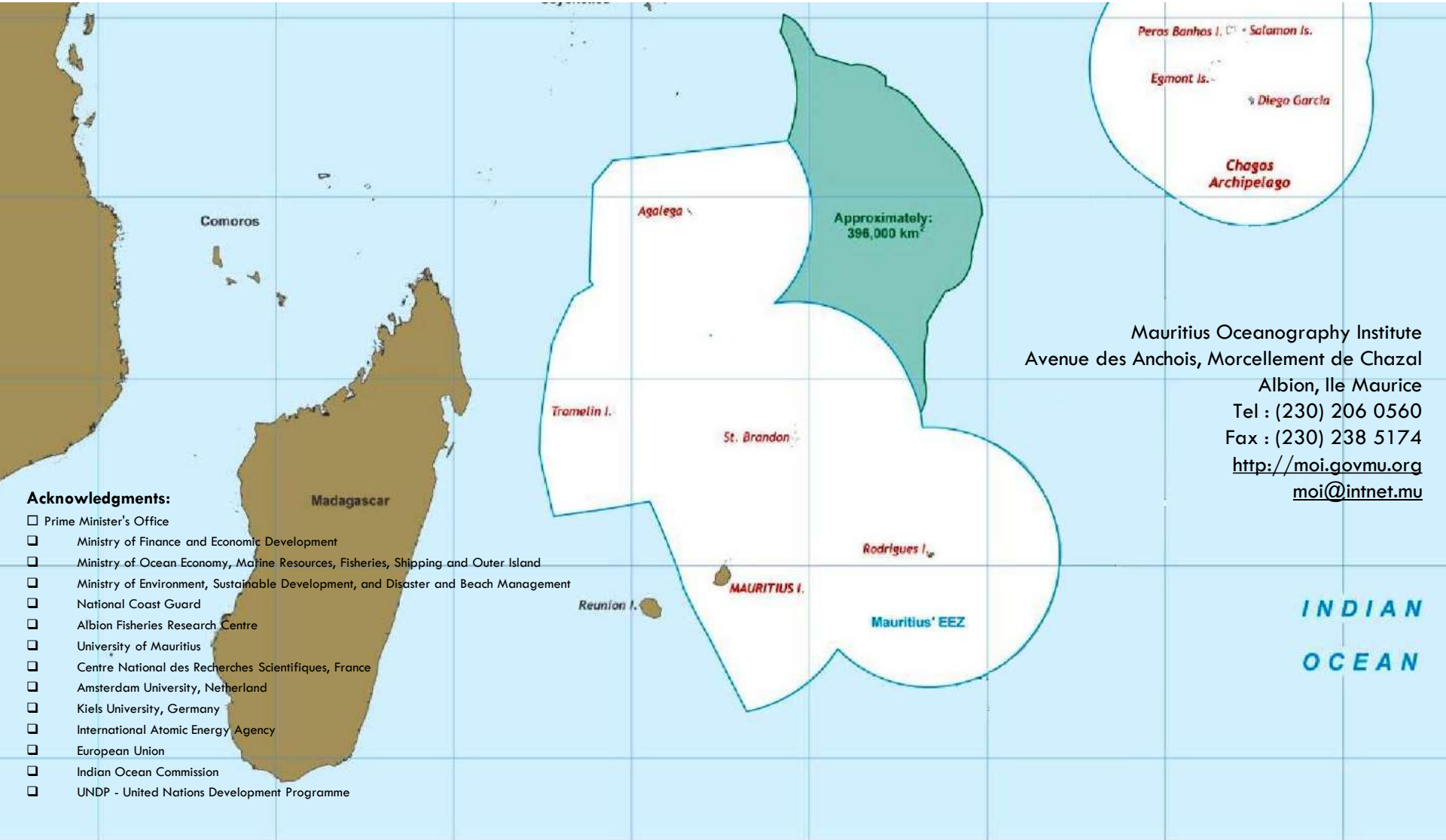


Bathymetric chart for (a) Flic en Flac & (b) Grand Baie (Mauritius)

Ballast Water Management

- **Collaboration:** Ministry of Ocean Economy, Marine Resources, Fisheries, Shipping (Shipping Division)
- **Field of research:** Marine Biosecurity : Marine Invasive Species Management
- **Main outputs:**
  - Support to the Shipping division in the development of a ballast water management regime for Port-Louis in order to increase adherence to international regulations and the corresponding protection of national marine resources.
  - Development of a computer based Ballast Water Risk Assessment and Decision Support (BWRADS) system customized for Port Louis.
  - Conducted a Port Biological Baseline Survey of Port Louis harbour.
- **Way forward:**
  - Extension of Port Biological Baseline Survey of Port Louis To Port Mathurin (2018)

THANK YOU



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- ❑ Indian Ocean Commission
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