INSTITUTE OF MARINE AFFAIRS

Annual Administrative Report

October 2020 - September 2021

Institute of Marine Affairs
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IMAgovTT

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About this Report

The Institute of Marine Affairs (IMA) Annual Report 2020-2021 has been prepared in accordance with section 66 A-D of the Constitution of the Republic of Trinidad and Tobago and in accordance with Section 11 1-G of Act No. 13 of 1990 entitled the Institute of Marine Affairs Act.

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CHAIRMAN'S REMARKS

The SARS-CoV-2 (COVID-19) pandemic with the attendant national restrictions as it relates to social distancing and activity on beaches and watercourses dampened somewhat the marine and coastal monitoring investigations normally undertaken by the Institute for the period. The Institute, however, used these limitations to build out information and communication technologies (ICT) infrastructure allowing accessibility by a multitude of stakeholders to our data-rich environment, foster greater virtual collaboration and enable remote work among the team, and more.

Researchers also developed linkages with the private sector for support updating and making available to students, researchers, educators, the business community, civil society, national and regional bodies and agencies, and members of the public generally, information on sensitive marine ecosystems in the country. Two projects of note stand out: the Marine Biodiversity Data Hub; and The Guide to Coral Reefs of Tobago.

The IMA is particularly proud of the "The Guide to Coral Reefs of Tobago" which was first authored in 1991 by former IMA Researcher, Mr. Richard Ladoo. The updating of this publication is an exercise made possible with the kind sponsorship of Shell Trinidad and Tobago Limited. The publication provides an overview of the distribution, status, threats and resilience capabilities of the reef structures in Tobago. multi-faceted in its utility, the book is a tool for decision makers, reference material for students, educators, and researchers and a guide for tourists and tourism interests.

Additionally, the digitising of the IMA's data to create a Marine Biodiversity Hub was made possible with funding from the Global Biodiversity Information Facility. It has enabled the IMA to digitise its records relating to its Marine Reference Collection and other datasets for upload to its website. Engagement activities, both externally and internally, enabled the creation of a knowledge product in line with stakeholder needs and requirements for maximum utility.

In the realisation of one of the major strategic pillars of the organisation's 2019-2024 strategic plan, that is, demonstrating long-term value to the government and people of Trinidad and Tobago, the Institute operationalised its research capacity in mariculture for the purpose of improving national food security and creating investment opportunities for local entrepreneurs. The infrastructure to house the research facility having been constructed in fiscal 2020, gave way to planning and research activities in preparation for the return of access to beaches which would allow for the capture of target species being considered for the fish farming study.

The IMA too partnered with The University of the West Indies for the conduct of the training and sensitisation exercises on farming in proximity to the Caroni River Basin, in a bid to promote wetland restoration. The Central Region, which hosts the country's largest wetland, which is a Ramsar site, is the breadbasket of the nation. Generations of farmers using fertilisers and pesticides contribute to the pollution of the watercourses leading to the river basin because of run off from agricultural activities and wastewater. The project assisted farmers in implementing ecosystem-based approaches to reduce harmful effluents from their activity thereby improving the water quality in the nearby wetlands.

The IMA, through its partnerships and strategic collaborations, continued to put its science to work in support of the national development agenda and Vision 2030 objectives of the Government of the Republic of Trinidad and Tobago. On behalf of the Board of Governors, I wish to thank the management and staff of the Institute for their unwavering support and dedication to providing the data required for our nation to make informed choices about the conservation and utilisation of marine and coastal resources. The Institute's science must leave the pages of texts and journals to not only inform public policy but craft implementable solutions to the challenges that face us all.

Hayden Alexander Chairman,
Board of Governors
Institute of Marine Affairs
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DIRECTOR'S REMARKS

I am pleased to present the Annual Report of the Institute of Marine Affairs (hereinafter referred to as the IMA), which reviews the performance, achievements and financial position for the reporting period October 1st, 2020, to September 30th, 2021.

Fiscal 2020-2021 was a challenging year for the IMA with the ongoing and worsening SARS-CoV-2 (COVID-19) pandemic upending workplace norms and even disrupting the personal lives of staff. Adherence to the response of the Government of the Republic of Trinidad and Tobago to the COVID-19 pandemic – implementation of mandatory restrictions such as national lockdowns and physical distancing to limit the spread of the highly-contagious illness - remained a key focus for management as the health and safety of staff continued to be priority. Management implemented hygiene measures with the distribution of face masks and personalised sanitisers to each staff member, work-from-home arrangements, mounting appropriate signage for the mandatory use of masks and physical distancing. The Information Technology Department stepped up to deliver technologies required to support the work-from-home arrangements and, inter alia, facilitate video-teleconferencing platforms to enable virtual meetings among departments and with stakeholders. The Institute offered technology loans to staff so they could purchase laptops that allowed them to work from home. As with other organisations, the IMA adapted to new ways of working and communicating, while assuring the health, well-being and safety of staff.

During this period, the Institute welcomed the Operations Manager, Mr. Khaliem Sajad, who started February 1, 2021. Mr. Sajad holds certification in Project and Contract Management, bringing to the IMA a wealth of experience in project management, construction management and procurement.

Locked in the throes of the COVID-19 pandemic, the second quarter of this reporting period began the United Nations (UN) Decade of Ocean Science for Sustainable Development 2021-2030, which led to the unveiling of a knowledge product. The IMA launched an informative publication titled, "Mangrove Forests of Trinidad and Tobago" on February 2nd, 2021 – World Wetlands Day, and a mobile application, 'SeaiTT app' unveiled at a virtual event in November 2020. While the book provides comprehensive information and data on the mangrove forests of Trinidad and Tobago, the mobile app is dedicated to gathering and sharing data on the coastal and marine environments of our twin-island republic. The launch of these knowledge products could not be more apt as they support the UN Ocean Decade which aims to identify, generate and use critical ocean knowledge – '*the science we need for the ocean we want'* - to manage our marine resources sustainably.

Despite these challenges brought on by the ongoing pandemic, the IMA continued to achieve several of our strategic and research priorities by engaging in key partnerships.

- The Government of the Republic of Trinidad and Tobago has a Technical Cooperation with the International Atomic Energy Agency (IAEA) on using Nuclear Techniques for Climate Change Adaptation and mitigation. As the national counterpart for the Technical Cooperation, the IMA received thirty-seven thousand Euros (€ 37,000) in laboratory equipment to boost its capacity to conduct research on microplastics and ocean acidification.
- As the Regional Activity Centre (RAC) for the Land-Based Sources of Pollution (LBS) Protocol under the Cartagena Convention, IMA signed a Small Scale Funding Agreement in 2020 to oversee the development of a Regional Nutrient Management Strategy (RNMS) for the Convention area. This strategy was finalised and submitted in April 2021 ahead of the Cartagena COP scheduled for July 2021.
- IMA was successful in winning a Global Biodiversity Information Facility (GBIF), Institution-level Biodiversity Data Mobilisation Grant for 20,000 Euro in 2021. This fund is aimed to enhance capacity for effective mobilization and use of Biodiversity Data in support of decision and policy making for sustainable development. The grant will be used to develop a centralised Marine Biodiversity Hub (MBH) for the purpose of (1) creating a MBH that is effective in the dissemination of data on the state of marine ecosystems in T&T to research

partners, civil society and decision makers, and (2) building capacity for more integrative research collaborations across sectors and creating sustainable partnerships through data sharing for the purpose of research, management and conservation. All existing data will be standardized and centrally stored for internal and external use with data protection capabilities.

- There is extensive mangrove dieback in the coastal forest north of Couva River. In order to rehabilitate this wetland areas, the cause of dieback has to be determine. In October 2020, IMA signed a research funding agreement with Point Lisas Nitrogen Limited (PLNL) to conduct a hydrological and topographical assessment of the forest north of Couva River. Field instruments such as water level sensors, tide gauges and salinity sensors were installed in March 2021 and will collect data for a one-year period. The results of this assessment will inform a mangrove restoration plan for the area.
- In December 2020, IMA received £10,670 in funding from the British High Commission in Trinidad and Tobago to undertake a regional study entitled 'Mangrove soil carbon sequestration assessment, a blue carbon project: assessing the physical and environmental impacts on carbon sequestration efficiency'. This project is a collaborative project with Belize, Suriname, Guyana and Trinidad and Tobago and will assess the amount of mangrove soil carbon under a range of conditions thereby assisting the inclusion of the valuation of mangrove blue carbon ecosystem services into national assessments for REDD+, Nationally Determined Contributions (NDCs) under the Paris Agreement, and Sustainable Development Goals (SDG) reporting in participating countries.
- IMA is the national focal point for the ACS project 'Impact of Climate Change on the Sandy Shorelines of the Caribbean-Alternatives for its Control and Resilience". This project is supported by the Korea International Corporative Agency (KOICA). As a component of this project, three (3) sites; one in 3 Caribbean islands were selected for technical assistance under the Executive Beach Rehabilitation Sub-component. Bonasse Bay, Cedros was selected as one of the sites and the ACS will provide approximately US $200,000 to fund the oceanographic study required to inform possible rehabilitation measures for this beach. In addition, IMA will also receive approximately US $50,000 work of geological monitoring equipment.
- In 2020, IMA signed a lease agreement with the THA for land at Pigeon Point to construct a Marine Field Station and Interpretive Centre. In June 2020, a geotechnical survey was conducted at the site and in April 2021, NIPDEC was selected to manage the design, construction and outfitting of the field station. Works has been delayed due to the COVID 19 restrictions. A marine field station at this site along with an interpretive center and a living classroom will promote the Heritage Park, not only as a recreational site, but as a site that promotes marine conservation and education in Tobago. It will be a state of the art research facility that can be used by both local and foreign scientists to conduct innovative marine research.
- In collaboration with the Inter American Development Bank-Compete Caribbean), the IMA launched a Blue Economy Innovation Challenge on February 25, 2021 to provide support to selected Caribbean start-ups and innovative firms to create new products and services, improve their processes and scale their commercial models rooted in cutting-edge technologies that contribute to the sustainable management of oceans and coastal resources.
- The Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization (IOC UNESCO) in collaboration with the Institute of Marine Affairs (IMA) has throughout the months of October and November 2020, undertaken activities on Marine Spatial Planning (MSP) and developing a sustainable Blue Economy in Trinidad and Tobago. The activities included meetings with central and local government representatives, academic experts and members of Community Based Organisations (CBOs). A video and report on a sustainable Blue economy for Trinidad and Tobago were produced.

Notwithstanding the challenges brought on by COVID-19, the Information Centre (IC), under the guidance of its Chief Information Officer, Ms. Carter-Fisher, conceptualised and implemented an initiative that advanced the strategic objectives of the IMA. The IC convened its second Virtual Distinguished Lecture and Panel Discussion on June 8, 2021, in observance of World Oceans Day. Sponsored by the Republic Bank Limited under its Power to Make a Difference (PMAD) Programme, Professor Judith Gobin, Professor of Marine Biology and Head of the Department of Life Sciences at The University of the West Indies, St. Augustine Campus, delivered the distinguished lecture entitled, "***Below the Blue: Exploring the Deep and Harnessing its Benefits"***. The virtual event, which was livestreamed and broadcast live on radio I95.5FM, allowed online participants to engage with leading experts and facilitated discussions on how Trinidad and Tobago and the region can explore the deep sea, conduct research to determine the resources that are attainable 200 metres under the surface and how these can be monetized to generate revenue and support livelihoods.

The performance and output for the period under review supports the Institute's Strategic Plan 2019-2024 and is consistent with Theme Five of the National Development Strategy 2030, which places the conservation of the environment at the heart of Trinidad and Tobago's sustainable development. I would like to thank the management and staff for their unwavering commitment to deliver quality services in these uncertain and unprecedented times. It is this commitment and dedication to delivering on marine environmental matters that has become our hallmark, a strength from which we continue to grow.

Rahanna Juman

Dr. Rahanna Juman
Director. (Ag.)
Institute of Marine Affairs
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ABBREVIATIONS AND ACRONYMS

APIC ---------- Association for the Promotion of International Cooperation
β-gal ---------- Beta-galactosidase
BID ---------- Biodiversity Information Development
BBNJ ---------- Biodiversity in Areas Beyond National Jurisdiction
BWM ---------- Ballast Water Management
CARICOMP ---------- Caribbean Coastal Marine Productivity
CARIRI ---------- Caribbean Industrial Research Institute
CCPF ---------- Compete Caribbean Partnership Facility
CEHI ---------- Caribbean Environmental Health Institute
CLME+EBM ---------- Caribbean Marine Large Ecosystem + Ecosystem Based Management
CMA ---------- Caribbean Marine Atlas
CREWS ---------- Coral Reef Early Warning System
DBH ---------- Diameter at Branch Height
EAP ---------- Employee Assistance Programme
EQP ---------- Environmental Quality Programme
EQPL ---------- Environmental Quality Programme Laboratory
ESA ---------- European Space Agency
F&ARP ---------- Fisheries and Aquaculture Research Programme
FOI ---------- Freedom of Information
GBIF ---------- Global Biodiversity Information Facility
GEF ---------- Global Environment Facility
GEF-SGP ---------- Global Environment Facility - Small Grants Programme
GIS ---------- Geographic Information Systems
HRPLUS ---------- Human Resource Information System
IAEA ---------- International Atomic Energy Agency
IAS ---------- Invasive Alien Species
ICC ---------- International Coastal Cleanup
ICRI ---------- International Coral Reef Initiative
ICT ---------- Information Communication Technologies
ICZM ---------- Integrated Coastal Zone Management
IDB ---------- Inter-American Development Bank
IFPAMTT ---------- Improving Forests and Protected Area Management in Trinidad and Tobago
IFREMER ---------- Institut français de recherche pour l'exploitation de la mer (French Research Institute for Exploitation of the Sea)
IMA ---------- Institute of Marine Affairs
KOICA ---------- Korean International Cooperation Agency
LB-IMTA ---------- Land-Based Integrated Multi-trophic Aquaculture
LBS ---------- Land-Based Sources
LiDAR ---------- Light Detection and Ranging
MBH ---------- Marine Biodiversity Hub
MSP ---------- Marine Spatial Plan
NALIS ---------- National Library and Information System Authority
NASA ---------- National Aeronautics and Space Administration
NBSLME ---------- North Brazil Shelf Large Marine Ecosystem
NCCP ---------- National Coastal Conservation Programme
NETMPA ---------- Northeast Tobago Marine Protected Area
NOAA ---------- National Oceanic and Atmospheric Administration
NOSCP ---------- National Oil Spill Contingency Plan
NSDI ---------- National Spatial Data Infrastructure
OCP ---------- Oceanography and Coastal Processes Programme
ONPG ---------- ortho-Nitrophenyl-β-galactoside
PAHs ---------- Polycyclic Aromatic Hydrocarbons
PBBS ---------- Port Biological Baseline Survey
PLNL ---------- Point Lisas Nitrogen Limited

PSIP ---------- Public Sector Investment Programme
RAC ---------- Regional Activity Centre
RAS ---------- Recirculating Aquaculture System
SAB ---------- Satellite Analysis Branch
SEA ---------- Secondary Entrance Assessment
SLMCs---------- School Library Media Centres
SMAP ---------- Soil Moisture Active Passive Mission
SMOS ---------- Soil Moisture and Ocean Salinity
STACIE---------- St. Augustine Centre for Innovation and Entrepreneurship
TLS ---------- Terrestrial Laser Scanner
UNEP ---------- United Nations Environment Programme
UTT ---------- The University of Trinidad and Tobago
UWI---------- The University of the West Indies
VIRGIS ---------- Virtual Reality Geographical Information System

PART 1

STRATEGIC DIRECTION

and

PHILOSOPHY

1.0 Vision, Mission, Philosophy and Strategic Objectives

VISION STATEMENT

To be the Centre of Expertise for Marine Scientific Research in the Caribbean Region.

MISSION STATEMENT

To conduct and foster research in coastal and marine policy, marine sciences and related matters and to provide advice in support of the sustainable development and management of the coastal and marine living and non-living resources of the Caribbean region.

BACKGROUND

The Institute of Marine Affairs (IMA) was established under Chapter 37:01 (as amended 1996) of the Laws of the Republic of Trinidad and Tobago with the primary objective of conducting and fostering research and providing advice to support the sustainable management of the coastal and marine areas and resources of Trinidad and Tobago. The IMA is the oldest multidisciplinary coastal, marine and environmental research organisation of its kind in the Caribbean Community (CARICOM) thereby offering its services to the English-speaking territories of the Caribbean.

The Institute is one of two Regional Activity Centres (RACs) established by the United Nations Environment Programme - Caribbean Environment Programme (UNEP/CEP) for the Protocol on the Prevention, Reduction and Control of Marine Pollution from Land-Based Sources and Activities (LBS Protocol, 1999).

Mandated to collect, analyse and disseminate data and information relating to the economic, technological, environmental, social and legal developments in marine affairs generally, the IMA formulates and implements specific research programmes/projects to achieve its overall objectives.

1.A The specific objectives of the IMA as detailed in the IMA Act are to:

1. develop and implement programmes and projects that translate the marine and related policies of Government of the Republic of Trinidad and Tobago into activities that contribute to national development;
2. develop and execute programmes and projects that foster and encourage regional and international collaboration in the exploitation of the marine and other related areas of the environment;
3. promote a public understanding of and an appreciation for all aspects of the marine and related environment;
4. stimulate and advance the conduct of marine scientific research in Trinidad and Tobago;
5. promote the utilisation and conservation of marine resources for the economic and social benefit of Trinidad and Tobago and to enhance the national capabilities; and,
6. do such things incidental or conducive to the attainment of the above objects.

1.B. Functions of the IMA include the:

1. Conduct of research and development on the marine and related resources of Trinidad and Tobago, the Caribbean and adjacent regions;

2. Conduct of research and development on the marine environment and other areas that impact upon the environment of Trinidad and Tobago, and adjacent regions;

3. Study of multiple uses of the sea and coastal zones, resources and use potential in Trinidad and Tobago, and adjacent regions and the evaluation and promotion of such studies to minimise conflicts which may result from such uses;

4. Collection and dissemination of information on economic, social, technological, environmental and legal developments in marine and coastal zones of the Caribbean and adjacent regions;

5. Provision of information and advice to the government in its formulation of policies relating to the marine and other related aspects of the environment;

6. Response to technical enquiries and questions by policy-making organs of the government, private sector organisations and individuals;

7. Arrangement of training courses and projects that foster and encourage regional and international collaboration in exploitation of the marine and related environment; and,

8. Provision of advice on the development and optimum utilisation of the marine and coastal resource potential of Trinidad and Tobago; and to act necessary or expedient for proper performance of its functions.

1.C Strategic Direction and Philosophy

A strategic plan for the organisation was developed for the period 2019-2024 and approved by the Ministry and Planning and Development and the Government of Trinidad and Tobago. It is predicated on a vision that places the IMA alongside the best in marine science and research globally. The survival of the organisation domestically and regionally requires that the IMA brings to bear cutting edge technology, advice, and solutions on challenges faced by the Region. Therefore, the IMA must raise it competencies and capacity so that it can be positively benchmarked against the best in the world.

The IMA 2019-2024 Strategic Plan has been developed with two main parameters in foci: the Government of Trinidad and Tobago's (GORTT's) Vision 2030 and the maximisation of the research capacity of the organisation for the benefit of the country. It is hoped that the work of the Institute will be brought to bear on marine environmental and socioeconomic issues impacting the twin island Republic, now and in the future.

In the next five years, the IMA will seek to leverage advances in Information Communication Technologies (ICT) to bring about innovations in the way it collects and analyses data and enlist public participation, where possible, in data capture and marine conservation in a bid to improve the timeliness and reach of our work. ICT revolutionising the way research is conducted enabling forecasting and trend analysis and the development of appropriate modelling capabilities that will contribute to the honing of the policy advice and prescriptions the IMA can provide. It is envisioned also, that greater citizen and stakeholder participation will lead to improvements in citizens' knowledge of our marine environment and more so their willingness to act to preserve and conserve our biodiversity and marine areas.

As the Regional Activity Centre (RAC) for the United Nations Environmental Programme (UNEP), ICT also offers the IMA additional benefits. Arising from our access to regional data, ICT will enable the development of big data sets for the Region. These "big data" sets once analysed, can lead to

the discovery of hidden patterns in samples, profiles, human activity and their overall impact on our marine world. Our aim; better policy advice for the Region and more specifically, Trinidad and Tobago.

The IMA is sensitive also to the economic opportunities that our coastal and marine environments offer not only for coastal communities, but also the nation. Research activity will therefore seek to support the development of marine based business both at a micro and macro level and bring about the development of a Blue Economy for Trinidad and Tobago; that is, socioeconomic development that is not only sustainable but in harmony with our marine environment. Research must therefore benefit the people for whom the research is undertaken!

1.D Strategic Intent and Solution

To leverage marine science to foster environmentally sustainable national development with a specific focus on coastal communities.

The IMA utilised the Value Chain Analysis of the organisation and the Balance Scorecard approach to review where value can be created, existing assets optimised and how the organisation can prepare itself to take advantage of emerging opportunities. The organisation must mitigate the threat of budgetary constraints by improving its ability to source grant funding and improving its visibility and perceived worth to the Government and national and global communities. It must reduce its cost structure, utilise a value for money approach and optimise available resources to create value. The IMA must seize opportunities that present themselves in terms of environmental trends and the employment of ICT technologies to create engaged communities and better, faster real time data collection, youth unemployment and urbanisation to demonstrate not only its value but its ability to seize the future today. The organisation's outlook must be continuously futuristic, analysing the environment for opportunities, synergies and possible partnerships that will bring process efficiencies and a reduced cost structure in the work of the organisation.

The strategic priorities for the next five-year period are based on improving long term stakeholder value, improving efficiencies. As a Statutory Body, whose principal stakeholder is the Government of the Republic of Trinidad and Tobago (GORTT) and secondary partner is the United Nations Environmental Programme (UNEP), the Institute's strategic (stakeholder focused) and financial objectives lie in the following goals and objectives.

The strategy for the 2019-2024 period is therefore built upon four strategic planks or priorities for the period 2019-2024.

1. **IMPROVED LONG TERM STAKEHOLDER VALUE THOUGH VISION 2030 ALIGNMENT AND THE FOSTERING OF INTERDISCIPLINARY RESEARCH WITH LINKAGES TO INDUSTRY**
   The IMA will provide the science that enables sound government policy decisions for the management of Trinidad and Tobago's marine and coastal environment and biodiversity. The work of the Institute will support the government's Vision 2030 strategic plan in two areas:
   - The thrust towards placing the environment at the centre of social and economic development; and
   - The thrust towards creating globally competitive businesses.

   The Institute will support the first by providing policy advice and recommendations based on sound science to support: climate change vulnerability assessment leading to improved climate change resilience; improvements in the quality of marine and coastal ecosystems and their sustainable use; strengthened environmental governance and management systems; and a more environmentally aware citizenry.

   The IMA will also increase the relevance of its science and advice to its stakeholders by pursing and promoting an interdisciplinary approach to research so as to arrive

at a comprehensive picture of the country's marine and coastal environment in support robust decision making. As the economic benefits of the marine environment become ever more apparent, an interdisciplinary approach to its study leading to the sustainable management of the sea's resources for the livelihood of all (the blue economy) becomes critical. The IMA will therefore foster a supportive environment for interdisciplinary research and we will actively seek out opportunities to partner with local and international organisations so that Trinidad and Tobago is equipped to address its environmental challenges. As regards the second Vision 2030 goal of the building of globally competitive business, the IMA will support this by creating linkages between our science and industry in a bid to support business development and ultimately sustainable livelihoods.

1. **GROWTH AND DIVERSITY OF RESEARCH FUNDING THROUGH GRANT FUNDING AND CORPORATE SPONSORSHIP**
   Funding of the marine research from the consolidated fund is expected to decrease owing to declining economic fortunes as Trinidad and Tobago undergoes economic adjustments arising from the structural changes in the global petroleum industry. The Institute will therefore seek grant and corporate sponsor funding in order to assist in supporting and expanding its research initiatives for the benefit of the country and the region.

2. **OPERATIONAL COST REDUCTION AND OPTIMISATION OF RESOURCES TO ACHIEVE VALUE**
   Managing cost, with a value for money operational approach to operations is another of the strategies that the IMA will employ to optimise the resources available to the organisation so that the people of Trinidad and Tobago achieve the greatest value for its investment in the organisation. Using 2017-2018 as a base, an analysis of the Institute's cost structure and break-even point was conducted. Based on a structure of 46% and 54% - direct and indirect cost respectively, in order to breakeven, it was revealed that following strategies, either singly or in combination, must be adopted in order for the Institute to remain financially viable.

   - Increase subventions by 20%.
   - Increase project revenue by 34.8%.
   - Reduce Direct Costs by 35%
   - Reduce Indirect Costs by 31%

1. **STRENGTHENING OF EXTERNAL ENGAGEMENT**
   The IMA will increase the visibility of the organisation and demonstrate the relevance of the organisation to sustainable development of the country. The building of the Tobago Field Station will not only advance the research in this locale but add to the national visibility and relevance of the Institute as it aligns with the island's nature tourism (ecotourism) thrust.

1.E Strategic Plan 2019-2024 – Objectives

a. To make strategic contributions to sustainable socio-economic development of Trinidad and Tobago and the region by leveraging marine science, coastal and biodiversity conservation for decision and policy making.

b. To build long term value for the Government of the Republic Trinidad and Tobago (GORTT) by 100% through the alignment of the IMA's output to the stakeholder's strategic goals and objectives and by responding to at least 85% of stakeholders' requests within a 24 to 48 hours.

c. To build long term value for the United Nations Environmental Programme (UNEP) as the Regional Activity Centre (RAC) for the Caribbean Environmental Programme of UNEP by

delivering at least 60% of the Institute's obligations to the RAC on a phased basis over a two-year period.

d. To create and build the stakeholder knowledge of the Institute as competent, reliable and efficient by employing at least an 85% zero rework target and quality standards for all documents for review by the principal and other stakeholders.

e. To contribute to the future and long-term planning and sustainability objectives of the GORTT by projecting the future needs of the country and the region by developing research projects that provide the information, management tools and advisory strategies for projected scenarios.

f. To be known as the Centre of Excellence for marine research in peer-reviewed publications in the region by at least a 50% increase and by the re-introduction of the IMA's e-journal in local and international strategic partnerships over three to five years period.

g. To expand the national awareness on marine and coastal environmental issues by 15% in two years and 35% at the end of the five-year period.

h. To build an enabling environment to foster the culture needed to support the strategic plan by employing transformational leadership approaches, building organisational trust, transparent management, and by cultivating a performance driven culture supported by a futuristic and global mindset.

i. To expand the research capability of the organisation by accessing grant funding so that it represents at least 60% of its research budget (10% in the first two years, 20% by the third year and 40% by the end of the five-year strategic period). Operational cost reduction by 15% through a value for money approach and optimising available resources to achieve value.

These goals and objectives are supported by objectives, targets, initiatives and indicators for the four perspectives of the Balance Scorecard: Financial, Internal, Customer/Stakeholder, and Learning & Growth at the broad organisational level which must in turn be worked through the work plan of the various Department.

PART 2

ORGANISATIONAL STRUCTURE

2.A Organisational Profile

A new organisational structure was proposed for the IMA to achieve its strategic objectives for the period 2019 to 2024. This structure is based on the following principles:

1. Division of the organisation into the two core functional areas, namely – Research and Administrative Support Services - where each Division is to be headed by a Deputy Director.

2. Creation of opportunities for vertical and horizontal growth of employees through the development of multidisciplinary skills and experience with a strong emphasis on capacity building and succession planning.

3. Creation for opportunities for promotion within each bargaining unit (I, II, III) based on academic achievement, experience and qualifications (in the case of the research core group) and on qualifications and experience (in the case of the administrative support group).

4. Alignment of jobs in each group with each other based on comparators of job descriptions and job specifications.

5. Filling of all Core Research Vacancies in the following six research programmes:
    - Biodiversity and Ecology
    - Environmental Quality
    - Fisheries and Aquaculture
    - Oceanography and Coastal Processes
    - Marine Governance
    - Geomatics and Geographical Information Systems

This new structure needs to be approved by the Cabinet of Trinidad and Tobago.

2.B Corporate Structure

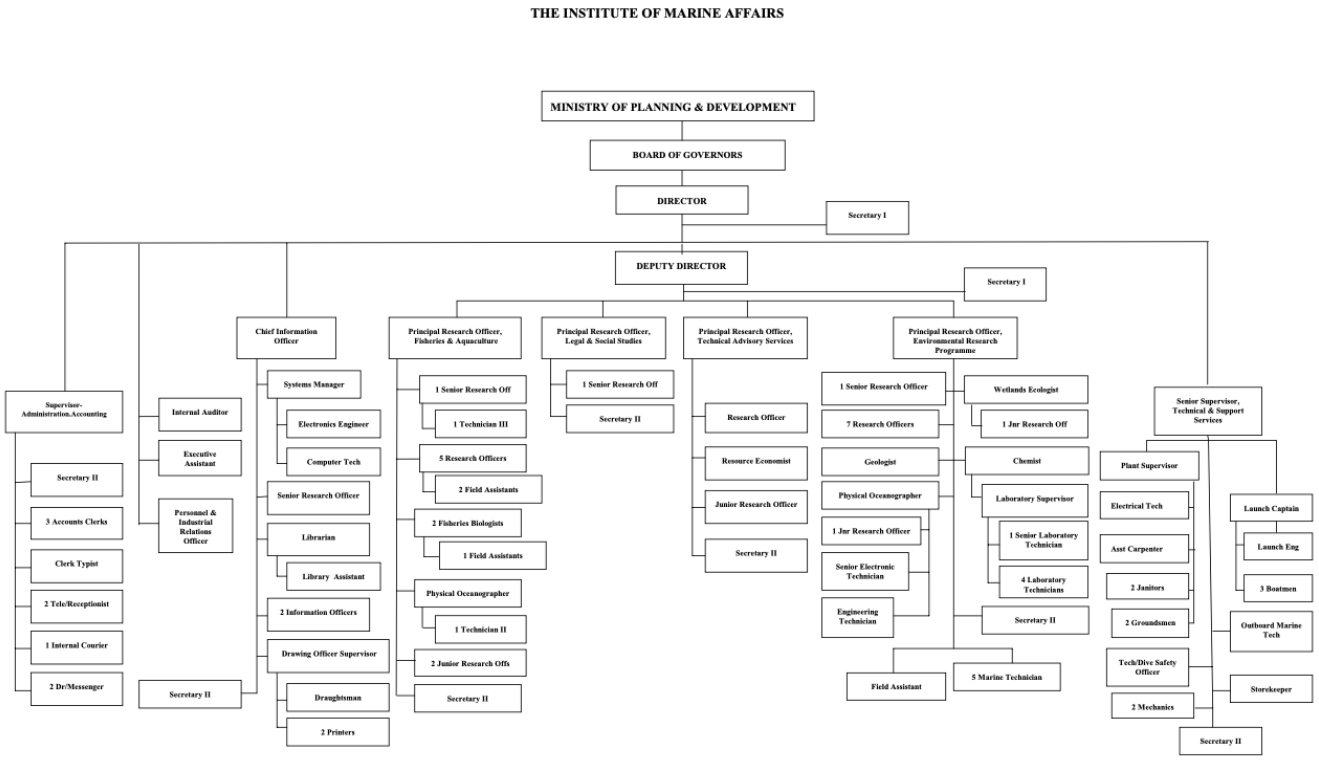

Figure 1: Layout of the organisational structure

The Proposed New Corporate Structure

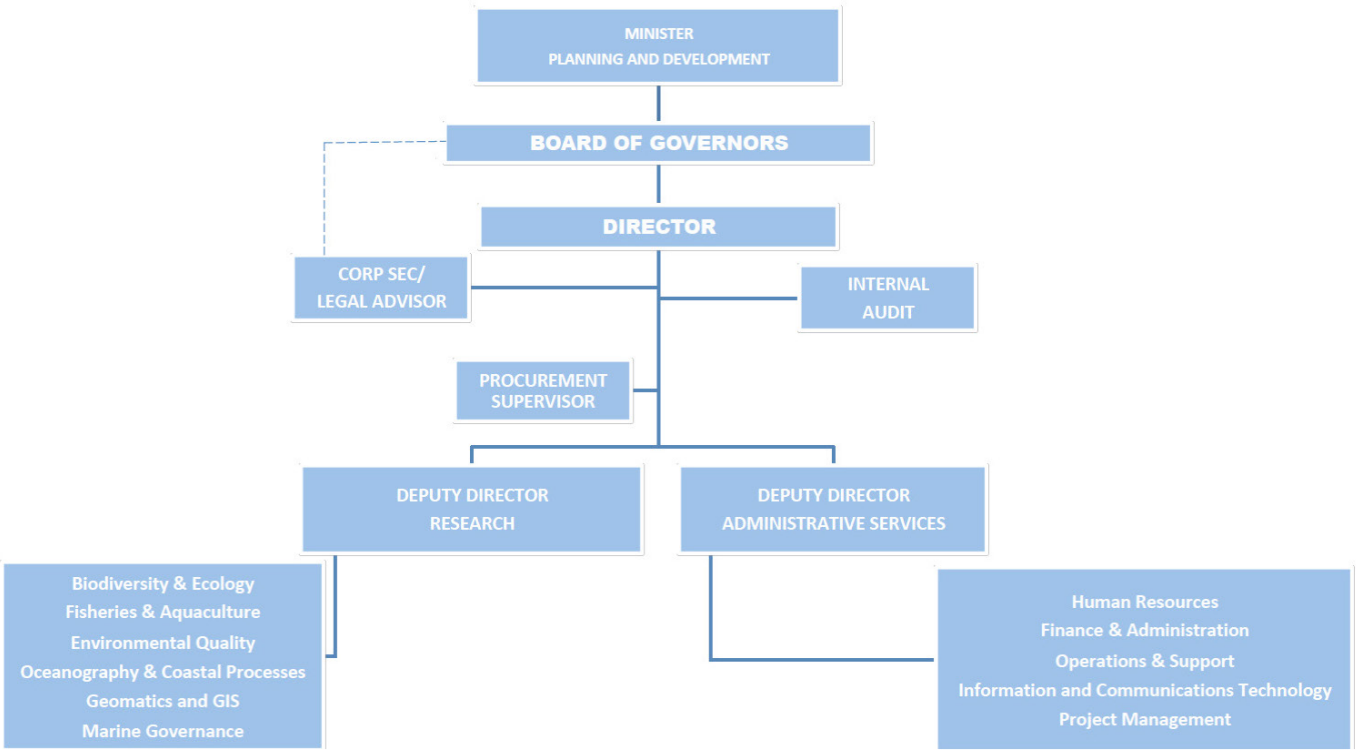

Figure: 2 – Diagram of proposed organizational structure

2.C Services Provided by the IMA

As the premier marine research organisation in the region, the IMA plays a pivotal role in conducting quality scientific and applied research, inclusive of long-term monitoring, of the marine and coastal environments and resources. The provision of data and research analyses aid regional governments in formulating policy and assist the business sector, industry and the wider community in making informed decisions. Services provided by the IMA include the following;

- Provision of data and information to assist government in policy formulation.
- Provision of current data on marine and coastal environments.
- Public education and awareness and provision of a library service.
- Long-term monitoring and conservation of biodiversity and marine ecosystems.

Special Projects - The IMA has identified several special projects proposed to advance the scientific component in providing advice for the sustainable management and use of its marine and coastal environments and resources. Special projects span both islands – Trinidad and Tobago – and address a myriad of issues with each special project covering the protection and conservation of marine environment and resource, public education and awareness and capacity building. These special projects include the following:

1. **The Tobago Marine Field Station Special Project** – The Tobago House of Assembly (THA) has granted land to the IMA to construct a Marine Field Station and Interpretive Centre at the Pigeon Point Heritage Park to the western landward limit of the Buccoo Reef Marine Park. The marine field station will carry out scientific research, conduct marine conservation through its long-term monitoring activities (coral reefs, mangrove forests, seagrass beds), and inter alia, provide public education and awareness programs that will redound to a more informed public, appreciative of the benefits of the island's wetlands and marine ecosystems.

2. **The Mariculture Facility Special Project** – The goal is to conduct applied research investigating the use of various forms of mariculture production systems and species inclusive of determining marine areas suitable for the mariculture activities to occur. Towards the latter half of 2019, a 3,800 square foot mariculture laboratory facility constructed at the IMA to begin experimental work. Once operationalised, the IMA will commence trials into commercially important marine finfish species, such as Grouper (Epinephelus spp) and Snapper (Lutjanus spp), shelled fish species and macro-algae. The results of the trials will be used to determine which areas in Trinidad and Tobago's waters are most suited for mariculture activities. Later stages of the project would see the deployment of experimental ocean-based mariculture installations, such as floating cages and rafts for the culture of finfish, shellfish and algae. With this project, the overarching goals is to attract stakeholders and investors to illustrate the potential of mariculture in Trinidad and Tobago while developing commercial scale systems.

3. **Caribbean Large Marine Ecosystem+ Ecosystem Based Management (CLME+EBM) Project** – Aimed at reducing pollution from agricultural run-off into the southern section of the mangrove forests in the Caroni Swamp, the CLME+EBM is an environmental management approach that considers the full range of interactions within an ecosystem, with a focus on human interactions, rather than consideration of ecosystem services in isolation. The IMA conducted research on the Caroni Swamp and findings revealed increased levels of nitrogen loads attributed to agricultural runoff with concentrations of heavy metals (zinc and copper) exceeding permissible levels in the blue land crab. A core characteristic of EBM is stakeholder engagement, where farmers, one of the main stakeholders, were engaged via meetings throughout the project's life cycle. The IMA continued to engage stakeholders with face-to-face and virtual meetings in September 28th and October 22nd, 2020 in response to the national COVID-19 pandemic restrictions. The IMA, in keeping with its commitment to facilitate an inclusive, participatory stakeholder

engagement, aims to re-engage these stakeholders post-project using alternative and appropriate media.

1. **Laboratory Accreditation ISO/IOE 17025 – the Environmental Quality Programme Laboratory (EQPL) is working to attain ISO/IEC 17025 standard accreditation.** The International Organization for Standardization/International Electrotechnical Commission (ISO/IEC) is the primary international standard for laboratories to carry out testing, calibration and sampling. The standard entails standardised laboratory operations together with competent and trained personnel. IMA was selected for laboratory accreditation (ISO/IEC17025:2017) support under the Government's Accreditation Programme for Public Laboratories. In December 2019, IMA signed a one-year contract with Trinidad and Tobago Bureau of Standard (TTBS), however due to delays caused by the COVID 19 pandemic, the contract was extended for another year. In April 2021, IMA submitted an application to TTLABS, the accrediting institute, to be accredited for the scope - nitrate and nitrite.

2.D Delegated Levels of Authority

According to Act No. 13 of 1990, The Institute of Marine Affairs (IMA) can delegate any of their powers along with the required level of authority to fulfill managerial responsibilities other than those articulated and conferred in Act No. 13 of 1990, the Institute of Marine Affairs Act. Mainly a decision-making authority, the Delegated Levels of Authority promote horizontal efficiency and accountability in the structure and operations of the Institute. The following represent the Delegated Levels of Authority;

Board of Governors

- Determination of Establishment (Minister's approval)
- Changes in Terms and Conditions of Employment (Minister's approval)
- Recruitment of Director, Deputy Director, Managers and Senior Professional (Minister's approval)
- Acting – level of Director, Deputy Director
- Confirmation of Employment - Managers and Senior Professional
- Promotion – Managerial, Senior Professional
- Discipline/Dismissal – Director, Deputy Director, Managers and Senior Professional
- No pay Leave over 12 months
- Study Leave over 12 months.
- Performance Appraisal – Director, Deputy Director, Managerial and Senior Professional

Director

- Recruitment of Professional, Technical and Support Staff
- Acting – Senior Professional, Managerial, Professional, Technical and Support Staff
- Confirmation of Employment – Professional, Technical and Support Staff
- Discipline/Dismissal – Professional, Technical and Support Staff
- Annual/Sick Leave – Deputy Director, Managers, Senior Profession and Professional Extended sick leave
- No Pay Leave up to 12 months
- Study Leave up to 12 months
- Training courses – local and overseas
- Performance Appraisal – Professional, Technical and Support Staff
- Temporary Employment

Heads of Departments

- Casual Leave – Professional, Technical and Support Staff

Human Resources and Industrial Relations Officer

- Annual Leave – Technical and Support Staff
- Sick Leave - Technical and Support Staff
- Overtime/Compensatory Time-off

2.E Legislative and Regulatory Framework

The IMA was established under Chapter 37:01 (as amended) of the Laws of the Republic of Trinidad and Tobago with the primary objective of conducting and fostering research and providing advice to support the sustainable management and use of the coastal and marine areas and resources of Trinidad and Tobago.

2.F Reporting Functions:

- Department Reports to the IMA Directorate
- Directorate to the IMA Board of Governors
- Sub-Committees of the Board to the IMA Board to the Board of Governors;
- Finance and Administrative Department of the IMA to the Ministry of Finance regarding PSIP and Recurrent Expenditure.
- Board of Governors to line Ministry (via Minutes of meetings)
- Directorate to special committees of the Parliament via the line Ministry (as requested)

2.F. Departmental Reports
Research Activities undertaken by the Research Programmes in Fiscal 2020/2021

1. BIODIVERSITY AND ECOLOGY RESEARCH PROGRAMME

Survey of Benthic Macrofauna, Bon Accord Lagoon, Tobago
Principal Researcher: *Attish Kanhai*

Seagrass beds are ecologically important marine resources as they provide several services essential to a productive marine environment. Seagrasses are known to create more habitats spaces for macrobenthic invertebrates as well as increase the available resources. The seagrass community of Bon Accord Lagoon covers an area of approximately 102 hectares (ha.) and extends in some places to a depth of approximately 6 metres (m.) Turtle grass, ***T. testudinum***, is the dominant seagrass species in the lagoon. Benthic macrofauna were collected during two sampling periods, dry and wet seasons of 2018 (March and September, respectively) using a hand-held PVC corer. Further sampling was conducted in July of 2020. To date, a total of 4,822 organisms belonging to 211 different species were recorded across both sampling periods. Seasonal variations, attributable to nutrient inflow within the Lagoon, were found among the macrobenthic populations at some stations sampled within the Bon Accord Lagoon. One publication entitled, ***Spatial and seasonal variation in polychaete communities according to their trophic categories in Southwest Tobago, West Indies***, has been accepted by the Journal, Neotropical Biodiversity. A second publication entitled, ***Structural and functional diversity of benthic amphipods in Thalassia dominated seagrass beds in the Southern Caribbean Sea***, has also been prepared and is in the process of being reviewed.

Assessing the Feasibility and Value of Coral Reef And Seagrass Rehabilitation In Tobago

Principal Researchers: *Dr. Anjani Ganase and Attish Kanhai*

Several disturbance events have affected Tobago's marine ecosystems resulting in significant mortality / dieback of critical coral reef and seagrass beds. Coral reef monitoring has shown up to 50% coral loss from the 2010 bleaching with minimal recovery to date. Seagrass beds in southwest Tobago have been impacted by land-based pollution, coastal development such as land reclamation, and acute disturbance events, such as sargassum influx. Considering the projected extreme events from climate change, there is an urgent need to boost the resilience of our seagrass and coral reef habitats and reduce the vulnerability of dependent communities. This study is the first stage in the IMA's plan to build its capacity in marine ecosystem rehabilitation in a rapidly changing climate. The IMA plans to assess a subset marine habitat across Tobago for the potential of active restoration along with nature-based strategies for management that are economically feasible, sustainable, community oriented, and even valued for its Blue Carbon contribution and climate mitigations. A proposal for this project was submitted initially to ICRI, but not accepted. This was subsequently resubmitted to British Petroleum Trinidad and accepted for funding.

Seagrass Monitoring

Principal Researchers: *Dr. Rahanna Juman and Attish Kanhai*

Fieldwork for the 2021 seagrass monitoring time point was conducted in Chaguaramas in April 2021 and in Tobago, September 2021. Only one season sampling was conducted during this period due to COVID-19 restrictions (national lockdown and seaside access limitations). A manuscript entitled, "***Seagrass loss decreases abundance, diversity and composition of macrobenthic infauna in a Caribbean Ba***y", was researched, prepared, and submitted for external review. Internal corrections are being prepared for submission to a journal.

Coral Reef Baseline Assessment (CRBA)

Principal Researchers: *Dr. Anjani Ganase, Ben Maharaj*

Following the collection of the field data in July 2019, coral reef benthic images were annotated and analysed for the technical benthic report, which was sent out for external review in May 2020. The final version of this report was finalised and approved in January 2021. Other activities of the CRBA project included structural complexity data modelling and analysis, which was completed in June 2020. This data along with the fish and benthic coral data are currently being analysed for spatial patterns in fish communities related to benthic compositions and environmental conditions (wave action, and disturbance history and reef structural complexity). The development of the hydrodynamic model using the existing IMA dataset to supply higher resolution environmental information for the community analysis was delayed until the hiring of the new oceanographer.

The socio-economic study for the coral reef sites was kicked off with the hiring of Ms. Hannah Lochan as an On-The-Job-Trainee (OJT) at the end of September 2020. A desktop data compilation of socio-economic data was conducted to determine (1) if clear geographic patterns of human activities exist and whether this was reflected in the health of the coral reef, and (2) characterise the level of dependency of communities to the coral reefs, and therefore the level of vulnerability to the degradation of coral reefs. The COVID 19 Pandemic has hampered the ability of the IMA to engage in stakeholder engagement activities. The Reef Report Card to showcase the health of the reefs at each monitoring site was carded for March 2021 as an output of the CRBA. It is anticipated that the results of this activity will play a crucial role in Tobago's pandemic recovery process.

Marine Reference Collection (MRC)
Principal Researcher: *Alana Jute*

The IMA has been conducting research on marine and coastal related environments and resources for Trinidad and Tobago over 40 years and during this time, the Institute has housed an extensive and historically important Reference Collection, , which is the largest collection of marine biodiversity for Trinidad and Tobago. The collection includes several fish species, molluscs, crustaceans, and corals.

In 2021, Data Officer, Mr. Paul Nelson, created an internal database based on the excel spreadsheet that was being used in digitizing the MRC. The IMA was able to access funding from the BID-GBIF Fund in 2021, which will focus

2. ENVIRONMENTAL QUALITY PROGRAMME

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The Environmental Quality Programme (EQP) conducts research to determine water, sediment and biota quality in the coastal and marine environments for the interpretation of pollutant effects on natural systems by identifying possible sources, and impacts such as bioaccumulation and eutrophication. This includes monitoring of pollutants such as nutrients, heavy metals, bacteria, and hydrocarbons. The data and information would aid in understanding the physical and chemical processes in the coastal and marine environment and assessing the various impacts on the coastal and marine environment from anthropogenic and natural influences. This data will identify changes or adverse impacts on the marine and coastal areas, from which information derived can guide/ inform policy making in a timely and efficient manner for the improvement in the quality of life of citizens and preservation of our natural environments.

Long-Term Environmental Monitoring of Selected 'Hot Spots'
Principal Researcher: *Dr. Darryl Banjoo*

At a Wider Caribbean Regional Workshop entitled, 'Assessment of Land Based Sources of Pollution and Methodologies in Land Based Sources', which was held in Venezuela in 2005, representatives identified the need to establish an environmental monitoring project. Such a project would identify changes or adverse impacts on the marine and coastal areas from which information derived would guide timely policy formulation. Results of the monitoring programme in Trinidad revealed areas of elevated pollution levels or hotspots. In 2020/2021, monitoring of marine areas continued in the Gulf of Paria in the wet and dry season at locations off Claxton Bay, Pt. Lisas, Caroni, Port of Spain, Maraval and Diego Martin. Land-Based sources of pollution were also assessed at coastal locations at Caroni River, Guayamare River, Blue River (Caroni Swamp), Cunupia River and Couva River.

Water quality data was provided for the Environmental Management Authority's (EMA's) annual State of the Environment reporting requirement. This long-term monitoring programme will determine whether pollution reduction strategies are effective, identify weaknesses and recommend appropriate mitigatory mechanisms. The data will add to the international body of knowledge on impacts of pollution. It would also enhance the Institute's ability to serve its mandate as one of the Regional Activity Centers for the Land-Based Sources of Pollution (LBS) Protocol. Lessons learned from this project will be shared with countries of the wider Caribbean Region.

Facilitating Capacity-Building with Technical Assistance and Technology Transfer for Managing Mercury in the Caribbean- Regional project to establish a mercury monitoring network in the Caribbean

Principal Researcher: *Wendy Nelson*

Trinidad and Tobago agreed to participate in a regional project developed by the Department of Analytical Services (DAS), Antigua. The DAS is the Focal Point in Antigua for the Minamata Convention on Mercury, which is an international treaty designed to protect human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds. The countries intended to participate to date include Antigua and Barbuda, Barbados, St. Kitts and Nevis, Dominica, Grenada, St. Lucia, Belize, Guyana, St. Vincent and the Grenadines and Trinidad and Tobago. The US Biodiversity Research Institute (BRI) mercury laboratory will be providing technical expertise for the project. The project aims to build technical capacity in the Caribbean through training and technology transfer in order to address existing data gaps in the global assessment of mercury and its impact on human and environmental health.

Bacterial Community Analysis of Three Coastal Ecosystems (Coral reef, Mangrove swamp, and Seagrass bed) in Bon Accord, Tobago

Principal Researcher: *Sheldon Ramoutar*

The bacterial community plays an important role in the biogeochemical dynamics of marine ecosystems, yet it is understudied. Microorganisms which are unique to each ecosystem underpin most of the geochemical cycles that were once previously thought to be driven by inorganic processes. The microorganisms' function by forming symbiotic relationships with eukaryotes, communicating with other microorganisms, acquiring nutrients and producing energy. Coastal ecosystems are currently under threat from pollution, diseases and climate change, thus the need for intervention is vital. This project is geared towards studying the microbial communities under diverse conditions to identify the beneficial organisms needed for healthy growth and to withstand environment impacts. This project would be the foundation for further work which would involve growing the beneficial microorganisms and adding to ecosystems under threat.

Bacteriological Water Quality at Popular Recreational Water-Use Sites in Trinidad and Tobago

Principal Researcher: *Sheldon Ramoutar*

Water based recreation is an important component of leisure activities and tourism in Trinidad and Tobago. Since 1981, bacteriological water quality surveys conducted by the IMA have indicated that there is sewage contamination at some of the beaches in Trinidad and Tobago. To date, however, there are still many popular beaches in Trinidad at which bathing water quality has never been assessed. Several international studies have found that there is an increased risk of contracting gastrointestinal illness, acute febrile respiratory illness and infections of the eye, ear, nose and throat from swimming in sewage contaminated water. The existence of poor water quality at any bathing beach in Trinidad and Tobago would impact negatively on public health and tourism. During 2020-2021, beach monitoring was conducted at Clifton Hill, Guapo Beach and Vessigny Beach in South Trinidad.

3. FISHERIES AND AQUACULTURE RESEARCH

Fisheries research conducted at the IMA includes research on fisheries biology as well as fisheries management. Fisheries research is conducted either as single projects or as part of interdisciplinary projects at the national and regional levels. Ongoing fisheries research included fish age and growth studies, heavy metals in fish studies, marine invasive species, and consulting nationally and regionally on polices and strategies affecting fisheries resources and resources users.

The IMA is currently engaged in several initiatives geared towards the development of the Marine Aquaculture (Mariculture) sub-sector of Trinidad and Tobago. The overall goal is to promote mariculture as a means of:

- Increasing food production nationally
- Creating new export markets for increased foreign currency generation
- Reducing fishing pressure and the use of potentially destructive fishing methods
- Creating sustainable livelihoods particularly in coastal and rural communities
- Habitat restoration and stock replenishment

Construction and Operationalising of Mariculture Laboratory

Principal Researcher: *Daniel Robinson*

In order to conduct mariculture research in a manner that is scientifically sound, environmentally sustainable and bio-secure, the IMA has identified the need to develop new research infrastructure and improve existing infrastructure. The department's mariculture research infrastructure consisted of a six (6) 20ft diameter tank marine RAS unit and a five (5) 4ft diameter tank quarantine system. While these systems have contributed greatly to mariculture research initiatives, there is a need for a dedicated multi-purpose mariculture laboratory. As such, the IMA began the process of procuring services for the construction of a 3800 sq. ft. mariculture laboratory in the 2018/2019 fiscal year. In September 2019 construction of the Mariculture Laboratory began, the facility was constructed on an existing concrete platform within the Aquaculture Facility. The laboratory contains a large open space, which will be populated with multiple marine recirculating aquaculture systems (RAS). Surrounding this open space is several modified shipping containers, which will serve as office spaces, supporting labs, control/ pump room, feed and general storage. Fiscal year 2019/2020 saw the construction of the superstructure and outfitting of several components including the electrical, paneling of laboratory spaces.

For the period 2020/2021 works continued in the mariculture laboratory. The priority was the assembling of the main marine RAS system and outfitting of laboratory spaces. The progress of the work in the mariculture facility was affected by the COVID-19 pandemic that resulted in the closure of the offices of the IMA from April 2021 to October 2021. Therefore, project milestones were unable to be met and work has continued into 2021/2022. The project has received additional funding from PSIP for the fiscal year 2021/2022. The priority will be the completion of all RAS units and outfitting of all supporting laboratory spaces. Concurrently, implementation of the mariculture work plan will commence. This will involve the collection of marine finfish broodstock and subsequent conditioning and breeding attempts.

Geo-spatial Site Suitability Study for Mariculture

Principal Researcher: *Daniel Robinson*

During the fiscal period 2020/2021, work into the identification of sites most suitable for the near-shore and offshore cage culture of finfish and shellfish in the coastal and marine environment of Trinidad and Tobago continued. This is being done with a multiple criteria geo-spatial analysis, which is looking at a variety of datasets that directly and indirectly impact suitability for such an endeavour. This information is crucial due to the variety of ecosystems along the coasts within the waters of T&T as well as current human activities which can potentially create user conflicts, namely, oil and gas, maritime and fishing activities. For the period 2020/2021, the remaining datasets were acquired and processed. Completion of the final suitability model was not accomplished in the time period due to a number of conflicting commitments by project team members. Completion of the suitability model is expected to occur in 2021/2022.

Implementation of Bio-security Plan

Principal Researcher: *Daniel Robinson*

With increased awareness of the detrimental impact of aquatic disease and pathogens, the Institute, with the assistance of The UWI School of Veterinary Medicine, is implementing its biosecurity implementation plan. During the fiscal year 2019/2020, diagnostic testing was undertaken in the aquaculture facility to determine if there is the presence of aquaculture disease and pathogens. This was done due to its presence in the past as well as physical external symptoms within the tilapia stock. Testing by the UWI Veterinary School indicated the presence of a few manageable aquatic pathogens. However, the presence of Piscine ***Mycobacterium Spp***. has emerged as a cause for concern due to its impact on the productivity of aquaculture systems and the difficulty of removal from systems. As such, it was recommended that the entire tilapia stock be phased out and fish displaying symptoms of any pathogens be euthanised and incinerated. Due to the challenges faced during the mitigation measures to deal with the COVID-19 pandemic, this activity was delayed and resumed late into 2019/2020. Implementation of the bio-security plan continued in early 2020/2021. This saw the euthanising of all stock which showed symptoms of aquatic pathogen and disease. All stock euthanised was subsequently placed into freezers and then incinerated at sugarcane feed centre. All active systems were harvested, drained and sanitized using high-pressure water, diluted hydrochloric acid, sodium hypochlorite and 70% isopropyl alcohol. To date, these systems are not active and similar sanitation exercises will be done prior to stocking of any systems. Such activities are expected to take place in 2021/2022.

As part of the biosecurity measures moving forward, several chemicals were purchased to sanitise the facility. This includes isopropyl alcohol, sodium hypochlorite and hydrochloric acid. These chemicals were used after systems were taken down and will be used prior to setting any system to ensure that systems are free of pathogens.

Age and Growth Studies of the Marine Invasive, Lionfish (Pterois spp.) from and Early Invasion in Tobago Waters

Principal Researcher: *Rosemarie Kishore*

The knowledge of age and growth is fundamental to fishery science and in adult fish populations; information of their age and rate of growth are necessary to understand the life history of the species and to assist in stock assessment of commercial fish stocks and other ecologically important fish species.

The age and growth assessment focuses on an invasive fish species to the Atlantic region. This study determined age and growth parameters using sectioned sagittate from an early invasion of the Lionfish in Tobago. It represented the first age and growth study for the southern Caribbean and offers useful information for comparison across the varying habitats within the introduced range of this invasive species. This research is completed. A draft technical report has been prepared and submitted.

4. GEOMATICS

Caribbean Marine Atlas

Principal Researchers: *Hamish Asmath, Nikia Gooding*

The Caribbean Marine Atlas (CMA) is an online digital technological platform that serves as a repository of geospatial and documental information to support decision-making in Integrated Coastal Zone Management (ICZM) and for the monitoring and evaluation of large marine ecosystems in the Caribbean. The Atlas's content is intended for planning officials, ministries, national and regional authorities, decision makers, policy makers, and stakeholders working with ICZM in the Caribbean. The design of the Atlas promotes the self-management of information by providing operational training in each country. It contains a large number of base spatial datasets, thematic and indicator datasets for Trinidad and Tobago and countries of the Caribbean. As of September 2019, the CMA contained 1100 spatial data layers and 85 documents. The CMA was fully operationalized in June 2019 and subsequently upgraded in 2020, it is currently in a maintenance phase. The IMA will continue to upload spatial data layers and documents from published and reviewed reports and projects. As well as sharing tutorials and videos to stakeholders for optimization of use for the CMA.

Spatial Mapping of Living and Non-living Coastal Resources of Trinidad and Tobago

Principal Researchers: *Hamish Asmath, Nikia Gooding*

This project involves the creation of a web-nh5based spatial data warehousing and management system at the IMA that incorporates and integrates all spatial data and metadata into a practical, searchable, catalogued database that will yield viable and practical products for both internal and external needs and users. It will improve the scope, effectiveness, efficiency, and support the development of research ideas through spatial data and products, an intranet web-based system to increase the availability, presentation and usefulness of such data and products as housed in the IMA. This system will contribute to and ensure that the IMA complies with the National Spatial Data Infrastructure (NSDI) initiative and the Caribbean Marine Atlas (CMA).

Hydrological Study of the Caroni River Basin to Determine the Transport and Fate of Land-based sources of Pollutants and to Restore Freshwater Habitats

Principal Researcher: *Hamish Asmath*

Caribbean river basins are generally of comparatively small size because of the predominance of island areas, and thus impacts are characterized by a short response time from land-use activities to coastal responses. Land-based pollution, from both point and non-point sources and activities within coastal watersheds, impacts on coastal areas and on the quality of the food harvested from these areas. In order to mitigate and control the impact of pollution on coastal and marine resources and on human health, it is essential that the type and load of pollutants be identified. This involves determination of the sources and their location, and the volume and concentration of the pollutants.

The Caroni River Basin, the hydrometric area that encompasses the Caroni Swamp, covers a total of about 883.4 km2, equivalent to 22% of the land surface area of the island and is the most populated and developed area of Trinidad. The hydrological regime in this river basin has been altered to facilitate human habitation and activities, including water harvesting for human consumption, flood mitigation and irrigation for agriculture. The Caroni and associated rivers discharge into the Caroni Swamp, the largest mangrove forest in Trinidad. The Swamp is important economically for oyster and fish harvesting, for hunting and for ecotourism. This study is modelling the hydrological regime within the Caroni Basin to determine the transport and fate of nutrient land-based pollutants. It serves to fulfil some of the responsibilities that the IMA has as the Regional Activities Centre of the Land Based Sources of Pollution Protocol.

Mangrove Forest Carbon Assessment

Principal Researcher: *Hamish Asmath, Nikia Gooding*

Mangroves play a significant role in the mitigation of climate change by sequestering carbon in aboveground (woody parts) and below ground (soil) pools. IMA in collaboration with the University of the West Indies, St Augustine Centre for Innovation and Entrepreneurship (STACIE) is conducting research to quantify the amount of carbon held in mangrove forests in Trinidad and Tobago. STACIE secured funding through the United Kingdom High Commission for the acquisition of a ground based Light Detection and Ranging (LiDAR), also known as a terrestrial laser scanner (TLS). The TLS can accurately recreate in exceptionally high detail the 3D structure of mangrove trees so that the woody portions can be quantified, which yields the amount of carbon in the tree.

Throughout the mangrove forests of Trinidad and Tobago, the IMA has established 30 plots within which the diameter at breast height (DBH) and tree height of each tree is measured. The TLS carbon measurements from individual trees is combined with the DBH and tree height data from the plots to develop a highly accurate estimate of carbon in each plot. This is then combined with the mangrove tree height for all of Trinidad and Tobago which was derived from an aerial LiDAR survey in 2014 conducted by the Government of Trinidad and Tobago. The result is a highly accurate estimate of the aboveground carbon held in mangrove forests. The total amount of carbon initially estimated to be held in mangrove forests in Trinidad and Tobago is 809,085.92 tonnes of carbon. This information can contribute towards inclusion in the Paris Agreement Nationally Intended Contributions, and REDD+.

Mangrove Soil Carbon Storage Assessment: A Blue Carbon Project

Principal Researcher: *Hamish Asmath, Nikia Gooding*

Assessing the Physical and Environmental Impacts on Carbon Storage - This is a regional project involving Belize, Guyana, Suriname and Trinidad and Tobago funded by the British High Commission to investigate the levels of mangrove soil carbon. Using satellite and airborne remote sensing techniques, robust estimates of aboveground carbon can be derived. There are no such approaches known to estimate mangrove soil carbon. This project will address this data gap by quantitatively assessing mangrove forest soil and aboveground carbon under a range of physical and environmental variables. A number of sites in each country will be selected that present contrasting variables (e.g. mangrove forest type, tree height, restoration activities, distance from water bodies, and pollution stress). Soil cores will be taken and analysed for carbon percentage, and aboveground carbon will be determined from tree mensuration. The variables will be analysed with the aboveground and soil carbon percentage to develop statistical relationships that would facilitate the robust estimation of soil carbon percentage using the other more easily measured variables.

The project will partner with the National Agricultural Research and Extension Institute (Guyana), the Anton de Kom University (Suriname), the World Wildlife Fund (Belize). These organisations are involved in mangrove work in each country and the techniques and methods used will be transferred to develop within each country, capacity for mangrove carbon assessment. The assessment of mangrove soil carbon would benefit participating countries and others in the region, by improving their ability to determine the mangrove carbon stock and facilitate applications to REDD+ for funding on the global carbon markets (ICAP, 2018). This project enables and empowers the participating countries to progress towards carbon trading through REDD+ credits (Karaosakis and Corfee-Morlot, 2007), which in turn also contributes towards the generation of innovations necessary to limit climate change.

Operationalisation of Oil Spill Detection and Monitoring for the Exclusive Economic Zone of Trinidad And Tobago

Principal Researcher: *Hamish Asmath, Nikia Gooding*

From May to June 2021, the National Oceanic and Atmospheric Administration (NOAA), Satellite Analysis Branch (SAB) provided training and tools for the Geomatics Unit, with personnel from the Ministry of Energy and Energy Industries (MEEI) and the Environmental Management Agency (EMA). After the training in June 2021, SAB analysts provided and continue to provide support for the operationalisation of real-time detection and monitoring for the local Exclusive Economic Zone (EEZ).

The EEZ of Trinidad and Tobago, especially in the Gulf of Paria experiences a very high level of marine traffic (including ships transporting oil), has several oil wells and platforms, and an oil refinery. The Gulf of Paria has been subjected to several large and small oil spills with a relatively high degree of frequency within the last 10 years. These have had a deleterious impact upon the marine and coastal environment. Under the National Oil Spill Contingency Plan (NOSCP), the IMA is the centre for oil spill detection and trajectory modelling. The early detection of oil spills and modelling the expected trajectory of the spill will, provide timely information to enhance the response to mitigate the spill. It will also serve to reduce the environmental, socio-economic and financial impact of spills. It will facilitate the identification of the responsible party from whom clean-up costs can be recouped and it can also serve as a deterrent for potential polluters. This will assist in the compliance with the Oil Pollution of Territorial Waters Act (1951) and ensure obligations to international conventions are met, including Oil Spill Protocol (1983), International Convention for the Prevention of Pollution from Ships (MARPOL) (1978), Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region (1986) under the Cartagena Convention (1986) and the Protocol Concerning Pollution from Land-Based Sources and Activities (1999) to the Convention for the Protection and Development of the Marine Environment and the Wider Caribbean Region (1986).

A Pilot Study of a VIRGIS Environment for the Visualisation of TLS Data, with Application to Mangrove Forest Management

Principal Researchers: *Hamish Asmath, Nikia Gooding*

In January 2021, a research fellowship was issued for the creation of a VRGIS (virtual reality geographic information system) application with specific purpose to visualise the Terrestrial Laser Scanning (TLS) mangrove 3D data collected in the Mangrove Forest Carbon Assessment. This was in part due to advancements in computing and the development of instruments that have resulted in 3D GIS data acquisition, visualisation, analysis, manipulation, and storage. One such advancement has produced TLS, which is a mode of on the ground LiDAR data collection that results in point clouds and offers added benefits when compared to airborne LiDAR. 2D and 2.5D GIS technology, software,

and hardware do not permit the effective visualisation of TLS data and as such, there is a need for an improvement in the visualisation and interaction of such data. This study examines such a need and postulates the use of VRGIS as a platform that will allow for and enable users to fully interact with, richly analyse and constructively visualise TLS data. A workflow was derived from a review of existing literature and constructed to facilitate the creation and development of a VRGIS android application. The application provided a VR environment for the visualisation of a 3D modelled mangrove tree, derived from TLS data collection in a mangrove forest. Post-development performance testing was conducted and revealed that the Mangrove VRGIS application was technically sound according to a criterion compiled to assess its performative soundness. A focused demonstration of the application's utility for Mangrove Forest Management was discussed, to highlight benefits that the VRGIS application provides for the management of this ecosystem.

5. OCEANOGRAPHY AND COASTAL PROCESSES

The Oceanography and Coastal Processes (OCP) Research Programme involves research in the following areas: oceanography, hydrography, hydrology, sedimentology and coastal dynamics. The data generated from our monitoring programmes and from research initiatives is used to inform coastal management plans and environmental policies and provide advice for sustainable development.

National Coastal Conservation Programme: Monitoring and Assessment of Coastal Processes along Shorelines with an Emphasis on Beach Dynamics

Principal Researcher: *Dr. Cassandra Nanla***l**

The beach monitoring component of the Coastal Conservation Programme commenced in 1988 and represents the longest beach monitoring record in the region. With increased competition for coastal spaces combined with climate change impacts, this dataset is one of the most significant components in most coastal projects. In fact, for the reporting period, many subsets of the data collected in this program were shared with university students, government ministries and other stakeholders. During the period October 2020 to September 2021 beach monitoring was carried out quarterly, to document changes in beach profiles, evidence of erosion and accretion at beaches and bays in Trinidad and Tobago. Analysis of these datasets are performed to provide a status of beaches and bays technical report across a selected period.

Impact of Climate Change on the Sandy Shorelines of the Caribbean: Alternatives for its Control and Resilience, Sandy Shorelines Project- KOICA

Principal Researcher: *Dr. Cassandra Nanlal*

The increasing vulnerability of Caribbean shorelines to the impacts of climate change is widely documented with many islands already experiencing accelerated beach erosion and more intense storms. With this realization, the Korean International Cooperation Agency (KOICA) Sandy Shorelines Project was developed in 2017 and currently includes 9 participating Caribbean states: Trinidad and Tobago, Costa Rica, Cuba, Dominican Republic, Guatemala, Haiti, Jamaica, Nicaragua and Panama.

Through this project, countries involved will receive approximately US $50,000.00 worth of shoreline monitoring equipment to aid with monitoring Caribbean beaches, enhance understanding of the impacts of climate change on the region and best practices to mitigate them. Additionally, Bonasse Bay, Cedros in Trinidad was selected as the pilot site for the beach rehabilitation project. The lessons learnt through this study will be shared with the other Caribbean states through the development of a best practices manual for beach rehabilitation in the Caribbean region. Reports submitted during this period include the following:

- Statement of Readiness of Trinidad and Tobago for the Monitoring Network;
- Revised equipment list for beach monitoring equipment for procurement- re-submitted 24th September 2021; and,
- Technical and Logistics Report for the Beach Rehabilitation Project at Bonasse Bay, Cedros.

The expected month of delivery for the equipment is in January 2022. A report on the beach monitoring programme and methodologies was submitted 24th September 2021. The project received an extension until June 2022.

Comprehensive National Coastal Monitoring Program

Principal Researcher: *Dr. Cassandra Nanlal*

The IMA is a key partner in the Comprehensive National Coastal Monitoring Program which is an initiative of the Ministry of Works and Transport, Coastal Protection Unit. As the primary national marine research institute in Trinidad and Tobago, the IMA's role in this initiative includes providing data for the national coastal monitoring database, capacity building and the continuation of the monitoring programme after the completion of the project. An updated existing equipment listing was provided to Coastal Dynamics for CNCMP project October 2021.

MULTI-DISCIPLINARY PROJECTS

Marine Biodiversity Hub (MBH), BID 2020: Institution-level biodiversity Data Mobilisation Grants

Principal Researchers: *Anjani Ganase, Hamish Asmath, Alana Jute, Nikia Gooding, Paul Nelson*

The IMA has received a BID institutional grant funding to develop a centralised Marine Biodiversity Hub (MBH) for the purpose of (1) effective dissemination of data on the state of marine ecosystems in Trinidad and Tobago to research partners, civil society, decision-makers and the international community, and (2) building capacity for more integrative research collaborations and creating sustainable partnerships through data sharing for research, management and conservation.
Over the first six months, the team focused on the following major activities:

1. Project introduction with internal (managers, IC department and research and technical staff) and external stakeholders (government partners, NGOs and educational institutions). The stakeholder engagement included survey assessments on data interests, types and sharing capabilities needed. This would guide the data standards and priorities, and the functionality of the MBH.

2. Capacity building in data mobilization strategies through a series of online workshops and remote learning activities.

3. Inventory digitization and marine data cataloguing of our primary datasets for GBIF, which includes the preparation of Marine Reference Collection for sharing with GBIF before our first mid-term report in May.

In preparation for the development and construction of the Marine Biodiversity Hub (Activity 4), which was expected to start in January 2021, IMA started the procurement process for bidding for the spatial developers in October. We are currently in the process of evaluations and will hopefully be completed before the end of January. This means that there will be a one-month delay in Activity 4 because of delays in the responses to questions by vendors who were on Christmas leave, along with IMA going on a mandatory break between Christmas and New Year's.

Caribbean Large Marine Ecosystem (CLME+) Sub Project

Principal Researchers: *Hamish Asmath, Darryl Banjoo, Wendy Nelson, Rahanna Juman, Farahnaz Solomon, Sheldon Ramoutar, Ben Maharaj*

Strengthening Ecosystem Based Management Frameworks and Ocean Governance in the North Brazil Shelf Large Marine Ecosystem Trinidad and Tobago was one of four participating countries of Caribbean Large Marine Ecosystem plus (CLME +) sub-project entitled "Strengthening Ecosystem Based Management (EBM) Frameworks and Ocean Governance in the North Brazil Shelf Large Marine Ecosystem (NBSLME)". The project sought to develop and test various governance arrangements to enable effective EBM of mangroves and wetlands. The interventions were designed to mitigate pollution and their impacts on coastal mangroves and wetlands within the NBSLME. This was done in the context of multilevel (local to regional) governance arrangements developed via a series of interactive, focused, multi-stakeholder consultations, and the implementation of community-based conservation interventions. The interventions were designed to mitigate pollution and their impacts within coastal mangroves and wetlands within the North Brazil Shelf Large Marine Ecosystem (NBSLME). The project sought to implement mangrove restoration and pollution abatement in countries of the NBSLME. For Trinidad and Tobago, the focus was on organic pollution from agriculture and wastewater in the southern section of the Caroni Swamp. The project assisted in promoting Ecosystem

Based Management (EBM) approach that addressed the three-priority ocean related problems in the Wider Caribbean Region of pollution, habitat degradation and unsustainable fishing in a holistic way and beyond a "sectoral" management approach. The project assisted the government to fulfil their obligations under the Cartagena Convention and its Protocols on Pollution and Marine Biodiversity.
The goal of one component of the project was to establish baseline conditions regarding nutrient levels in the Cunupia/Guayamare study site, with the aim of comparing it to future sampling events to determine whether mitigation measures and interventions with farmers resulted in a reduction of nutrient levels. The study involved sampling nutrient and physiochemical parameters at seventeen (17) stations during March and November 2019, representing one dry and one wet season in the Cunupia/New Guayamare watersheds. The results obtained for the New Guayamare and Cunupia watersheds indicated poor water quality with elevated levels of nutrients and low dissolved (DO) oxygen to support aquatic life.

The findings of this study on the New Guayamare and Cunupia watersheds indicate poor water quality arising from agricultural, industrial and domestic sources of pollution. Compared to the Trinidad and Tobago water pollution rules (TTWPR, 2019) and International criteria and guideline values from the United States Environmental Protection Agency (USEPA), Australian and New Zealand Environment and Conservation Council (ANZECC), Canadian Council of Ministers of the Environment (CCME), the sites sampled for parameters DO, turbidity, ammonia, reactive and total phosphates were above acceptable limits and guideline values that indicate increased risk of negative impacts to aquatic life. Visible evidence of eutrophication, the presence of algal material, and low DO were reported in the Cunupia/New Guayamare watersheds. Based on the elevated levels of nutrient pollution, low dissolved oxygen and toxic ammonia there is an urgent need for management intervention to reduce pollutant levels in the catchments areas of New Guayamare and Cunupia.

EQP Lab Accreditation Project

Principal Researcher: *Kyle Williams*

The IMA began the accreditation process of its Environmental Quality Programme Laboratory (EQPL) for the nitrate/nitrate test scope in 2020. Under the guidance of the Trinidad and Tobago Bureau of Standards (TTBS), the ISO/IEC 17025 management system was used, and the process is now in its final stage.

The ISO/IEC 17025 is the primary international standards for both testing and calibration laboratories. The International Organization for Standardization (ISO) provides standards which specify the general laboratory requirements for the competence to carry our testing, calibration and sampling. The ISO/IEC 17025 accreditation will provide the EQPL with a management system with a holistic approach with process driven modules and a system approach to management which standardizes the overall operations of the Laboratory.

At present, the EQPL is in the process of completing audits of the management system and awaiting the TTLABS Laboratory Assessors to appoint a date to come into the IMA to assess the management system before the accreditation certification can be awarded. Management has already committed its plan to extend the accreditation to other test scopes within the laboratory. Therefore, preparations have already been made to have other test scope follow all the management system procedures. Due to the Covid 19 pandemic (rotational working and say at home orders), there was a slowdown in the implementation of some of the procedures. However, refreshment of some procedures is currently being implemented, as well as the updating of the management system now that audits are in the process of completion.

Hydrological study of the Caroni River Basin to Determine Transport and Fate of Land-based Sources of Pollutants

Principal Researchers: *Hamish Asmath, Sheldon Ramoutar, Wendy Nelson, Rahanna Juman, Farahnaz Solomon*

Caribbean river basins are generally of comparatively small size because of the predominance of island areas, and thus impacts are characterized by a short response time from land-use activities to coastal responses. Land-based pollution, from both point and non-point sources and activities within coastal watersheds, impacts on coastal areas and on the quality of the food harvested from these areas. In order to mitigate and control the impact of pollution on coastal and marine resources and on human health, it is essential that the type and load of pollutants be identified. This involves determination of the sources and their location, and the volume and concentration of the pollutants.

The Caroni River Basin, the hydrometric area that encompasses the Caroni Swamp, covers a total of about 883.4 km2, equivalent to 22% of the land surface area of the island and is the most populated and developed area of Trinidad. The hydrological regime in this river basin has been altered to facilitate human habitation and activities, including water harvesting for human consumption, flood mitigation and irrigation for agriculture. The Caroni and associated rivers discharge into the Caroni Swamp, the largest mangrove forest in Trinidad. The Swamp is important economically for oyster and fish harvesting, for hunting and for ecotourism. This study is modelling the hydrological regime within the Caroni Basin to determine the transport and fate of nutrient land-based pollutants. It serves to fulfil some of the responsibilities that the IMA has as the Regional Activities Centre of the Land Based Sources of Pollution Protocol.

Component – Impacts of land-based pollutants on human health
Subject area- Bacteriological assessment of water and mangrove oyster (***Crassostrea rhizophorae***) in the Caroni river basin mangrove ecosystem, Trinidad

The possible impacts of land-based pollutants within the Caroni Basin on human health will be determined by assessing biota harvested for human consumption. More specifically, a bacteriological assessment of the mangrove oyster (***Crassostrea rhizophorae***) will be conducted. The mangrove oyster harvested from the Caroni Swamp is eaten as a raw oyster cocktail. Oysters are capable of harbouring microorganisms after filtering polluted waters, and can cause be a potential health risks when eaten raw. The genus Vibrio is responsible for most health risks associated with oysters and whilst typical infections result in diarrhoea and vomiting, some infections can cause more severe illnesses, including bloodstream infections and severe blistering skin lesions.

Regional Nutrients Reduction Strategy and Action Plan:Development of a Regional Nutrient Reduction Strategy and Action Plan

Principal Researcher: *Dr Darryl Banjoo*

The UNDP/GEF CLME+ Project "Catalysing Implementation of the Strategic Action Programme for the Sustainable Management of Shared Living Marine Resources in the Caribbean and North Brazil Shelf Large Marine Ecosystems" in conjunction with the IMA and the Regional Coordination Unit of the Caribbean Environment Programme/Cartagena Convention Secretariat (UNEP CAR/RCU) has developed the Regional Nutrient Strategy and Action Plan in support of global commitments related to the maintenance of healthy ecosystems. The IMA in its capacity as Regional Activity Centre for the Land-based Pollution Sources and Activities (LBS) Protocol conducted a sub-regional study in the English-speaking countries which contributed to the strategy and production of an Action Plan and Implementation Schedule. The general objective of the strategy is to establish a collaborative framework for the progressive reduction

of the impact produced by the nutrient load as a priority goal in marine ecosystems in the WCR. The project contributes to the Cartagena Convention for the Protection of the Marine Environment of the WCR and Sustainable Development Goals 6 and 14.

The objectives of the projects were as follows:

- To expand the baseline developed under the State of Convention Area (Pollution) report and identify most important "regionally relevant" pollution sources in terms of the transboundary nature of both sources and impacts;
- To identify high priority areas for further action based on most affected ecosystem types and most important socio-economic impacts;
- To contribute to the operationalisation of the Caribbean Platform for Nutrients Management;
- To assist in defining new areas of research relating to nutrient pollution in the Wider Caribbean Region

During the period, the Regional Nutrient Strategy and Action Plan was finalised in July 2021 and was adopted in the Fifth Meeting of the Contracting Parties (COP) to the Protocol Concerning Pollution from Land-Based Sources and Activities (LBS) in the Wider Caribbean Region which was held virtually on the 26 July 2021.

Hydrological Study of the Mangrove Forest North of the Couva River

Principal Researchers: *Cssandra Nanlal, Hamish Asmath, Nikia Gooding, Rahanna Juman*

Observed mangrove dieback within the forest north of the Couva River has caused concern as no significant regeneration has been recorded since 2014. Initial water quality testing conducted in November 2020 did not provide potential cause for the mangrove dieback and a hydrological study was commissioned. This study investigates the water levels, temperatures and salinities at various locations in the study area. Watershed and elevation mapping was done for the study area based on available data, and a vegetation analysis was carried out to record changes and patterns in the vegetation in order to determine the likely cause of the mangrove die-off. For this research, water level and salinity gauges were deployed at strategic locations within the area of interest (Figure 2) for a 1-year period. Additionally, a tide gauge was deployed at the nearest suitable jetty location for 1 year. Salinity and water level sensors were deployed along 3 transects throughout the swamp.

2.F.2 THE INFORMATION TECHNOLOGY PROGRAMME

Information Technology Department

The Information Technology Department continued to make steady progress in deploying technology effectively to enhance productivity, streamline workflows, and enable seamless communication. Despite financial limitations and COVID lockdown period in 2021, the department managed to maintain and make modest improvements to the IT infrastructure, ensuring a resilient and agile network to support remote **Work from Home** (WFH) functionality. The limited projects undertaken during this reporting period focused on Service Delivery enhancement, IT Governance improvement, and strengthening Asset Security and Privacy.

Deployment of ICT Equipment and Mobile Handset to Managers

In the first quarter of 2021, the Information Technology Department successfully completed the acquisition, configuration and deployment of new laptops and accessories for the management team. Furthermore, ITD undertook the implementation of a significant upgrade by replacing outdated and limited cell phones previously utilized by our managers with moder mobile handsets. This initiative was driven by the necessity for our managers to have reliable and high-performing modern IT equipment capable of seamlessly handling multitasking demands, which included coordinating work activities, participating in virtual meetings, and efficiently carrying out administrative tasks. These efforts were particularly crucial given the constraints imposed by the pandemic. The successful deployment of these new devices reflected ITD's commitment to improving service delivery, towards our management team by providing them with the necessary tools to navigate the challenges of a dynamic and digitally reliant work environment.

Mobile Applications SeaITT

Integrated Environmental Incident and Lionfish Mobile Application, and Software Platform
A mobile application was successfully developed to engage stakeholders on issues pertaining to the invasive lionfish, capture data on environmental incidents, and bring awareness of the IMA's activities and brand. A strategic partnership between the developer Caribbean Industrial Research Institute (CARIRI) Centre for Enterprise Development and IMA produced the SEAiTT Mobile Application. A functional mobile application capable of capturing, collating, and reporting on environmental incident data and disseminating information on the marine environment was launched in 2020. IMA Service Delivery to stakeholders was greatly improved by the addition of the SEAiTT mobile application.

Recommissioning of IMA's Virtual Private Network to support Remote Work

Given the challenges the Covid19 pandemic presented in 2020 - a Virtual Private Network (VPN) was re-established to support IMA's Telecommuting (work remotely/ home) Policy. A VPN allows a secure connection over the Internet to a corporate network allowing access to otherwise inaccessible resources. As such, authorised staff can access data and information resources resident at IMA, hence reducing the need to be physically onsite, which also aids in mitigating the spread of Covid 19 Virus. This project is in congruence with the strategic objectives of enhancing ICT service delivery and strengthening Asset Security and Privacy.

Cross-functional Team in Establishing Strong Event Live Streaming and Production Capabilities

A collaboration between the Information Technology and Information Centre Departments has been formed to expand expertise in event streaming and production. Live event streaming of symposia, product launches, webinars and other public relation events has been expanded to include Zoom, IMA's YouTube Social Media Channel to engage internal and external stakeholders. The cross functional team has honed production capabilities to a professional standard, reviewed and produced documentation to guide operations, purchased hardware and lighting to support the product quality. As of September 2020, live events streaming, and audience engagement has improved greatly to support the dissemination of information and data related to IMA activities. With most broadcast receiving typically over one hundred views within 2 days of streaming.

Networking of Building Seven

The network infrastructure within building (B7) was outfitted with Category 6 infrastructure and interconnected to the IMA's network via a high-speed fibre backbone. The project required the design and outfitting of new Ethernet Cabling and Network Switches, which were connected by fibre optic cable to the server room. Although the project was completed prior to October 2020 and entailed the creation of a new network subnet. The network was eventually commissioned in the second quarter of 2021, when staff from Building Five (B5) migrated to Building Seven (B7).

2.F.3 THE OPERATIONS PROGRAMME

The Operations Department

The Operations Department consists of Facilities, Technical Support Services, Health, Safety, and Security supervised by an Operations Manager. Staff of the Facilities Department comprise the following:

- 2 Groundsmen
- 2 General Craftsman
- 1 Electrical Technician
- 1 Secretary II
- 1 Handyman/Labourer
- 1 Property and Building Maintenance Trainee

The Facilities Department engaged in several projects for 2020-2021 in addition to maintenance and repairs of the grounds and buildings. Hereunder is a summary of works ongoing and completed:

i. Developed Scope of Works, Bill of Quantities and other documents for the Demolition of Building 6 (B6) and Refurbishment of Building 7 (B7). This project was successfully completed.

ii. B7 Variation works have been completed Arkeo Ltd. The works included refurbishment of the female toilet, refurbishment of the ramp, roof for walkway and tiling of concrete walkway and stairs. Additional works included Kitchen cupboards and blinds for offices.

iii. Works continue on the new Mari-culture facility with plumbing and electrical works to the fish tanks ongoing. Procurement of an air intake fan and electrical materials for supplying power to the tanks continues to the next Fiscal period.

iv. Fire Alarm installed in B7 and commissioned.

v. A request was made by Director (Ag.), Dr. Rahanna Juman, for a Bio-Securing the Shade house Facility. Site visits and drawings were completed.

vi. Tobago Field Station, Letter of Award issued to the project management firm, NIPDEC and awaiting a date for the kick off meeting.

vii. Research Building sealing works to openings where services were passing through the walls were completed in house and approved by Peake Technologies. They effected remedial works on the supply duct.

viii. Painting the handrails to the Research Building was completed.

ix. Installation of security lighting all over the compound was completed.

x. The Fire Pump was serviced.

On-going works

- WASA to regularize the sewage connection.
- A licensed plumber is to be contacted to register our sewage connection. Follow-up to be made with CDA as drawings already have WASA stamps.
- Design Engineering is still working with us on the electrical audit. Site visit conducted by the contractor to start the rewiring of the Accounts building.

Facilities Department also maintains the following contracts for essential repairs and services that are ongoing:

- Research Building AC system & all other Buildings
- Freight & Passenger Elevators in Research Building
- Compound Generator
- General Pest Control
- Janitorial Services
- Security Services

The Department is also responsible for supplying the Institute with potable water as well as ensuring that all coolers are sanitized
Chiller & Freezer maintenance in Research Building Ground Floor

- Well Servicing
- Sanitary Bins
- Fire Alarm System
- Catholic Centre-Bus Parking
- SWMCOL-1 x 3 cubic yard bin stationed in Aquaculture

Technical Support Services (TSS)

The Technical Support Services Department staff consists of:

- 1 Launch Captain
- 1 Boatman
- 1 Launch Engineer
- A Seaman II
- 1 Auto Mechanic
- The Outboard Technician position remains vacant.

The Technical Support Services (TSS) Department currently maintains the fleet of vehicles and vessels comprising of the following vehicles:

- TCX 5579-Toyota Hilux
- TCX 5580-Toyota Hilux
- TDH 7658-Mazda BT-50
- TDH 7659-Mazda BT-50

…and vessels:

- R.V. PELAGICA
- M.L. KANAWA
- MAKO 25
- YAMAHA SX-210. We have yet to add this vessel officially to our fleet as we are awaiting funds to purchase engines to equip this vessel.
- MUDSKIPPER + Trailer

For the period under review, body works were carried out on the following vehicles in on-going efforts to properly maintain our aging fleet:

- TCX 5579-Toyota Hilux
- TCX 5580-Toyota Hilux
- TDH 7658-Mazda BT-50
- TDH 7659-Mazda BT-50

The following vehicles are in derelict form and are the subject of an auction:

- TBR 4966-Mazda B2500 Pick Up
- TBZ 5770-Mazda B2500 Pick Up
- TBZ 4737-Mazda B2500 Pick Up

A new compressor was purchased and commissioned in our Mechanic's Workshop.

Repairs were also carried out on the R.V. Pelagica's engine and trailer, as well as the bodywork while restorative works were completed on vessel, MAKO 25. Annual licenses are due in April of each year for vessels and Mudskipper trailers. The TSS Department continues to provide support means of proper working vehicles and available vessels and crew to our Researchers and their respective projects.

HSSE

- Covid-19 combating measures continued
- New HSE policy to be posted by the end of October 2021.

PART 3

POLICIES

and

DEVELOPMENT INITIATIVES

Policies and Initiatives

There were no new policies and initiatives for fiscal 2021.

PART 4

FINANCIAL OPERATIONS

INSTITUTE OF MARINE AFFAIRS
UNAUDITED FINANCIAL STATEMENTS
FOR THE YEAR ENDED
SEPTEMBER 30, 2021

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INSTITUTE OF MARINE AFFAIRS
UNAUDITED BALANCE SHEET
As at 30 September 2021

	Notes	2021 TT$	2020 TT$
ASSETS			
Non-Current Assets			
Pension Plan Asset		1,293,479	-
Fixed Assets	**5**	40,812,778	42,184,846
Total Non-Current Assets		42,106,257	42,184,846
CURRENT ASSETS			
Cash and bank		2,419,804	2,116,809
Investments		26,441,595	31,105,362
Accounts Receivable		151,040	74,738
Goods in Transit		278,148	244,484
VAT		166,939	166,939
Prepayments & Other Assets		2,689,937	2,872,470
Total Current Assets		32,147,463	36,580,802
TOTAL ASSETS		74,253,720	78,765,648
EQUITY AND LIABILITIES			
Revaluation reserves		531,918	531,918
Retained Earnings		17,554,912	20,304,851
		18,086,830	20,836,769
Non-Current Liabilities			
Pension Plan Liability	**4**	-	865,159
Deferred Income		52,641,412	53,591,412
Retentions		1,282,812	1,275,880
Total Non-Current Liabilities		53,924,224	55,732,451
Current Liabilities			
Accounts Payable		681,361	677,729
Accruals & other Liabilities		1,561,305	1,518,699
Total Current Liabilities		2,242,666	2,196,428
TOTAL EQUITY & LIABILITIES		74,253,720	78,765,648

Chairman Board of Governors_____ Director (Ag.)_____

The accompanying notes form an integral part of these financial statements.

INSTITUTE OF MARINE AFFAIRS
UNAUDITED INCOME AND EXPENDITURE ACCOUNT
For the year ended September 30, 2021

	Note	2021 TT$	2020 TT$
INCOME			
Government Funds		18,402,677	19,255,628
Interest		372,241	486,783
(Loss)/Gain on Foreign Exchange		(9,998)	19,294
Non-Government Income		448,934	350,626
Total Income		**19,213,854**	20,112,331
EXPENDITURE			
Salaries & Related Cost		16,738,770	16,364,948
Administrative Expenses	**6**	2,859,832	3,242,006
Maintenance & Repairs		895,507	890,899
Research Expenses		685,061	651,435
Audit fees		86,400	86,400
Board remuneration		370,938	264,728
Depreciation Expense		2,489,398	2,916,507
Total Expenses		**24,125,906**	24,416,923
(Deficit) for the period		(4,912,052)	(4,304,592)
OTHER COMPREHENSIVE INCOME			
Unrealized Gain on Investment		3,470	20,709
Pension Plan Adjustment		2,158,638	(174,903)
Total Comprehensive Income		**(2,749,944)**	(4,458,786)

The accompanying notes form an integral part of these financial statements

INSTITUTE OF MARINE AFFAIRS
UNAUDITED STATEMENT OF ACCUMULATED SURPLUS
September 30, 2021

	2021	2020
	TT$	**TT$**
Accumulated surplus brought forward	20,304,851	24,763,632
Deficit for the period	(2,749,944)	(4,458,786)
Accumulated surplus carried forward	17,554,907	20,304,851

The accompanying notes form an integral part of these financial statements.

INSTITUTE OF MARINE AFFAIRS
UNAUDITED CASH FLOW STATEMENT
For the year ended September 30, 2021

	2021	2020
OPERATING ACTIVITIES	**TT$**	**TT$**
Deficit for the period	(2,749,944)	(4,458,786)
Adjustments:		
Depreciation	2,489,398	2,916,507
Revaluation Reserve		
Unrealized Gain / (Loss) on Investments	3,470	(20,709)
Deferred Income	(1,105,000)	(1,315,178)
(Decrease) in Pension Plan Liability	(2,158,638)	(440,739)
(Loss)/Gain on Foreign Currency	(9,998)	19,294
Net cash used in Operating Activities	(3,530,712)	(3,299,611)
Decrease in Trade and Other Receivables	72,567	362,242
Increase in Creditors and Accruals	53,170	304,874
Changes in Operating Assets & Liabilities	125,737	667,116
Net Cash used in Operations	(3,404,975)	(2,632,495)
INVESTING ACTIVITIES		
Capital grants received	155,000	115,178
Acquisition of Fixed Assets	(1,117,325)	(1,670,209)
Net cash flow investing activities	(962,325)	(1,555,031)
Gain/(Loss) on Foreign Currency	9,998	(19,294)
Unrealized (Loss) / Gain on Investments	(3,470)	20,709
Net (Decrease) in cash and equivalents	(4,360,772)	(4,186,111)
Cash Balance at Beg. of period	33,222,171	37,408,282
Cash Balance at End of Period	28,861,399	33,222,171
Represented by:		
Cash at bank	2,419,804	2,116,809
Investments	26,441,595	31,105,362
	28,861,399	33,222,171

The accompanying notes form an integral part of these financial statements.

INSTITUTE OF MARINE AFFAIRS
NOTES TO THE FINANCIAL STATEMENTS - September 30, 2021

INCORPORATION AND ACTIVITIES

The Institute was established by an Act of Parliament of Trinidad and Tobago on 10th May 1976, Chapter 37:01 of the Laws of the Republic of Trinidad and Tobago refers. This Act was amended by Act #13 of 1990.

The principal activities are:

a. to develop and implement programmes and projects that translate the marine and related policies of the Government into activities that contribute to national development;

b. to develop and execute programmes and projects that foster and encourage regional and international collaboration in the exploitation of the marine and other related areas of the environment;

c. to promote a public understanding of and appreciation for all aspects of the marine and related environment;

d. to stimulate and advance the conduct of marine scientific research in Trinidad and Tobago;

e. to promote the utilisation and conservation of the marine resources for the economic and social benefit of Trinidad and Tobago and to enhance the national capabilities;

f. to do all such things as are incidental or conducive to the attainment of the above objects.

REPORTING CURRENCY

These financial statements are expressed in Trinidad and Tobago dollars.

1. SIGNIFICANT ACCOUNTING POLICIES

a) Accounting Convention

These financial statements are prepared under the historical cost convention and in accordance with approved accounting standards. No account is taken of the effects of inflation.

b) Accounts Receivable

Accounts receivable are stated net of provision for bad and doubtful debts. The provision for doubtful debts remains unchanged from 2017.

c) Fixed Assets

Fixed assets are depreciated at rates estimated to write off the depreciable amounts of the fixed assets over their useful lives.

The annual depreciation rates used are: -

Category	Method	Rate
Buildings and improvement works	Straight line	2%
Plant and machinery	Reducing balance	10-25%
Computer Equipment	Reducing balance	33%
Furniture and fittings	Reducing balance	10%
Marine vessels	Reducing balance	25%
Motor vehicles	Reducing balance	25%
Reference and resource materials	Reducing balance	10%

2. SIGNIFICANT ACCOUNTING POLICIES (continued)

d) Income

The Government of Trinidad and Tobago funds most of the operations of the Institute by means of monthly subventions. These are recognized on a cash basis and credited to income.

e) Deferred Income

Grants from Government, related to the purchase of fixed assets, are deferred and credited to revenue over the useful life of the assets concerned.

f) Taxation

The Institute may be exempted from payment of, or the Government shall bear the cost of any taxes, customs duties, fees or levies which may be imposed on the Institute in respect of any equipment, materials and supplies imported into Trinidad and Tobago by the Institute which are essential for its operations

g) Foreign currency

Transactions involving foreign currencies are converted at the rates prevailing on the dates of such transactions. Monetary assets and liabilities are translated at the rate prevailing at the Balance Sheet date. Exchange gains and losses are taken directly to the Income and Expenditure Account.

h) Actuarial Gains and Losses

Actuarial Gains and Losses are recognised immediately through the statement of other comprehensive income.

4. PENSION PLAN LIABILITY

The Institute's pension plan is a defined benefit plan. The plan is operated by virtue of a Trust Deed made on 8th June 1990 between the Institute of Marine Affairs and the Trustees of the Plan. The assets supporting the Plan are invested through a Deposit Administration Policy with an insurance company.

Effective October 1st, 1999, the Institute adopted the provisions of International Accounting Standard 19 Employee Benefits (IAS 19) (Revised). It treated with the transitional asset as an adjustment to the opening retained earnings of that period because it was impracticable to restate the comparative information of prior periods.

Retirement Benefit Asset/Liabilities

Net liability in statement of financial position

	2021	**2020**
Present value of defined benefit obligation	(55,752,825)	(54,600,862)
Fair value of plan assets	57,046,304	53,735,703
Value of surplus/(deficit)	1,293,479	(865,159)
Unrecognized actuarial losses/(gains)	-	-
Net defined benefit asset/(liability)	**1,293,479**	**(865,159)**

INSTITUTE OF MARINE AFFAIRS
PENSION PLAN LIABILITY (Continued)

Movement in present value of defined benefit obligation

	2021	2020
Defined benefit obligations at start	54,600,862	53,797,033
Current service cost	1,921,791	1,892,620
Interest cost	3,074,615	2,870,874
Members contributions	381,114	382,832
Past service cost/(credit)	-	-
Re-measurements:		
Experience Adjustments	-	-
Actuarial (gain)/loss from change in financial assumptions	(2,222,200)	(1,564,158)
Benefits paid	(2,003,356)	(2,778,338)
Defined benefit obligation at end of year	55,752,825	54,600,862

Movement in fair value of plan assets

	2021	2020
Plan assets at start of year	53,735,703	52,491,134
Actual return on plan assets (prior year adjustments)	-	(8,375)
Actual return on plan assets	3,495,306	1,584,098
Company's contributions	1,477,138	2,115,517
Members contributions	381,114	382,832
Benefits paid	(2,003,356)	(2,778,338)
Experience Adjustments	-	-
Administration & other non-Plan Investment Management Expenses	(39,600)	(51,165)
Fair value of plan assets at end of year	**57,046,304**	**53,735,703**
Actual return on plan assets	**3,495,306**	**1,584,098**

Expenses recognised in profit or loss

	2021	2020
Current service cost	1,921,791	1,892,620
Interest Cost	3,074,615	2,870,874
Expected return on plan assets	(2,950,384)	(2,746,652)
Administration & other non-Plan Investment Management Expenses	39,600	51,165
Net pension cost	**2,085,622**	**2,068,006**

INSTITUTE OF MARINE AFFAIRS
PENSION PLAN LIABILITY (Continued)

Re-measurements recognised in other comprehensive income

	2021	2020
Actuarial (gain)/loss from changes in financial assumptions	(198,479)	(38,099)
Experience Adjustments	(2,023,721)	(1,526,058)
Expected Return on plan assets	2,950,384	2,746,652
Actual return on plan assets	(3,495,306)	(1,584,098)
Total amount recognised in other comprehensive income	(2,767,122)	(401,603)

Reconciliation of opening & closing statement of financial position entries

	2021	2020
Opening defined benefit asset/(liability)	(865,159)	(1,305,898)
Actual return on plan assets (prior year adjustments)	-	(8,375)
Net pension cost	(2,085,622)	(2,068,006)
Re-measurements recognised in other comprehensive income	2,767,122	401,603
Company contributions paid	1,477,138	2,115,517
Closing defined benefit asset/(liability)	**1,293,479**	**(865,159)**

Summary of principal assumptions as at 30th September

	2021	2020
Discount rate	6.75% p.a.	5.50% p.a.
Expected return on assets at the end of the year	6.75% p.a.	5.50% p.a.
Future promotional salary increases	3.75% p.a.	3.75% p.a.
Future inflationary salary increases	2.00% p.a.	0.75% p.a.
Future increases in the NIS Ceiling for earnings	Nil	Nil
Future increases to pensions	2.00% p.a.	0.75% p.a.
Mortality	UP94 Generational at 2021	UP94 Generational at 2020
Termination of active members	Nil	Nil
Early Retirement	Nil	Nil
Future expenses	Nil	Nil

INSTITUTE OF MARINE AFFAIRS
PENSION PLAN LIABILITY (Continued)

Sensitivity analysis	2021	2020
Base IAS 19 Results	55,752,825	54,600,862
Reduce Discount Rate by 1.0% pa	66,188,071	64,923,515
Increase Discount Rate by 1.0% pa	47,638,413	46,599,375
Reduce Salary Increase by 0.5% pa	54,092,442	52,955,712
Increase Salary Increase by 0.5% pa	57,537,057	56,371,455
Increase average life expectancy by 1 year	56,382,099	54,901,969

INSTITUTE OF MARINE AFFAIRS
NOTES TO THE FINANCIAL STATEMENTS - September 30, 2021

5. FIXED ASSET

PROPERTY, PLANT AND EQUIPMENT	LAND & BUILDINGS	CAPITAL WORK IN PROGRESS	MOTOR VEHICLE	PLANT & MACHINERY	REFERENCE & RESOURCE	FURNITURE & FIXTURES	TOTAL
Year ended 30 September 2020							
Opening book value 2020	29,730,174	3,665,587	258,287	6,303,969	217,259	2,009,568	42,184,844
Transfers							
Additions		698,288		400,379			1,098,666
Retentions		18,664					18,664
Disposals							
Depreciation on Disposal							
Depreciation charge	(787,070)	-	(64,571)	(1,404,096)	(30,861)	(202,799)	(2,489,398)
Closing net book value	28,943,104	4,382,538	193,716	5,300,252	186,398	1,806,769	40,812,777
At 30 September 2021							
Accumulated Cost	39,684,323	4,382,538	1,915,575	46,842,259	1,295,346	5,973,271	100,093,312
Accumulated depreciation	(10,741,218)	-	(1,721,860)	(41,542,007)	(1,108,948)	(4,166,502)	(59,280,535)
Net book value 2021	**28,943,104**	**4,382,538**	**193,716**	**5,300,252**	**186,398**	**1,806,769**	**40,812,777**
Year ended 30 September 2020							
Opening book value 2019	30,458,181	2,467,260	344,383	7,688,272	171,479	2,197,966	43,327,541
Transfers							
Additions		1,094,724		507,188	35,802	32,495	1,670,208
Disposals							
Retentions		103,603					103,603
Depreciation on Disposal							
Depreciation charge	(728,007)		(86,094)	(1,891,490)	9,978	(220,894)	(2,916,507)
Closing net book value	**29,730,174**	**3,665,587**	**258,287**	**6,303,969**	**217,259**	**2,009,568**	**42,184,844**

At 30 September 2020							
Accumulated Cost	39,684,323	3,665,587	1,915,575	46,441,880	1,295,346	5,973,271	98,975,982
Accumulated depreciation	(9,954,149)		(1,657,288)	(40,137,911**)**	(1,078,087)	(3,963,703)	(56,791,138)
Net book value 2020	**29,730,174**	**3,665,587**	**258,287**	**6,303,969**	**217,259**	**2,009,568**	**42,184,844**

6. ADMINISTRATION

Included in Administration expenditure is the cost attributable to a 30 year lease agreement between the Chaguaramas Development Authority (CDA) and the IMA. This lease is an operating lease and provides for an annual rent of $12,000 over the total period of the lease.

	2021 $	2020 $
Minimum lease payments recognised as an expense in the year	254,960	254,960
	======	=====

As at the balance sheet date, the IMA has outstanding commitments under the operating lease as follows:

	2021 $	2020 $
Within one year	12,000	12,000
In the second to fifth years inclusive	48,000	48,000
After five years	252,000	252,000
	312,000	312,000
	========	=======

7. SEVERANCE BENEFITS

Under the provisions of the Retrenchment and Severance Benefits Act 1985, the Institute is required to pay severance benefits to workers who are retrenched. The Institute has adopted a 'pay-as-you-go' approach in dealing with these payments. With this approach provision is not made for obligations until employees are actually retrenched.

4.E INTERNAL AUDIT FUNCTIONS

The Internal Audit function is guided by the Internal Audit Charter, which outlines the role, responsibilities, authority, reporting lines and protocols for the Internal Audit Unit. The Internal Audit Unit developed and executed an audit plan for the fiscal year 2020-2021, which was approved by the Audit Sub-Committee of the Board of Governors.

The following financial and operational audits were included in the 2020-2021 Audit Plan:

- Bank Reconciliations & Investments;
- Accounts Receivable & Prepayments;
- Information Technology (IT);
- Review, Property, Plant & Equipment;
- Research;
- Petty Cash Count at 30 September 2021

A discussion for each audit is outlined hereafter.

Bank Reconciliations & Investments

Audit Criteria

Compliance with the Bank Accounts Policy approved on 12 June 2020.
Effective Internal Controls for the Bank Reconciliations.
Accuracy of the bank account balances on the general ledger and the financial statements.
Accuracy of the investment account balances.

Audit Results

The Bank Reconciliation statements presented were prepared on time and in accordance with IMA's Bank Accounts Policy.
There were No Stale Dated Cheques or Long Standing deposits at the time of the audit.
The bank account balances on the general ledger and the financial statements were found to be materially accurate.

Conclusion and Recommendations

Implementation of a Procurement to Payment Checklist for each purchasing transaction greater than $500 will assist in maintaining and strengthening internal controls.

Accounts Receivable & Prepayments

Audit Criteria

Assurance that Accounts Receivable and Prepayments meet the audit assertions of accuracy, completeness, existence and rights and obligations.

Audit Results

The Prepayment and Receivable Accounts reconciliation schedules were prepared, checked and approved in a timely manner.
Long-standing receivable balances, previously deemed uncollectible, remain on the Accounts Receivable account. The lack of review of the Provision for Doubtful Debts balance remain the same for a number of years. The relationship and recording of goods received dates, prepayments, amortisations and accruals can be improved.

Conclusion and Recommendations

The long-standing receivable balances should be re-examined to determine recoverability. If still uncollectible, it is recommended that the necessary approval be sought before the uncollectible debts are written off as a bad debt expense.

The Provision for Doubtful Debts should be reviewed annually and adjusted accordingly based on whether the debts have been recovered or have to be written off.

Greater care should be taken in the treatment of prepayments, amortisations and accruals.

Information Technology (IT) Review

Audit Criteria

Compliance and Effective Internal Controls in the areas of Logical Security, Disaster Recovery, Physical Security, Operations, IT Services and Maintenance

Audit Results

The Board of Governors did, not approve some of the IT Policies in use.

At the time of the audit, there was a draft IT Disaster Recovery Plan (DRP) with key areas such as Network Infrastructure, Servers Infrastructure, Data Storage and Backup Systems, Data Output Devices, Database Systems and IT Documentation still to be updated. It was also noted that the DRP has not been tested nor approved by the Board of Governors.

Due to limited funding, the storage of data back-up tapes off –site was not continued.

Daily checks on server maintenance were noted at the time of the audit.

Conclusion and Recommendations

All IT Policies should be reviewed and updated accordingly before seeking approval from the Board of Governors. An IT Disaster Recovery Plan (DRP) is critical for the IMA to have in place in case of a disaster. It is crucial for the DRP to be tested and approved by the Board of Governors, as such a plan will guide the IMA in restoring systems and operations in the shortest possible timeframe. The IT DRP is only one part of an organisation's disaster planning and should filter into a Business Continuity Plan (BCP) for the IMA to ensure that all business processes can continue to operate during or immediately after a disaster. Once the funding becomes available, IMA should once more explore the opportunities of storing the data off -site for additional protection.

Property, Plant & Equipment

Audit Criteria

A review of the fixed assets with particular focus placed on understanding and examining the use of the new Sage Fixed Asset Software.

Audit Results

At the time of the audit, the software could not provide a full Fixed Asset Register showing all relevant information in one report for audit purposes.

There is a risk of omission/duplication of assets and inaccuracy of balances since there is no monthly reconciliation between the sub-ledger (Fixed Assets Register) and the General Ledger Fixed Assets Accounts. The depreciation method was changed from Reducing Balance to Straight-line with no approval from the Board of Governors.

Conclusion and Recommendations

The ability of Sage Fixed Assets Software to generate the full Fixed Assets Register should be explored further. Consultation with the software provider should be considered where necessary and any further training could be sought to reap the full benefits of the newly installed software.

Monthly reconciliations between Sage Fixed Assets (Fixed Asset Register balances) and Sage 50 Accounting General Ledger Fixed Assets and Accumulated Depreciation Accounts are recommended

to ensure completeness and accuracy. Standard Operating Procedures (SOPs) should be developed to document procedures and responsibilities for the maintenance of the Fixed Assets Register.
Retroactive approval by the Board of Governors should be sought for the change in the method of calculating depreciation.

Research

Audit Criteria

Compliance with the approved Research Work Plan

Audit Results

At the time of the audit, the level of completion of research projects varied. There was a slow turnover of submission of reports by researchers for review, amending after different levels of review and final approval. This was due to a number of challenges during that period including the COVID -19 restrictions which hindered fieldwork.
There was a challenge in comparing budgeted costs to actual costs for all research projects examined.

Conclusion and Recommendations

All efforts were to be made to have the researchers complete reports. A review of the project job codes in the Accounting system is recommended to better capture all project related costs.

Petty Cash Count at 30 September 2021

The Petty Cash Count was completed on 30 September 2021 for the various petty cash floats at the IMA with no issues noted.

PART 5

HUMAN RESOURCE and DEVELOPMENT PLANS

5.0 HUMAN RESOURCE DEVELOPMENT

In alignment with the IMA's Strategic Plan 2019-2024 the Human Resource Department (HRD) has been supporting the organisational change and capacity building through the following Human Resource Management approaches:

5.A. Organisational Establishment Recruitment processes

The HRD has been looking after the recruitment needs of the Institute, which includes interviewing and selecting new hires, to ensure the Institute has the right staff in place at the right time to execute its mandate. To do so a human resource programme geared at ensuring that the Institute has the right level of human assets, with the experience and capabilities necessary to successfully execute the strategies has been put in place. This also includes determining when recruitment is necessary in each department as well as if the hire is a benefit to the Institute and that the potential candidates can fit with the company's culture.

New hire on-boarding - In addition to the recruitment process of seeking potential candidates, the HRD ensures that newly hired employees are inducted and oriented to assist settle them in to mitigate/avoid workplace issues in the future.

Employee management - The HRD places emphasis on keeping employees grounded by maintaining employee satisfaction, employment engagement and even maintaining workplace atmosphere. The Human Resource Department utilises simple and effective employee engagement ideas to assist in getting employees engaged through recognition and commemoration of various events/ occasion celebrated the world over, celebrating small wins, advocating employee well-being, heath, and safety.

5.B Category of Employees and Human Resource Planning and Staffing

In keeping with the organisation chart, the Human Resource Department will fill all positions with individuals who are assessed by the Institute to be capable of discharging the duties and responsibilities of the post in a competent, effective and efficient manner and to the required standard.

To achieve the objectives outlined in this strategic plan the senior management positions ought to be filled on a long-term, permanent basis. The vacant positions of Principled Research Officer are required to be filled with experienced and competent professionals who can provide leadership and guidance to the staff of the Institute, subject to availability of funding.

There are some types of expertise that the Institute would only be able to recruit if the IMA is allowed to offer compensation packages in keeping with market rates. For such a position, the Institute, with Ministerial permission, would have to offer the position on contract. For the sake of continuity and institutional strengthening managerial positions should be offered on a permanent basis subject to a probationary period.

Innovative means of securing necessary expertise will continue to be utilised, for example:

- Collaboration with the Ministry of Education and the Ministry of labour for specific resources.
- Affiliating with the University of West Indies and The University of Trinidad and Tobago.
- The Research Fellowship Programme as a means of encouraging the development of specialised skills in the various areas of study, while at the same time harnessing the resource to assist in the research activities.

- The Summer Internship Programme gives university students the opportunity to get involved and assist in research activities and thereby encourage students to consider careers in marine research.

Compensation and Benefits

The Institute is funded by the government and as a result the levels of salaries and allowances are constrained by pay levels in the public service which in turn are affected by the dramatic economic circumstances of the day.

All efforts are being made to amicably conclude negotiations on all outstanding Collective Agreements i.e. 2013 – 2016 and 2016 to 2019. The HRD will continue to calculate for payment and record all claims for Overtime and Compensatory Time earned. The Institute in providing benefits (non-cash element of the total compensation package) to employees meets a heavy cost. Group Health Insurance, Pension Plan, Life Insurance, EAP, Commuting Assistance, staggered work hours, subsided loans and advances, special allowances and uniforms are some of the benefits enjoyed by the staff.

The HRD will continue to review the present programme of benefits to ensure that the needs of the employees are being met and to ensure that each benefit is supportive to achieving the Institute's strategies, goals and desired organisational culture.

The HRD undertook a comprehensive job evaluation and compensation exercise that is tied to the Institute's strategic Plan to ensure that senior positions, which do not fall under the Bargaining Units, are properly compensated based on the reasonable market value of the jobs. The recommendation of which was submitted to the Ministry of Planning and Development for onward submission to the Human Resource Advisory Committee.

5.C. Career Path Systems - Training and Development

Training and development is one of the ways to improve the company's employee engagement. Continuing the education of established employees and constantly upgrading their skills and knowledge is the responsibility of the human resources department.

Ongoing employee training is vital for the Institute to maintain its level of expertise, professionalism, relevance and skill. Where possible the Institute would provide support in the form of partial funding or assist in locating external funding.

Due to limited funding, the HRD was required to find/create different types of training and programmes, to ensure that their employees are equipped and educated. Notwithstanding the financial constraints, employees and even management need a refresher course occasionally. The HRD continues to work in collaboration with other departments to achieve the goals and maintain the standards of the company and its value.

Research Staff are again encouraged to pursue higher research degrees and would be allowed to use the research they undertake at the IMA to assist them in this regard. Where it is necessary that staff attend full-time study, the Institute may consider the granting of study leave in conformity with the policy on Study Leave.

The new organisational structure proposes that the post of Secretary be upgraded to that of Administrative Assistant. The Institute has pledged to support the present secretarial staff to acquire the necessary higher-level skills through participation in the APS Diploma Course at UWI.
In keeping with the strategic objective to obtain laboratory accreditation, laboratory staff have been undergoing training in the requirements of such accreditations.

Opportunities for undertaking collaborative research with scientists in the Latin American countries are always available. With the hosting of the RAC at the IMA it would be advantageous if staff be bilingual. The Institute would encourage and support its staff to learn Spanish.

The Human Resource Department continues to work with the department heads to determine the skills/competence gaps and to develop training strategies to reduce and/or eliminate these gaps wherever possible.

5.D. Performance Assessment – Management Strategies

To ensure organisational excellence and high levels of productivity and performance the existing Performance Management System will continue to be utilised more effectively as staff and managers become more familiar with the System. All employees have been educated about their role, function, and what they are accountable for i.e. Key Performance Indicators and Key Behaviour/Competence Areas. The Human Resource Department has facilitated the developing of key targets, performance planning, interim reviews and the final closeout of performance appraisal processes.

Industrial Relations

The Seamen and Waterfront Workers' Trade Union is the recognised bargaining agent for the Institute's staff. The Institute continues to have good relations with the Union and it is anticipated that this relationship would be maintained through good human resource management. Through the Human Resource Department, the Institute together with the Union will maintain effective arrangements for negotiations, consultations, communication and the settling of grievances.

The Human Resource Department has been able to oversee the proper implementation of the terms and conditions agreed to in the Collective Agreements.

Human Resource Policy Development

The existing Personnel Policy Manual was upgraded to a Human Resource Policy Manual. The Human Resource Department ensured that the policies and procedures embraced and reinforced the philosophies and values of the desired organisation culture in line with human resources best practice.

The Human Resource Policy Manual is also in alignment with the IMA's Collective Agreement, the labour laws of Trinidad and Tobago and contemporary best practices. An Employee Handbook, summarising these policies, has been produce, to be distributed to all staff.

Employee Relations

The Human Resource Department was able to promote and encourage employee wellbeing and work life balance initiatives. The Human Resource Department hosted a Health Fair for employees and Managing Work/Life Virtual Session.

The Human Resource Department will continue to extend personal Birthday greetings to staff and provide timely information for posting in the IMA's Newsletter regarding staff achievements and successes. All successes will be highlighted and celebrated throughout the Institute.

5.F. Employee Support Services

The Human Resource Department will continue to administer the Group Plans namely, the Group Health Plan, Travel Insurance and Group Life Plans. The department will continue to administer employment, industrial and executive medicals and the issuance of staff uniforms (including field gear).

The department's role as the official liaison with the Employee Assistance Programme (EAP) Service Provider and Chair of the EAP Steering Committee will continue. As part of the EAP activities, educational workshops to promote mental and emotional wellbeing will be delivered. Other activities to promote greater use of the programme will also be undertaken.

Health and Safety

The HRD, through participation on the Health and Safety Committee, would continue to monitor/ oversee the health and safety of workers at the Institute to create a safe working environment.

Human Resource Information System – (HRPLUS)

In keeping with the Strategic Plan to create paperless and seamless approval systems, the Human Resource Department along with the Information Technology Department have been working closely with HRPLUS Team to have the computerisation of Leave Administration Online Self-Service Module implemented.

Employees would be able to directly query the system for details on their leave balances, medical coverage and other personal information. Managers would also be able to query the system for employee information needed to assist them in efficiently managing staff. Properly implementation of this online self-service module of HRPLUS would allow the human resource staff to focus more attention on strategic matters.

PART 6

PROCUREMENT PROCEDURES

IMA Procurement Annual Report 2020/2021

For fiscal 2020/2021 the Institute of Marine Affairs (IMA) focused on implementing Operational Level Planning. The IMA benefited by achieving its objectives of promoting transparency and accountability while identifying procurement risks and determining how you will mitigate those risks. This process provided the IMA with a procurement strategy to reduce the transaction cost by creating procurement frameworks for 80% of the leverage purchases. The IMA recognised the need to properly manage their preventative maintenance schedules, which assisted in reducing their transactions costs under the following categories; security services, janitorial services, insurance, IT contracted services, and some areas of repairs and maintenance buildings for example; the servicing of the generator (on compound and vessel), air condition units (split and centralised), freezer/chiller, elevator, fire extinguishers, fire alarm, well services, personnel hygiene bins, and pest control services.

In addition, it provided a clear justification for our procurement decisions and completed the procurement process quicker and easier. The IMA also increased its pool of vendors by conducting market research to ensure competitiveness in our procurement strategies. This strategy achieved value for money and reduced the risk of supply since more vendors are available on the market by extension maintaining constant communication with suppliers during the contact management stage.

Major projects for 2020/2021

The Public Sector Investment Programme (PSIP) funded projects for fiscal 2020/2021 to continue achieving the IMA strategic objectives:

1. Construction of New Facilities of the Institute of Marine Affairs. The funding received $1,000,000.00 for this project will be utilised for the implementation of phase V of the project to ensure that administrative staff is removed from the potential human health risk due to the presence of mould, mildew, and faulty electrical infrastructure in building five.

2. Construction of a Marine Field Station and Interpretive Centre at Pigeon Point Heritage Park. The funding received $1,000,000.00 will be used for hiring a project management consultant and begin the design phase of this project. This strategic objective when complete will provide an opportunity to expand the tourism product from one of recreation to one of learning and active participation in marine conservation efforts.

3. Development of the Mariculture Industry in Trinidad and Tobago. The funding received $599,109.00 will be used for operationalisation of the Mariculture facility which will be completed internally by the Fisheries department. The Development of the Mariculture Industry in Trinidad and Tobago is to promote mariculture production through applied research which will investigate the use of various forms of mariculture production systems and species and determine areas most suitable for these activities to occur.

Training Initiatives

The IMA attended the following workshops hosted by the Office of Procurement Regulations “the OPR” in anticipation of the full proclamation of the Public Procurement and Disposal of Public Property Act 2015, as amended (“the Act”):

1. Roll out of Training Standards to ‘named’ Procurement Officers on September 28, 2021

2. Roll out of Training Standards, Competence Levels, and Certificate Requirements to Education Institutions on September 30, 2021

3. Developing the Annual Procurement Plan November held on 2-3 2021.

4. Procedures Adopted in Line with Legislation

The IMA continued preparation of the Readiness Assessment Checklist sent by the OPR Office in January 2020 to ensure compliance with the Public Procurement and Disposal of Public Property Act, 2015 (as amended) by implementing the following:

- The IMA assessed to determine procurement capacity needs and began developing the internal control framework as outlined in the handbooks and guidelines from the OPR Office.
- Establish Procurement and Disposal Function & Inform the OPR of the 'Named' Procurement Officer
- Appoint Procurement and Disposal Advisory Committee (PDAC) & Disposal Committee.

Disposal of Assets

The Institute of Marine Affairs sought approval in October 2020 from the Ministry of Finance for the disposal of five vehicles and two vessels that have become derelict. The vehicles/vessels have been non-operational for an extended period and in this regard, the Board of Governors in June 2020 approved the sale of items via public auction.

PART 7

PUBLIC and COMMUNITY RELATIONS

7.0 Public and Community Relations 2020-2021

The Information Centre

As the main source of information produced by the IMA, the Information Centre (IC) is responsible for promoting a public understanding of and fostering a public appreciation for all aspects of the coastal and marine environments of Trinidad and Tobago, as articulated in Act No. 13 of 1990. Working with the Directorate and the Research Programmes, the Information Centre, as the public face and voice of the IMA, engages in partnerships with governments, non-governmental organisations and the business sector, reaches out to key stakeholders, schools, tertiary-level establishments and the media, and maintains a library that disseminates publications and electronic information resources.

Consistent with the United Nations (UN) Sustainable Development Goal No. 14 – '**Live Below Water'**, and Goal No. 4 – '**Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all'**, the IC spearheaded and focused on achieving the strategic objectives and deliverables espoused in the Institute's 2019-2024 Strategic Plan under the following different categories for the period October 2020 to September 2021.

A. Client and Public Access to Services

i. Services using Traditional Media – Radio Broadcasts
ii. Services using Traditional Media – Newspaper
iii. Services using Digital Media - social media and Website
iv. Library information service

B. Community, Stakeholder Engagement and Outreach

C. Strategic Partnerships (local, regional and international)

7.A Client and Public Access to Services

Communications play a crucial role in not only supporting the research analyses undertaken by the IMA but also represents a primary vehicle through which the public can be sensitised to the challenges and issues facing our coastal and marine resources and of the evidence-based solutions undertaken by the IMA to address them. In 2019, the Institute's Chief Information Officer prepared a Strategic Communications Plan to support the strategic objectives of the IMA, provide a vehicle through which IMA research analyses can be disseminated to stakeholders, sensitise the public and strengthen the Institute's brand. Beyond raising awareness, communication outputs (ministerial policies and research publications) also serve to aid government in formulating policies on varied aspects of the coastal and marine environments.

The Strategic Communications Plan identified six main communications mediums to package and convey the Institute's environmental messages with the aim of engaging the public based on demographics. The communication medium identified include the following – audio, visual, written, virtual, social media and face-to-face. One of the key elements of the Institute's Strategic Communications Plan is the use of traditional media (radio and newspapers), which remains an effective communication tool in the 21st century and social media, which has solidified as a major choice of communication medium along with other digital platforms with the younger generations.

For the period under review, traditional media of radio broadcasts and newspapers and digital media were used to raise awareness to an array of topics on the marine environment including but not limited to wetlands (coral reefs, mangroves and seagrasses), coastal and marine pollution

(micro- and macro-plastics), integrated coastal zone management, coastal erosion, water quality, beach safety, aquaculture, mariculture and fisheries. Traditional and digital media, which briefly documents deliverables attained for FY 2021, comprise the following:

I. Traditional Media - Radio Broadcasts
II. Traditional Media – Newspapers
III. Digital Media – Social media and Website

I. Traditional Media – Radio Broadcast Programmes

While trends in technology and new media continue to emerge, radio remains one of the most effective ways to reach a firm's target audience owing to its adaptability (radio is accessible on mobile phones and devices via livestream services, smart speakers and computers) and portability (mobile phones and devices and smart speakers are easy to transport owing to size).

During the COVID-19 pandemic, the IC continued the production of radio programmes for the Institute's Beyond-the-Blue Radio Broadcast Series, which commenced in 2019. Funded by Republic Bank, the Institute's Chief Information Officer successfully produced seventeen (17) radio broadcasts under the theme, '**Beyond the Blue Season III**; **The Ocean and You: Increasing your Ocean Literacy'** from the comfort of her home. That 2021 marked the first year in the Ocean Decade (UN Decade of Ocean Science for Sustainable Development 2021-2030), the objective of the radio programmes was to foster an understanding of the connectedness between oceans and marine spaces, promote awareness of the economic and livelihood value of marine spaces and, promote an awareness of the role scientists and civil society play in preserving, conserving and adequately utilising the blue assets (coastal and marine resources) for the benefit of all. To this end, seventeen (17) radio programmes were produced and broadcast by the Chief Information Officer, Ms. Alicia Carter-Fisher and subsequently aired on I95.5 FM and Radio Tambrin 97.2FM (Tobago) for the period under review. A list of the topics of the radio programmes can be viewed in Appendix (00) on Page (XX).

As the radio programmes continue to enjoy widespread success among various demographics, all the topics were aired on mainstream radio stations I95.5FM (Trinidad) and Radio Tambrin (Tobago) to raise awareness to ocean health issues. These broadcasts, which contribute to the Institute' rich tapestry of scientific research and information, have been uploaded and audio-archived on the website (www.ima.gov.tt) for discussion, for further research and form an integral part of the Institute's corporate memory and products delivered to the public.

II. Traditional Media – Newspaper Articles

Consistent with the Centre's mandate to foster an appreciation for all aspects of the marine environment among the public, the Library coordinated the publication of thirty-two newspaper articles in three national circulating newspapers through the development and implementation of a newspaper editorial content plan. Guided by the objectives of the Research Programmes Work Plan 2018-2020 and approved by the Director (Ag.), the newspaper editorial content plan comprised an itemised list of marine environmental topics set to a calendar for the timely submission and release/ publication of articles. For the period under review, twenty-two (22) newspaper articles, which were researched and written by staff of the Information Centre and Research Programmes, were submitted and published a total of thirty-two (32) times in three national circulating newspapers (Daily Express, Newsday and the Trinidad and Tobago Guardian) and one online platform – LoopTT. These articles were also uploaded on the Institute's website and the following websites in an effort to expand reach to online stakeholder communities in the delivery of information services;

- Institute of Marine Affairs – www.ima.gov.tt
- Ministry of Planning and Development website – www.planning.gov.tt

- Arthur Lok Jack Global School of Business – www.lokjackgsb.edu.tt
- National Library and information System Authority (NALIS) – www.nalis.gov.tt

All published articles included the logo of the IMA which enhanced the Institute's brand messaging and stakeholder recognition. Please see Appendix (00) on page (xx) for a list of titles of newspaper articles published for the period under review.

III. Digital Communications

Digital communications incorporate the use of digital tools to effectively communicate with stakeholders, staff and members of the public. A rapidly growing communication channel, digital communications continue to be cost-effective resulting in it being the most preferred medium/ platform for communication, particularly by government agencies and ministries. The following section captures a snapshot of the performance of digital communication in supporting the Institute's strategic goals and research objectives for the period October 1st 2020 to September 30th, 2021. The section is further divided into the following categories;

a. Website Management Performance; and,
a. Social Media Performance

a. Website Management Performance (www.ima.gov.tt)

The website of the IMA has been developed with the objective to promote the research output (publications and data) of the four research programmes, to raise awareness on marine environmental issues, provide conservation solutions and advice to these environmental issues, disseminate pertinent research-based, scientific information and provide information on the Institute's public education and awareness/outreach activities.

As a main source of service delivery, the Institute's website (www.ima.gov.tt) is quickly becoming a main platform to engage new visitors and stakeholders, connect with existing online communities and retain current stakeholders, measuring the performance of its website/web page has become a strategic issue.

To measure performance, Google Analytics was used to provide an overall snapshot of the website's audience (visitors and users) and their activity through a dashboard. This is usually done by tracking key performance indicators such as page views, bounce rates and referral traffic. The dashboard helps to also measure visitors' and users' data to optimise for website usage efficiently. The following dashboard measures the Institute's web page (www.ima.gov.tt) performance in communicating its environmental messages to external members of the public for the period 1st October 2020 to 30th September 2021.

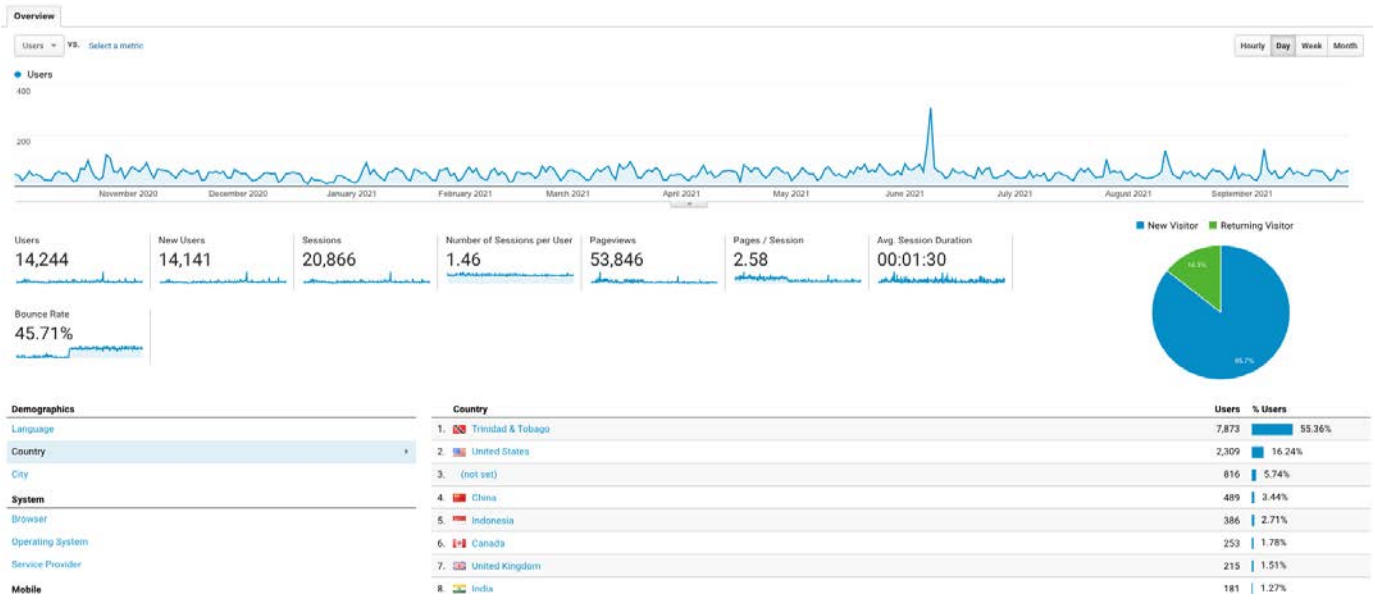
The following image provides a graphical illustration of the geographical location on the number of visitors to the website as it reveals where visitors to the IMA web page are geographically located. Based on the illustration at the side, the majority of returning visitors who accessed the website more than once were from Trinidad with 7,873 users, followed by the United States in second place with 2,329 users.

Pageviews

Pageviews help to measure the frequency with which users viewed the IMA website or loaded specific webpages, quantifies the engagement from its audience, assess the popularity of relevancy of the information uploaded and generally measure various performance metrics. From 1st October 2020 to 30th September 2021, there were 53,846 pageviews.

New Users or Visitors – Out of the **20,866** sessions for FY2021, a little over **14,000** new or unique visitors accessed the web page based on the illustration. Unique visitors are more valuable than returning visitors as it shows the IC's successful efforts to expand its reach to new visitors. The sessions and unique visitors peaked in **the month of June 2021** which coincided with the virtual Beyond the Blue Distinguished Lecture and Panel Discussion event, which was held on the June 8th 2021, drawing numerous visitors to the website.

Engagement – Based on the graphical illustration generated from Google Analytics, the average **bounce rate of 35.3%** was near to optimal as this can be attributed to the virtual Beyond the Blue Distinguished Lecture and Panel Discussion event and the Beyond the Blue Radio Broadcasts uploaded onto the website. The bounce rate of 35.3% recorded in the latter months of FY2021 means that visitors were spending time on landing pages and clicking on available links.



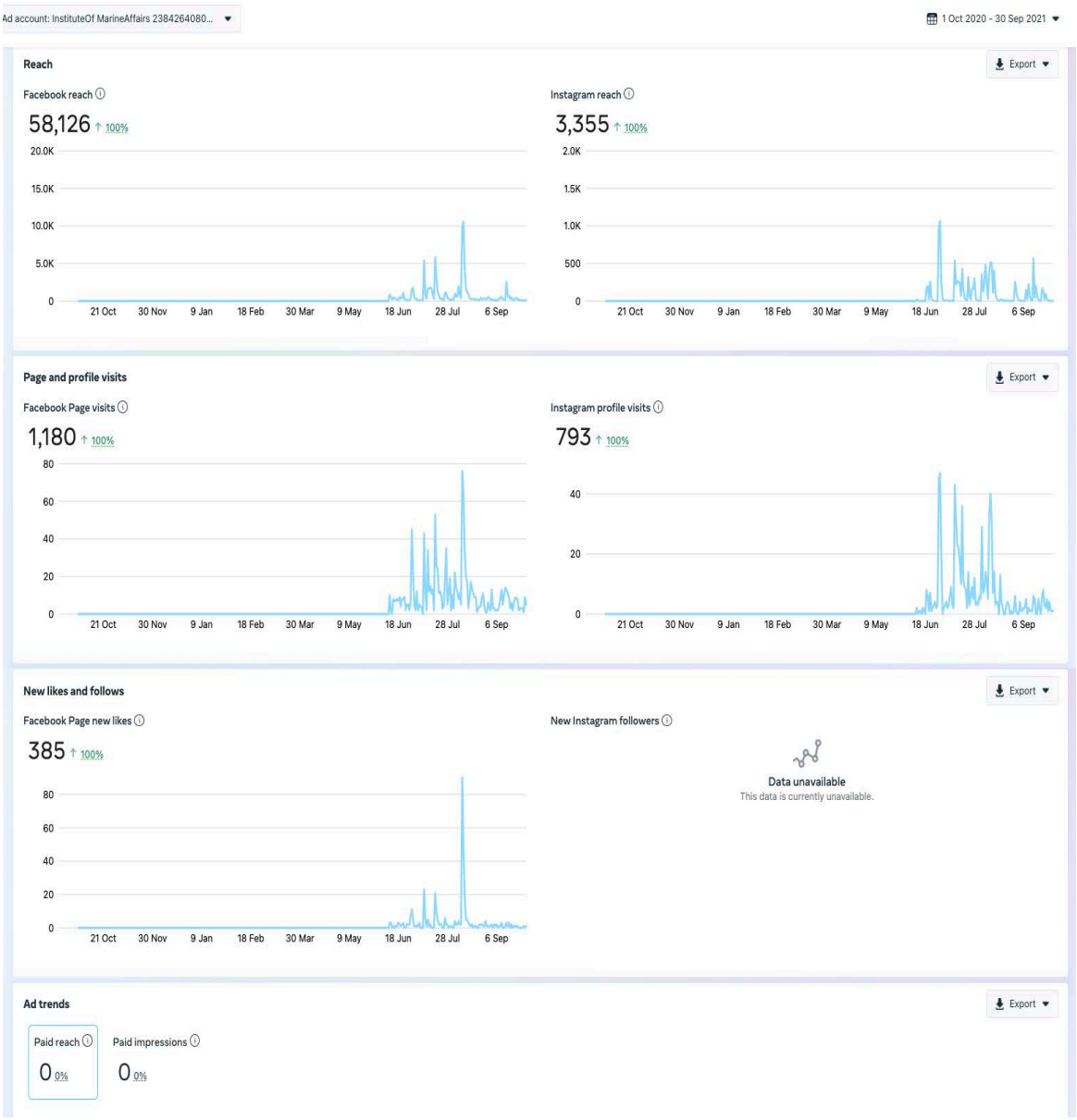
Geographical location of online users
Source: Google Analytics

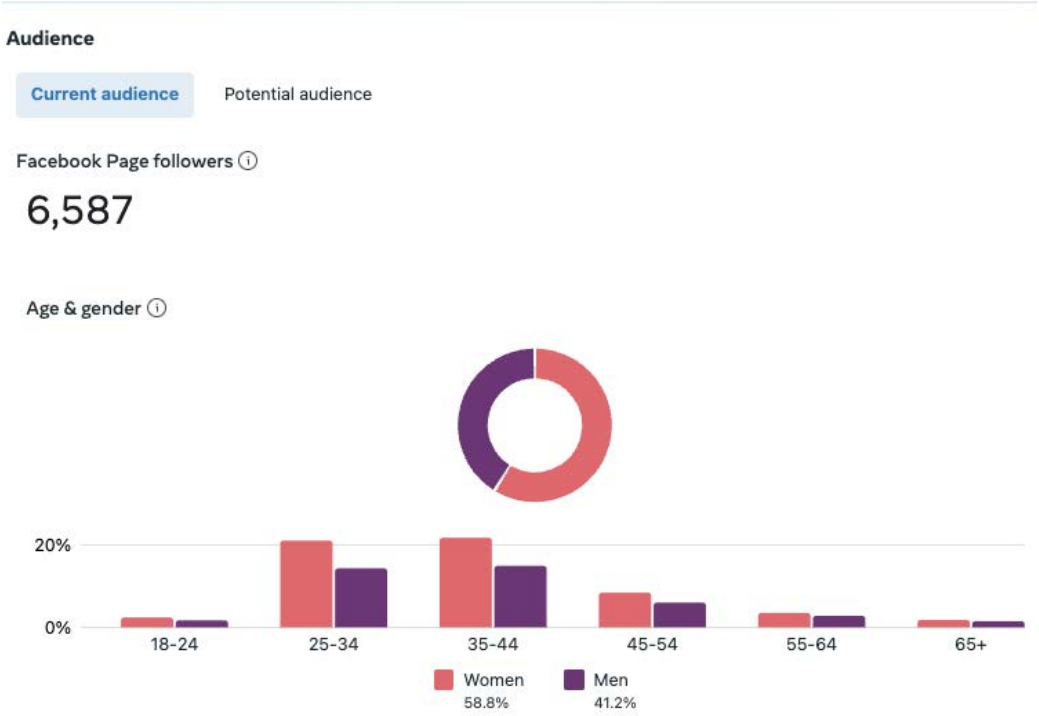
b. Social Media Management

Social media has become so widespread in its use that government ministries utilise this digital channel to connect and communicate effectively with key stakeholders and members of the public. In FY2021, the IMA continued to use social media to promote its research output, raise awareness to the United Nations (UN) environmental observances and to expand reach to users and persons with an interest in marine environmental science. Social media continues to represent an opportunity for the IMA to grow its audience in a quick and cost-effective means through the provision of timely and relevant content. In FY2021, the IMA maintained an active presence on four primary social media platforms: Facebook, Instagram and YouTube.

Facebook – With billions of users across the world, Facebook continues to be the most widespread social media tool used by government administration, business, industry, homemakers and the IMA to communicate with stakeholders and general public. The following represents analytics for the period under review.

- Page followers – 66,587
- Page visits – 1,180
- New Page Likes – 385
- Total Reach – 58,126





Audience insights helped the IMA to determine the demographics (age and gender) of users whom we would have engaged with the environmental messages (infographics and videos, etc.)

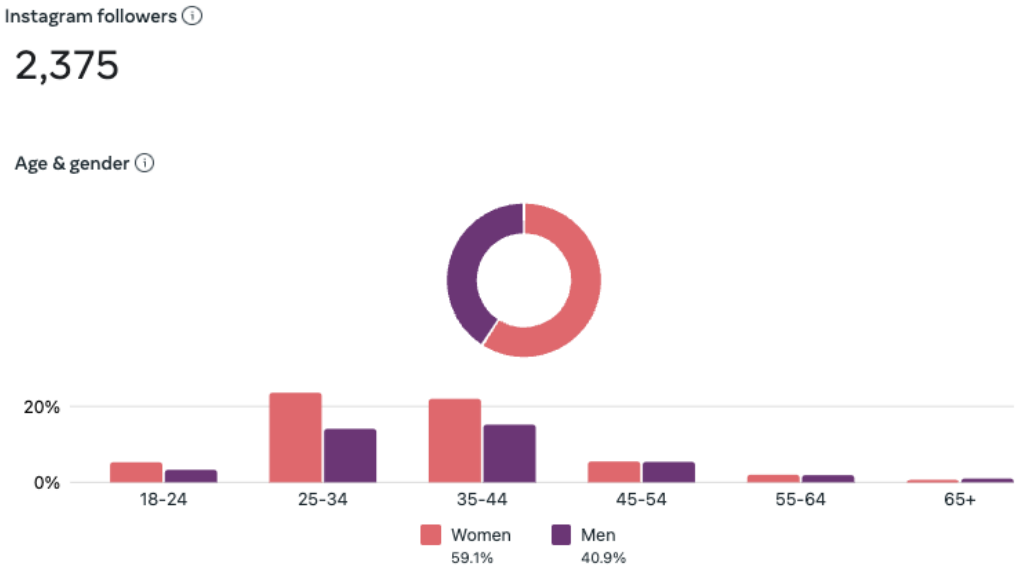
YouTube - YouTube remains the top video platform in the world with over 1.5 billion monthly users. Uploading home-grown educational videos on marine environmental issues, produced by the IMA, provides the opportunity for environmental messages to be shared, disseminated in the hope of bringing changes in attitudes to how society views its precious marine resources. The following analytics refer to the period under review.

- YouTube **11** Subscribers – **19** likes and comments
- YouTube Posts -**3**
- Followers -**160**
- Total Posts – **5**
- Total Impressions: **9602**

- Total Engagements (Likes, Comments, shares)
    - **49.4Watch** time (hours)
    - 1625 Views
    - 1:49 Average view duration
- Top Posts
    - **756 views**
    - **23.3 Watch** Time(hours)
    - View duration 1:52 (minutes)
    - 40.6% - Average percentage viewed

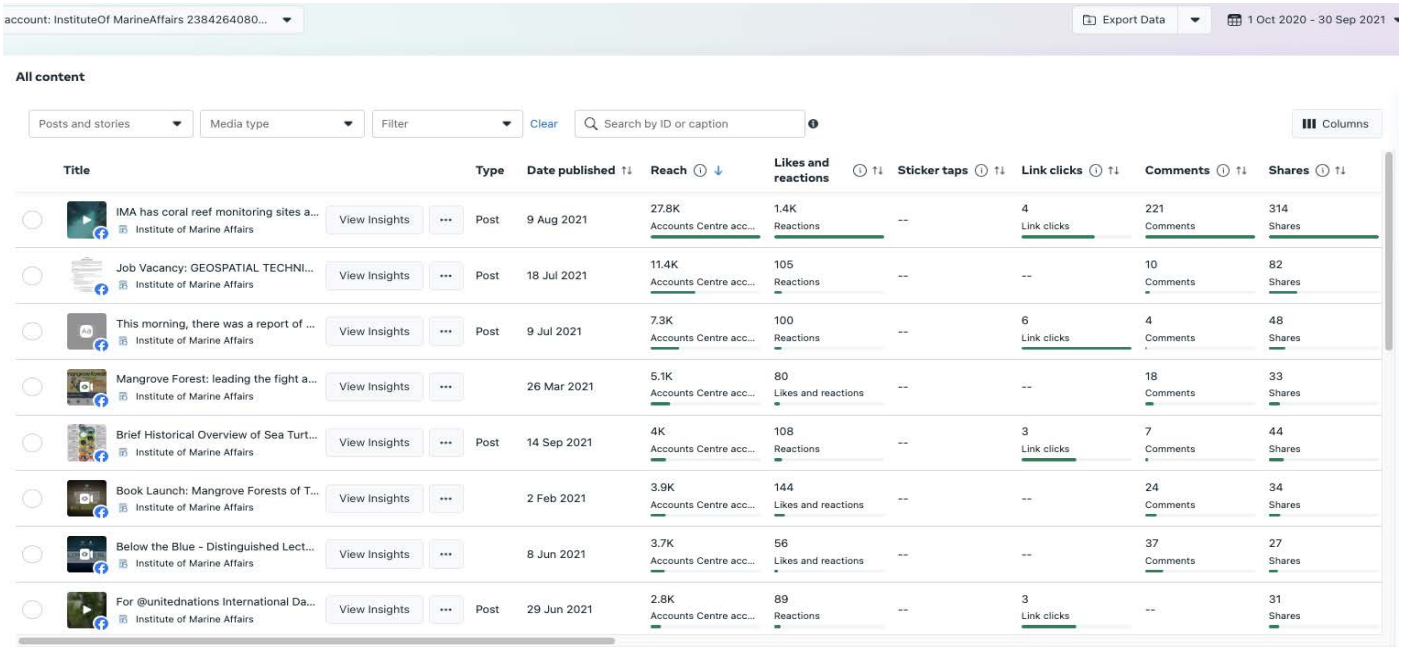
Instagram - For the period under review, the Institute's Instagram account recorded 793 profile visits which reflects the number of times that our profile was viewed and recorded a reach of 3,355 persons who read content posted on the social media account.

Demographics – According to Pew Research Centre, Instagram is the preferred social media platform for Internet users aged 16 to 24 years. For the period under review, the preferred age group and gender for engagements was the 25 to 44 age group and preferred gender recorded was women. This information lets IMA whom we are engaging and the age group which helps in creating and curating relevant marine environmental messages.



Instagram age demographics FY 2021

The following image shows the Institute marine environmental posts that were most likely reached.



IV. Library and Information Services

In alignment with Goal No. 14 – Life Under water, which is articulated in Theme V of the Government of the Republic of Trinidad and Tobago's National Development Strategy – Vision 2030, the Institute of Marine Affairs (IMA) Library Unit continued to meet the research objectives and information requests of the support departments through the provision of a comprehensive cache of relevant and current information resources.

This section onwards documents the achievements and contributions made by the Library Unit for the fiscal period October 2020 to September 2021. For readers' convenience, the fiscal period is referred to as FY2021 throughout this section, which is organised under the following sub-headings.
- **Library Management; Library Operations; and Library Services.**

Library Management

Charged with the responsibility to provide a current and comprehensive cache of varied formats of information that support the Institute's strategic direction, meet the relevant needs of the research programmes and support departments, the Library continued to provide a virtual information service amid COVID-19 (coronavirus) pandemic for FY 2021. As the pandemic worsened from month to month during the first six months of 2021, the librarian responded to the COVID-19 pandemic with the use of Information Communication Technologies (ICTs) that would provide a continued virtual access of information to users during the national lockdown and ensure the continued online acquisition of electronic resources.

COVID-19 Library Response

- Further to the public announcement of the suspension of all non-essential public and private businesses, sporting and recreational activities by Dr. the Honourable Keith Rowley, Prime Minister of the Republic of Trinidad and Tobago from March 2021 and onwards, the IMA Library temporarily closed its public walk-in information service to staff and members of the public in an effort to prevent the spread of this highly contagious and deadly illness.
- Correspondence informing of the Library's closure due to health and safety concerns related to the COVID-19 pandemic were sent via e-mail to five key stakeholders and several public and special libraries throughout Trinidad and Tobago.
- Notices informing of the availability of the Library's Virtual Information Service following its physical closure to public walk-ins were uploaded on the Institute's website www.ima.gov.tt and posted on the Institute's Facebook social media account. Although physically closed to users, the Library ensured its sustainability during this period through the provision of a virtual information service.
- In accordance with the COVID-19 Guidelines and Regulations articulated in the Public Health Ordinance {2019 Novel Coronavirus (2019-CoV) (No. 32) Regulations, 2020, signage depicting compulsory wearing of face masks or coverings and six feet physical distancing were erected inside the library. This was undertaken to protect the health and safety of staff. The signage would remain erected and kept intact until there is provision to change them as guidance adapts and as health protocols and rules change.
- To keep connected with Staff during the national pandemic lockdown, the Librarian ensured that marine environmental, related information products and other general fun activities were downloaded and disseminated to staff and their families while at home during the lockdown**.**

MINISIS M2L Database

The Library's database combines the functions (acquisitions, cataloguing, and serials management) into a unified a system with an online public access catalog (OPAC) interface available only to staff. Discussions were held with CHACH Instruments, the sole regional service provider of the MINISIS database system, to upgrade the interface, include one social media account and to enhance access to full text publications for remote users. As the national pandemic lockdown, which took place

from 27th March to 16th June 2020, helped accelerate several private and government businesses to offer their services online. the Library has started working with the service provider to provide an improved information service to remote users.

Library Operations

Library operations refer to the acquisition, cataloguing and classification and storage of information resources. The following highlights the major operational activities undertaken to advance the research objectives and public education awareness thrust in FY2021.

Library Key Performance Indicators – 2018-2021			
Fiscal Periods	**2018-2019**	**2019-2020**	**2020-2021**
Library Services – Activity	**Total**	**Total**	
Circulation of IMA Publications	**41**	**61**	**54**
Staff Users of the Library	**45**	**28**	**33**
Queries ▪ Internal Queries ▪ Public Walk-in Queries ▪ Structured Groups (Schools and public) ▪ E-mail Queries ▪ Website Queries ▪ Social Media Account Queries	216 (65) (52) (31) (53) (11) (04)	118 (41) (03) (00) (62) (08) (04)	165 (64) (01) (00) (74) (14) (12)
Data Requests	**03**	**04**	**02**
Freedom of Information Requests	**02**	**02**	**03**
Physical Displays / Exhibitions	**4**	**0**	**0**
Electronic Displays	**6**	**1**	**2**
Library Space used for Meetings	**48**	**0**	**0**
Library Operations			
New Publication (Gratis) Additions	**20**	**07**	**03**
Downloaded publications	**31**	**75**	**84**
Cataloguing and Classification of publications	**53**	**76**	**69**
Digitization of IMA Research Reports and other publications	33	14	45
Newspaper Clipping Articles	277	281	264
Feedback and Evaluation			
Assess the helpfulness and friendliness of Library Staff	**77%** very satisfied **23%** somewhat satisfied	**70%** very satisfied **while 22%** somewhat satisfied and **8%** no comment	**81%** very satisfied while 19% were satisfied
Assess overall library service	**54%** very satisfied **22%** satisfied **24%** somewhat satisfied	**65%** very satisfied while **35%** somewhat satisfied	**83%** were satisfied with **11%** were satisfied **and 6%** somewhat satisfied
Assess the relevance and currency of content	**48%** very satisfied **52%** partially satisfied	**52%** very satisfied, **33%** somewhat satisfied and **25%** not satisfied	**76%** were satisfied, **20%** partially satisfied and **4%** not satisfied

Table 1: IMA Library Key Performance Indicators Fiscal 2018-2021

Collection Development

A total of 116 publications were added to the Library's collections of which 84 publications were downloaded from open access peer-reviewed websites, 3 items received via traditional print mail, and one item was received via an e-mail resource sharing arrangement with The Environmental Management (EMA) Library. As the IMA Library has an active resource sharing arrangement with The Alma Jordan Library of The University of the West Indies, not much information was shared due to the closure of the University Library. It should also be noted that downloads from the ScienceDirect Elsevier Pre-paid Download Bundle was under utilised as staff were unable to access the articles due to connectivity issues.

Library Service

Despite the worsening challenge of COVID-19 pandemic, the Unit continued to provide a virtual information service to all staff with several free scientific journal downloads, access to family e-book classics for download and dissemination of electronic recipes as staff and their families worked from home.

While there was just one walk-in request from the Library which was addressed in the shortest possible time, all other information requests were acknowledged and addressed with relevant attachments using virtual platforms (Zoom; wetransfer.com and Google Meets). For the period under review answered eight research queries via WhatsApp and recorded its highest number of information requests (74 in total) which were addressed in a timely manner with full text attachments, ten more than the previous fiscal period (FY 2020). It was noted that more persons opted to use web mail (library@ima.gov.tt) and WhatsApp platforms to request information, which were all addressed in a timely manner. This trend demonstrated that while the public walk-in service was temporarily closed, the virtual system increased in use and can reflect an emerging trend for the IMA Library. It was noted that users took more time to provide feedback to the two-minute surveys which were sent after each external query was received garnering positive overall feedback for the Library's virtual information service.

The Elsevier ScienceDirect Pre-paid Bundle Service was provided to all Research Officers with an introductory training seminar that was conducted virtually. Each research officer was given a passcode with his/her email as evidence of staff working from home to have access to twenty-seven article downloads each. The librarian was charged with the responsibility of managing the use and delivery of articles upon request.

To replace the annual library exhibition which are normally mounted to engage internal staff for the UN-declared Environmental Days, the Library used social media – Facebook to virtually host a World Mangrove Day Word Search Word Game Puzzle in 2021. The objective was to engage staff and members of the public on the growing significance and importance of mangrove wetlands for man's well-being and economic development. Twelve (12) persons participated in the virtual word search and six persons submitted correct and completed sheets. The Winners were sent congratulatory messages with attachments of e-books via email. Please see Appendix (00) for the blank Word Search Puzzle game.

7.B. Continuous Stakeholder Engagement

The Strategic Communications Plan stated that the process of continuous stakeholder engagement is critical to engaging different perspectives, providing learning opportunities and in some cases building capacity on all aspects of the marine environment whereby stakeholders, mainly as experts in their field, are engaged to contribute to the decision-making process before any implementation is carried out.

For Fiscal 2020-2021, the IC engaged several stakeholders using virtual and face-to-face communication channels.

I. IMA Second Virtual Distinguished Lecture and Panel Discussion – June 8th, 2021

The Information Centre convened its second virtual Distinguished Lecture and Panel Discussion on June 8, 2021, to commemorate World Oceans Day. Titled, "***Below the Blue: Exploring the Caribbean Deep and Harnessing its Benefits***", the online distinguished lecture, which highlighted the benefits of deep-sea ecosystems to the Caribbean region, was delivered by Professor Judith Gobin, Dean of the Faculty of Science and Technology, of The University of West Indies (UWI). Distinguished lecture programs enable experts in the field to share their knowledge, expertise, and insights on the marine environment. Broadcast live on radio I95.5FM and streamed live on the Institute's social media accounts of YouTube and Facebook, the event had a wide appeal with online participants joining from over twelve (12) countries (including Bahamas, Barbados, Colombia, Jamaica, Puerto Rico, United Kingdom, United States), and with participants from the United States White House, International Oceanographic Commission (IOC), government ministries, academia, the private sector and several non-governmental organisations (NGOs).

Chaired by the Institute's Chief Information Officer, **Ms. Alicia Carter-Fisher**, the virtual event was well attended, bringing together over two hundred and ninety-five (295) online participants. Highlighting the need for collaboration as the way forward to benefit from deep blue assets, the distinguished lecture offered participants an opportunity to engage with leading experts and re-initiated the conversation on the conservation of deep-blue assets.

Caption: Faunal Species found on the sea floor off the North East Coast off Trinidad and Tobago
Source: Professor Judith Gobin

In her lecture, Professor Gobin engaged participants with underwater videos and imagery taken of fauna and flora from the ocean and on the seabed to depths from 1,500 to 2,100 metres. These visuals were taken from her 72-hour deep-sea ocean research expedition in 2014 off the north coast of Trinidad and Tobago, when she was invited by the Exploration Vessel (E.V.) Nautilus to explore the southern Caribbean, including the southeast coast of Tobago. In her lecture, she noted that deep-sea research expeditions are crucial to uncover and share new data such as the eighty-seven (87) new species which were discovered in the dark depths of the ocean between Trinidad and Tobago.

She further opined that knowledge of deep-sea biodiversity, mineral and metal deposits, hydrocarbons, and chemicals and enzymes is critical as these being used frequently in the production of cosmetics and cancer pharmaceuticals. She continued to underscore the importance of deep-sea research for the region as new knowledge can also help mitigate climate change and contribute to policy formulation and management decisions addressing extractive industries such as hydrocarbon extraction and deep-sea mining.

She concluded that the distinguished lecture planned by the IMA on the deep blue sea could not be more timely, relevant and helpful in exploring the benefits to be derived from the deep-sea as the international community observed World Ocean's Day while reflecting on the objectives of the United Nations Decade of Ocean Science and Sustainable Development 2021-2030. The Panel discussion following the distinguished lecture highlighted various benefits to deep-sea research from the following experts:

- **Professor Marcel Jaspars of the University of Aberdeen United Kingdom** who discussed "*The Opportunities and Challenges for the Exploitation of Marine Genetic Resources by Small Island Developing States with Measures to Overcome those Challenges*."

- **Mr. Kahlil Hassanali** (PhD Candidate Sweden & IMA Researcher) who introduced online participants to "*The Ongoing United Nations Negotiations for Treaties to Manage the Utilisation of Blue Assets (biodiversity) in Areas of the Oceans beyond National Jurisdictions and CARICOM's Negotiation Position*."

- **Mr. Torsten Theile** who explored "*Engaging Science and Business to Explore the Deep: Innovative Finance for Ecosystem Conservation, Restoration and Sustainable Economic Development*."

- **Dr. Diva Amon**, Deep-Sea Biologist with over fifteen deep-sea explorations to her credit, is attached to the United Kingdom Natural History Museum delivered a moving presentation that focused on "*The Regulations and Policy Considerations that must be Enacted in order to Protect the Deep-sea Marine Environment and their Sensitive Ecosystems*."

- **Dr. Alan Leoanardi**, Chief Executive Officer of the Consortium for Ocean Leadership and former Director of NOAA Office for Ocean Exploration and Research, who discussed the benefits to "Collaboration: The Key to Sustainably Advancing Ocean Science, Development, and Conservation."

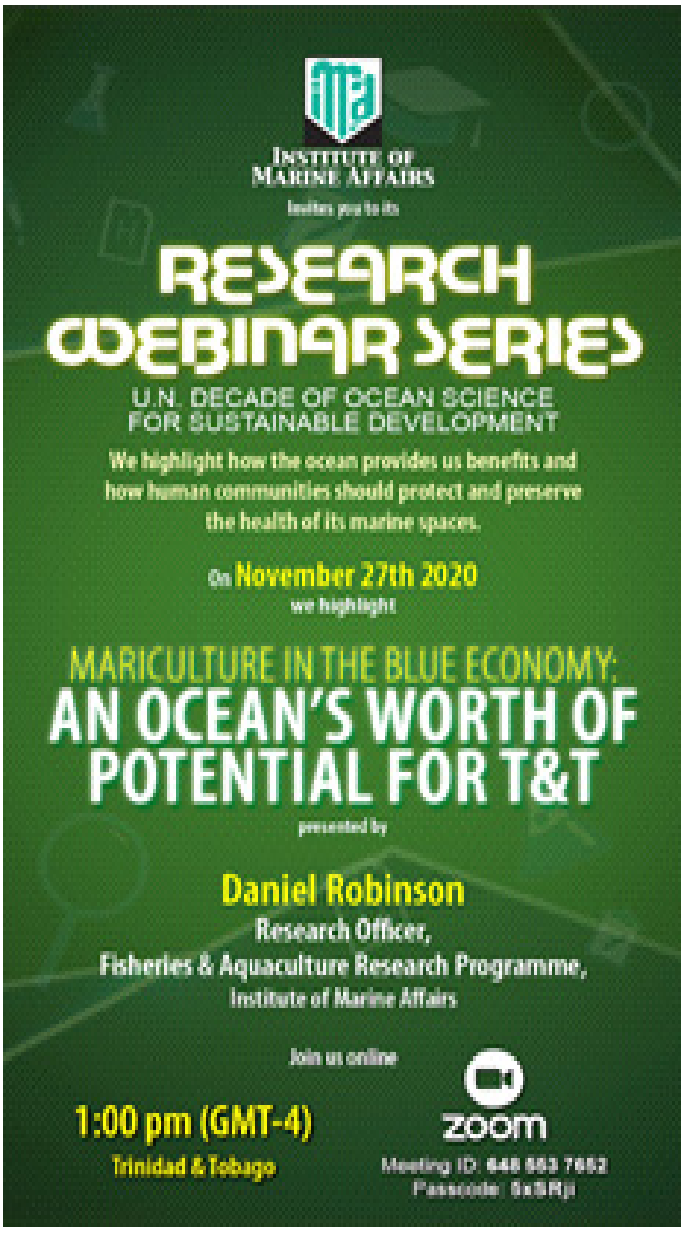
Sponsored by the Republic Bank Limited (RBL), the distinguished lecture is the second such event hosted by the IMA to focus on the conservation of marine biodiversity as an integral component of the United Nations Decade of Ocean Science for Sustainable Development 2021-2030. It follows the previous and highly successful first virtual Distinguished Lecture in 2020, which focused on the possibility of the blue economy fostering economic diversification away from a mainly petroleum economy.

II. Virtual Research Webinars

Despite national lockdowns and severe travel restrictions implemented globally to curtail the spread of the COVID-19 pandemic, the Information Centre continued stakeholder engagement activities when it hosted a series of virtual research webinars to staff and external stakeholders from November 2020 to May 2021. The objective was to primarily share the research findings of ongoing research projects undertaken by the IMA on coral reef resilience in Tobago and mariculture in Trinidad.

Coral Reef Ecologist, **Dr. Anjani Ganase**, presented on '*Assessing Coral Reef Resilience in Tobago'* on November 11, 2020

Research Officer, Fisheries & Aquaculture Research Programme, **Mr. Daniel Robinson**, presented on '*Mariculture in the Blue Economy: An Ocean's Worth of Potential for T&T*' On November 27, 2020



III. Virtual Booth at Integrated Water Resources and Coastal Symposium

Engaging over fifty (50) individuals from the public, the Information Centre presented its first virtual booth at the **Integrated Water Resources and Coastal Symposium** from March 17-19, 2021. Hosted by the Ministry of Works and Transport (MOWT) in collaboration with the Coastal Protection Unit (CPU), the Water and Sewerage Authority (WASA) and the Water Resources Agency (WRA) under theme, '*Island Life: from Water from Ridge to Reef*' the three-day virtual event was well attended despite COVID-19 pandemic restrictions. The IC donated several copies of it recently published publication titled, the '**Mangrove Forests of Trinidad and Tobago'** to Coastal Dynamics for prizes to be won during the symposium.

IV. Launch of IMA 2021 publication - 'The Mangrove Forests of Trinidad and Tobago.'

In commemoration of World Wetlands Day on February 2, 2021, the Information Centre hosted a virtual book launch, unveiling the publication titled, '*Mangrove Forests of Trinidad and Tobago*'. The publication descries the various types of mangrove trees that are indigenous to Trinidad and Tobago with a comprehensive description of the geographical distribution of this wetland ecosystem dispersed across the twin-island state. Authored by the Director (Ag.) of the Institute of Marine Affairs, Dr.Rahanna Juman and research officers – Mr. Hamish Asmath, Ms. Nikia Gooding and Mr. Gyasi Collins - the publication explores the unique flora and fauna associated with mangroves and provides sound tips on mangrove conservation.

(L-R) (Krystal Ganaselal Information Officer/ Public Relations IMA) (Dr Rahanna Juman Director (Ag.) of the IMA) (Paula Greene, executive director (ag.) (Primati Persad, Director Educational Library Services Division (ag.) and Cherylann Quamina –Baptiste, Director Heritage Library Division (ag.) of NALIS.

On February 23, 2021, the IMA presented the National Library and Information System Authority (NALIS) with one hundred and sixty-two (162) copies of this recent publication at NALIS, Port of Spain, reinforcing its commitment to public education and awareness. In presenting the books, Dr. Juman said, "Mangrove forests play a critical role in maintaining healthy ecosystems and help in mitigating climate change. Hence, we need to protect and conserve mangrove forests for our sustainable future". With the theme for World Wetlands Day 2021 titled, 'Wetlands and Water", she said "mangroves are among the more powerful nature-based solutions of fresh water". She further expressed hope that this new publication would help sensitise readers on conservation efforts to protect mangroves, which she described as being "among the most threatened ecosystems in the world". Executive Director of NALIS (Ag.), Ms. Paula Greene, expressed her gratitude for the donation on behalf of NALIS. She said, "It is the remit of NALIS to collect and preserve the intellectual memory of Trinidad and Tobago for future generations and so we are indeed truly elated and appreciative when organisations write and contribute to the national repository".

V. SeaiTT App - Mobile Application Launch

Mobile applications are empowering persons to collect scientific data (pictures, scans, and data) with the use of their smartphones and share this data from anywhere and at any time. The IMA is committed to the process of citizen science, working with communities and allowing the public to collect and send data to the IMA, allowing participation in scientific projects. On November 6, 2020, the Institute of Marine Affairs, in association with the Caribbean Industrial Research Institute (CARIRI) launched its mobile application – SeaiTT app. Developed by CARIRI, the SeaiTT app is an integrated software solution which features three components; (1) an app that features a web app for the benefit of users to report marine and chemical environmental incidents to the IMA; (ii) an environmental incident monitoring platform that facilitates the Institute's monitoring and management of data received by the public; and (iii) an integrated data analysis platform.

VI. IC Publications

In fostering a public appreciation for all aspects of the coastal and marine environments in Trinidad and Tobago through the research output (reports) conducted by the six Research Programmes, the IC continues to produce the following three publications to engage key stakeholders and staff.

- **External Newsletter** – Titled, **'IMA News'**, the Institute's triannual newsletter provides articles on the latest developments and findings in research undertaken by the IMA, public education and awareness activities and school outreach. From a deep dive into the coral reefs off Tobago, back on land to the mangrove forests, to the testing of water quality at our beaches across Trinidad and Tobago including the 'Deep Blue Corner' that presents factual tidbits, there is always new research to explore and factual information to discover and learn. Three issues of the IMA News (April 2021; August 2021 and December 2020) were designed, produced, and disseminated to all the Institute's stakeholders and uploaded on to the website for ease of public reference and archival storage.

- **IMA Tidal Calendar** – The Information Centre has, for the past twenty-one (21) years, been producing an annual tidal calendar, which predicts low and high tides at various locations (Port of Spain and Galeota) across Trinidad and Tobago. For the period under review, IC produced the 2021 tidal calendar under the UN Ocean Decade theme, 'UN Decade of Ocean Science for Sustainable

Development 2021-2030. The calendars were delivered to several third-party agents (bookstores) for sale, presented to key stakeholders and staff.

- **Internal Newsletter** - Titled **'IMA Wave'**, the Institute's internal newsletter, which provides a record of in-house activities – research workshops and seminars, staff activities to commemorate the observances of United Nation (UN) environmental days and years, etc. staff activities and events - is produced on a monthly basis with an internal appeal only. For the period under review, three web-based newsletters produced by the Communications Assistant, Ms. Alicia Kwok, were temporarily prepared and disseminated to all staff from October to December 2020 while an electronic format was produced in June 2021 and disseminated to all staff via email. All issues continue to be disseminated and subsequently archived for corporate memory.

VII. Public Awareness and Outreach

Virtual School Outreach - The COVID-19 (Novel coronavirus) pandemic has had a major impact on the education system in Trinidad and Tobago for the duration of Fiscal 2021. While the Government of the Republic of Trinidad and Tobago used the UNESCO Framework for Reopening Schools in April 2020, schools were closed a month later in May 2020 owing to the deleterious effects experienced with the spread of the virus. The closure of schools and tertiary-level institutions in adherence to the Public Health [2019 novel Coronavirus (2019-n-CoV)] (No. 7) Regulations 2021, forced the Outreach arm of the Information Centre to conduct face-to-face outreach in schools across Trinidad and Tobago.

Despite this major setback, the Information Officers resorted to virtual engagement to conduct school outreach activities. Using virtual platforms (Zoom), the Information Officers successfully delivered presentations on Water Quality Testing and Coastal processes to approximately seventy-five (75) online students from three schools - **Bishop Anstey High School – Port of Spain, Parvarti Girls Hindu College and El Dorado East Secondary School**

Virtual Career Fairs - Career Fairs are an essential part of school outreach as school pupils and students are engaged from an early age on several aspects of ocean literacy. While ocean literacy does not guarantee a change in mindset or behaviour towards the conservation of coastal and marine resources, being ocean literate sometimes goes beyond our thought processes and daily actions that can contribute to conserving oceans. Ocean literacy can also include teaching pupils and students on how to conserve and also inspire them to have such a deep connection and passion to ocean and marine conservation that they aspire to read careers in marine sciences. Using virtual platforms (zoom), the information officers delivered presentations on careers in marine sciences to approximately one hundred and sixty (160) students over two three-day periods in the South East Educational and St. Patrick Educational District for the periods April 14-16 and May 4-7, 2021, respectively.

Public Outreach - During the height of the pandemic, the Information Officers continued to deliver virtual presentations to key stakeholders on several United Nations declared environmental days and observances. For the period under review, the Information officers delivered virtual presentations to approximately thirty-five (35) employees of Shell Trinidad and Tobago Inc. to commemorate World Environment Day on June 5th and World Oceans Day on June 8th, 2021. Presentations were delivered to **Scouts TT** on 4th August 2021. Approximately seventy (**70)** scouts attended the two sessions on 'Food Webs and Chains' and 'Careers in Marine science'. Pre-recorded sessions were also prepared and shared with the organisation on "Careers in Marine Science', 'Climate Change', 'Coral Reefs' and 'Marine Pollution'.

7.C. Strategic Partnerships (Local, Regional and International)

Strategic Partnerships – local

Due to chronic budgetary constraints, the IMA is under constant pressure to do more with less. To this end, the IC has partnered with Republic Bank Limited – a title sponsor - to produce key messages that focus on varied aspects on the conservation of marine and coastal environments and resources. Funded by Republic Bank, the Institute's Chief Information Officer successfully produced seventeen (17) radio broadcasts under the theme, '**Beyond the Blue Season III**; **The Ocean and You: Increasing your Ocean Literacy'** from the comfort of her home. That 2021 marked the first year in the Ocean Decade (UN Decade of Ocean Science for Sustainable Development 2021-2030), the objective of the radio programmes was to deliver the scientific information and data we need for the ocean we want.

Strategic Partnerships – International

IMA is a member of the National Planning Committee of Trinidad and Tobago and partners with the Caribbean Network for Integrated Rural Development (CNIRD), Co-Ordinator of the Ocean Conservancy's International Coastal Cleanup. IMA's representative participated in a pilot cleanup and data collection exercise at Chacacharare on Friday 27th November 2020. Due to the COVID-19 pandemic, with restrictions, a pilot exercise was conducted, comprising one representative from various agencies, compared to larger previous events. IMA's representative also participated in a second clean up exercise at Chacachacare on 19th March 2021, with all protocols observed.

APPENDICES

APPENDIX ONE

Research Report Publications

Kishore, Rosemarie et al. ***Age and Growth Studies of the Marine Invasive Lionfish (Pterois spp.) From an Early Invasion in Tobago Waters. Draft Report,*** 2021.

Banjoo, Darryl. ***Report on the Fingerprinting Analyses on Oil Samples Collected from Vessel FSO NABARIMA in the Gulf of Paria, Venezuela***. Chaguaramas: Institute of Marine Affairs 2020.

Banjoo, Darryl. ***Baseline Nutrient Pollution of the Guyamara and Cunupia Catchment of the Caroni River Basin***. Chaguaramas: Institute of Marine Affairs, 2020.

Banjoo, Darryl. ***State of the Marine Environment Report 2020 – Water Quality Component***. Chaguaramas: Institute of Marine Affairs, 2020.

Ganase, Anjani. ***Benthic Composition of Coral Reefs of Tobago in 2019, and Summary Report 2010 – 2019***, 2020. Chaguaramas: Institute of Marine Affairs, 2020.

Gooding, Nikia and Thompson, Ruqayyah, ***Assessing Land Reclamation: The Use of Shoreline Analysis. Draft Report***. Chaguaramas: Institute of Marine Affairs, 2020.

Maharaj, Ben et al. ***An Agricultural Survey of the Guayamare and Cunupia Watersheds, Trinidad. Final Report 2020 submitted to CLME+ Secretariat***. Chaguaramas: Institute of Marine Affairs, 2020.

Nelson, Wendy. ***State of the Marine Environment Report 2020 – Heavy Metals and Plastic Pollution Components***. Chaguaramas: Institute of Marine Affairs, 2020.

Solomon, Farahnaz and Wendy Nelson. ***Assessment of Heavy Metals in the Blue Land Crab (Cardisoma guanhumi) from the Caroni Swamp Final Report: submitted to CLME + Secretariat***. Chaguaramas: Institute of Marine Affairs, 2020.

Thompson, Ruqayyah. ***Operationalising ICZM through MSP: The North-West Peninsula Pilot Project. Draft Report***. Chaguaramas: Institute of Marine Affairs, 2020.

Research Proposals

Ganase, Anjani and Attish Kanhai. ***Assessing the Feasibility of Coral Reef and Seagrass Restoration and Rehabilitation in Tobago Research Proposal to British Petroleum of Trinidad and Tobago.*** September 2021. Typescript.

Ganase, Anjani. ***Coral Reefs of Trinidad and Tobago Book Research Proposal to be Sponsored by Shell Trinidad and Tobago Limited***. August 2021. Typescript.

Ganase, Anjani et al. ***Drift into the Blue, Unity for Humanity Research Proposal***. June 2021. Typescript.

Robinson, Daniel. ***Mariculture Development Programme: Feasibility Study of Culture Techniques for Marine Finfish in Trinidad and Tobago Research Proposal***. June 2021. Typescript.

Ganase, Anjani and Attish Kanhai*. Assessing the Feasibility of Coral Reef and Seagrass Restoration/Rehabilitation in Tobago (UNEP/ICRI concept note) Research Proposal.* March 2021. Typescript.

Ganase, Anjani et al. *The Institute of Marine Affairs Marine Biodiversity Hub, GBIR Research Proposal.* March 2021. Typescript.

Ganase, Anjani. *Coral Spawning in Tobago, SES Explorer Award for Inspirational and Scientific Trailblazing Research Proposal*. February 2021. Typescript.

Ganase, Anjani. *Marine Ecosystem Assessment and Rehabilitation Plan Consultancy, Pigeon Island, Pointe Sable Environmental Protection Area, St. Lucia Research Proposal*. December 2020. Typescript.

Environmental Incident Reports

Banjoo, Darryl. *Report on the Fingerprinting Analysis on Oil Samples Collected from Vessel FSO NABARIMA in the Gulf of Paria – October 2020*. Chaguaramas: Institute of Marine Affairs, 2021.

Technical Reports

United Nations Environment Programme. *Regional Nutrient Pollution Reduction Strategy and Action Plan for the Wider Caribbean Region*. UNEP/CEP, 2021.
(Authors: L. Talaue McManus; Sherry Heileman; Christopher Corbin; Darryl Banjoo)

Ramoutar, Sheldon. *Bathing Beach Water Quality at Maracas and Las Cuevas Beach*. Chaguaramas: Institute of Marine Affairs, 2021.

Ganase, Anjani. *Kilgwyn Seagrass Habitat Assessment*. Chaguaramas: Institute of Marine Affairs, 2021.

APPENDIX TWO

Beyond the Blue Radio Broadcast Series Season Three: Ocean Literacy

Miller, Margaret. "Building Coral Reef Resilience." Interview by Alicia Carter-Fisher. *Beyond the Blue Radio Series*, 21 September 2021, https://www.ima.gov.tt/2021/09/21/beyond-the-blue-season-3-episode-17/.

Miller, Margaret. "Effect of Climate Change on Coral Reefs." Interview by Alicia Carter-Fisher. *Beyond the Blue Radio Series*, 14 September 2021, https://www.ima.gov.tt/2021/09/14/beyond-the-blue-season-3-episode-16/.

Richard, Kyle. "The Leatherback Turtles – Endangered Species." Interview by Alicia Carter-Fisher. *Beyond the Blue Radio Series*, 8 September 2021, https://www.ima.gov.tt/2021/09/08/beyond-the-blue-season-3-episode-15/.

Banjoo, Darryl. "Marine Pollution Threats to our Ocean Health – Part One" Interview by Alicia Carter-Fisher. *Beyond the Blue Radio Series*, 8 August 2021, https://www.ima.gov.tt/2021/08/24/beyond-the-blue-season-3-episode-14/.

Banjoo, Darryl. "Marine Pollution Threats to our Ocean's Health – Part Two." Interview by Alicia Carter-Fisher. *Beyond the Blue Radio Series*, 17 August 2021, https://www.ima.gov.tt/2021/08/17/beyond-the-blue-season-3-episode-13/.

Nelson, Wendy. "Marine Pollution: Threats to our Ocean's Health – Part Three." Interview by Alicia Carter-Fisher. *Beyond the Blue Radio Series*, 14 August 2021, https://www.ima.gov.tt/2021/08/14/beyond-the-blue-season-3-episode-12/.

Nelson Wendy. "Marine Pollution: Threats to our Ocean's Health – Part Four". Interview by Alicia Carter-Fisher. *Beyond the Blue Radio Series*, 3 August 2021, Beyond the Blue - Season 3 Episode 11 - IMA.

Kishore, Rosemarie. "Threats to the Fisheries Sector." Interview by Alicia Carter-Fisher. *Beyond the Blue Radio Series*, 27 July 2021, https://www.ima.gov.tt/2021/07/27/beyond-the-blue-season-3-episode-10/.

Kishore, Rosemarie and Alexander Girvan. "Livelihoods and Food Security: Contributions of our Oceans to the Fishing Sector." *Beyond the Blue Radio Series*, 22 July 2021, https://www.ima.gov.tt/2021/07/09/beyond-the-blue-season-3-episode-9/.

Girvan, Alexander. "Economic Potential for our Oceans." Interview by Alicia Carter-Fisher. *Beyond the Blue Radio Series*, 29 June 2021, https://www.ima.gov.tt/2021/06/29/beyond-the-blue-season-3-episode-8/.

Amon, Diva. "Deep Sea Debris." Interview by Alicia Carter-Fisher. *Beyond the Blue Radio Series*, 29 June 2021, https://www.ima.gov.tt/2021/06/29/beyond-the-blue-season-3-episode-7/.

Amon, Diva. "Deep Sea Resources." Interview by Alicia Carter-Fisher. *Beyond the Blue Series,* 29 June 2021, https://www.ima.gov.tt/2021/06/29/beyond-the-blue-season-3-episode-6/.

Amon, Diva. "Deep Sea Ecosystem Characteristics." Interview by Alicia Carter-Fisher. *Beyond the Blue Radio Series*, 29 June 2021, https://www.ima.gov.tt/2021/06/29/beyond-the-blue-season-3-episode-5/.

Nanlal, Cassandra. "Ocean Features and Impacts on Life on Earth." Interview by Alicia Carter-Fisher. *Beyond the Blue Radio Series Episode 4*, 28 June 2021. https://www.ima.gov.tt/2021/06/28/beyond-the-blue-season-3-episode-4/.

Nanlal, Cassandra. "Ocean: Ecosystem Services and Biodiversity." Interview by Alicia Carter-Fisher. *Beyond the Blue Radio Series*, 28 June 2021, https://www.ima.gov.tt/2021/06/28/beyond-the-blue-season-3-episode-3/.

Nanlal, Cassandra. "Oceans: Value to Earth". Interview by Alicia Carter-Fisher. *Beyond the Blue Radio Series*, 28 June 2021, https://www.ima.gov.tt/2021/06/28/beyond-the-blue-season-3-episode-2/.

"Introduction to Beyond the Blue Season III: Ocean Literacy. Hosted by Alicia Carter-Fisher. *Beyond the Blue Radio Series*, 4 May 2021, Beyond the Blue - Season 3 Episode 1 - IMA.

Newspaper Articles (October 2020 – September 2021)

Kishore, Rosemarie. "Reducing Fishing Sector's Vulnerability through Diversity." Cari-Bois, [Port of Spain], 9 Sep. 2021

Kishore, Rosemarie. "Diversity Key to Reducing Vulnerability." Guardian, [Port of Spain], 3 Sep. 2021, p. 25.

Kishore, Rosemarie. "Reducing Fishing Sector's Vulnerability through Diversity." Newsday, [Port of Spain], 2 Sep. 2021, p. 22.

Kishore, Rosemarie. "Diversity Key to Reducing Shortfalls in Fishing Industry." Trinidad Express, [Port of Spain], 26 Aug. 2021, p. 28.

Kishore, Rosemarie. "Reducing Fishing Sector's Vulnerability through Diversity". Newsday Tobago, [Port of Spain], 26 Aug. 2021, p. 10.

Thompson, Ruqayyah. "A Safe Ocean." Newsday Tobago, [Port of Spain], 12 Aug. 2021, p. 10.

Thompson, Ruqayyah. "A Safe Ocean." Guardian Tobago Digest, [Port of Spain], 6 Aug. 2021, p. 23.

Thompson, Ruqayyah. "Towards a Safe Ocean." Trinidad Express, [Port of Spain], 5 Aug. 2021, p. 29.

Juman, Rahanna. "International Day for Conservation of Mangrove Forests." Guardian Tobago Digest, [Port of Spain], 30 July 2021, p. 23.

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Ganase, Anjani "Building Ocean Resilience." Guardian Tobago Digest, [Port of Spain], 25 Jun. 2021, p. 22.

Kanhai, Attish. "No Place like a Mangrove Forest." Trinidad Express, [Port of Spain], 24 Jun. 2021, p. 27.

Kanhai, Attish. "There is no Place like a Mangrove Forest". Guardian Tobago Digest, [Port of Spain], 18 Jun. 2021, p. 23.

Nanlal, Cassandra. “A Predicted Ocean.” Guardian Tobago Digest, [Port of Spain], 11 Jun 2021, p. 23.

Solomon, Farahnaz. “UN Dedicates Decade to Eco Restoration.” Trinidad Express, [Port of Spain], 5 Jun. 2021, p. 26.

Aleisha, Dennie. “Marine Macroalgae - Pivotal Role.” Trinidad Express, [Port of Spain], 22 Apr. 2021, p. 24.

Ganaselal, Krystal. “Valuing a Precious Commodity Water.” Guardian Tobago Digest,[Port of Spain], 2 Apr. 2021, p. 23.

Jute, Alana. “The Ancient Gentle Giant the Leatherback Turtle”. Guardian Tobago Digest, [Port of Spain], 12 Mar. 2021, p. 23.

Nelson, Wendy. “We All Long for Clean Ocean”. Trinidad Express, [Port of Spain], 4 Mar. 2021, p .27.

Nelson, Wendy. “UN Decade of Ocean Science for Sustainable Development.” Guardian Tobago Today, [Port of Spain], 26 Feb. 2021, p.24.

Barrow, Lorraine. “A Tribute to Women of Marine Science.” Trinidad Express, [Port of Spain], 18 Feb. 2021, p. 27.

Barrow, Lorraine. “Salute to IMA’s Women of Science.” Newsday Tobago, [Port of Spain], 16 Feb. 2021, p. 10.

Barrow, Lorraine. “Marine Science Contributions to a Sustainable Future”. Guardian Tobago Today, [Port of Spain], 12 Feb. 2021, p. 26.

Juman, Rahanna. “Wetlands provides Water and Protection”. Newsday Tobago, [Port of Spain], 2 Feb. 2021, p. 10.

Ganase, Anjani. “UN Decade of Ocean Science for Sustainable Development 2021-30.” Guardian Tobago Today, [Port of Spain], 22 Jan. 2021, p. 24.

Juman, Rahanna. “UN Decade on Biodiversity sees Unprecedented Loss Undermining Well-being Security.” Trinidad Express, [Port of Spain], 31 Dec. 2020, p. 28.

Juman, Rahanna. “UN Decade on Biodiversity (2011-2020) Our Oceans -Where are we.” Guardian Tobago Today, [Port of Spain], 25 Dec. 2020, p. 27.

Juman, Rahanna. “UN Decade on Biodiversity and Our Oceans 2011-2020-Where are we.” Guardian Tobago Today, [Port of Spain], 18 Dec. 2020, p. 27.

Ramoutar, Sheldon. “Are you Cleaning Your Toilet Bowl Correctly.” Guardian Tobago Today, [Port of Spain], 11 Dec. 2020, p. 25.

Robinson, Daniel. “Mariculture in the Blue Economy.” Trinidad Express, [Port of Spain], 26 Nov. 2020, p. 25.

Ganaselal, Krystal. “IMA launched Lionfish App.” Trinidad Express, [Port of Spain], 24 Nov. 2020, p. 25.

Ganaselal, Krystal. “IMA launched Lionfish SeaiTT App.” Newsday Tobago, [Port of Spain], 23 Nov. 2020, p. 11.

Charles, Guischard. “Electronic Waste: An Emerging Threat to Our Marine Environment.” Trinidad Express, [Port of Spain], 29 Oct. 2020, p. 25.

Charles, Guischard. “Electronic Waste: A Threat to Our Marine Environment.” Guardian Tobago Today, [Port of Spain], 23 Oct. 2020, p. 26.

Kanhai, Attish. “Biodiversity Matters even Worms.” Newsday Tobago, [Port of Spain], 21 Oct. 2020, p. 11.

APPENDIX THREE

Training – Staff participation in local and international online training.

Training
Training in Use of the Hydro-bid Platform
Shoreline Management Training by the Danish Institute of Applied Hydraulics (DHI)
CANARI Foresight Training Scenario Series facilitated by Dr Adrian Cashman
SECORE Course Training Webinar: "Introduction to Larval-based Coral Restoration Techniques
Multi-lateral Environmental Agreements (MEAs) Negotiation Skills Training
Crash Course in the Human Dimensions of Shark Conservation hosted by the IUCN Shark Specialist Group
National Oceanic and Atmospheric Administration (NOAA) Satellite Analysis Branch, Oil Spill Monitoring Training
Coral Reef Mapping for Managers. Commonwealth Blue Charter Training Programme.
The Commonwealth Blue Charter Training - Policy Considerations when Developing a Sustainable Blue Economy
Policy Development for the Blue Economy. Commonwealth Blue Charter Training Programme
The Dynamics of Marine Ecosystems and Sustainable Management Training Course by the Association of Caribbean States (ACS)
Green Climate Fund Training Sessions hosted by the Environmental Policy and Planning Division (EPPD) and facilitated by Climate Analytics
Remote Sensing and Mapping for Coral Reef Conservation
Ecosystem Valuation Training on Valuation Methods hosted by Caribbean Natural Resources Institute (CANARI)
Practical Internal Auditing, facilitated by the TTBS Lab Accreditation Consultancy
The Blue Economy: Blue Resources Online Course
Shoreline Management Training - DHI Online Course facilitated through the Comprehensive National Coastal Management Programme
Science-Policy Interaction. Commonwealth Blue Charter Training Programme
Commonwealth Blue Charter Training on Project Proposal Development
International Development Bank (IDB) through the Inter-American Institute for Social and Economic Development (INDES): Principles for Reviewing Environmental Impact Assessments - Edition 11; Social Impact Assessment - Edition 3; Meaningful Stakeholder Engagement (Muse) - Edition 12

Staff Representation in External Committees

External Committees
The Advisory Committee on Animal Health and Welfare under the Ministry of Agriculture, Land and Fisheries.
The Basel Convention Plastic Waste Partnership Working Group.
The Blue Economy Innovation Challenge Evaluation Committee.
The Caribbean Large Marine Ecosystem (CLME)+ Region Project Steering Committee.
The Caroni Lagoon National Park and Bird Sanctuary Management Committee.
Commonwealth Blue Charter Action Groups on (1) Sustainable Blue Economy and (2) Coral Reef Protection and Restoration.
The Focal Point for the Data Buoy Cooperation Panel.
The Global Environmental Benefits Project Advisory Committee.
The Global Environment Facility Small Grants Programme (GEF SGP) - National Steering Committee (NSC) 2020- 2022.
Integrated Coastal Zone Management Inter-Ministerial Committee.
The Land Reclamation Committee.
The Marine Scientific Research Sub-Committee.
The Monitoring and Assessment Working Group to the LBS Protocol.
The National Maritime Policy and Strategy Inter-Ministerial Committee.
The National Sea Turtle Task Force.
The National Working Group- Global Environment Facility 'Implementing Sustainable Low and Non-Chemical Development in Small Island Developing States (GEF ISLANDS) Project.
The National Working Group- Inter-American Development Bank (IDB) Waste Electrical and Electronic Equipment (E-Waste) Project 'Management of E-Waste in Guyana, Suriname and Trinidad and Tobago'.
The National Working Group/Trawl Multi-Sectoral Committee for Co-Management on Bycatch Issues and Improved Livelihood Strategies in the Shrimp Trawl Fishery in Trinidad and Tobago (REBYC II – LAC Project).
The Steering Committee for the Preparation of Trinidad and Tobago Third National Communication and Biennial Update Report to the United Nations Framework Convention on Climate.
The Trinidad and Tobago National Council for Sustainable Development.
The UNEP Working Group on Marine Litter and Microplastics in Latin America and the Caribbean.
The Upstream Effluent Management Working Group.

Virtual Attendance and Online Participation at Regional and International Conferences, Symposia and Workshops from October 2020 to September

2021

Title of Workshops
Virtual attendance at the Regional Workshop on the North-western Atlantic (NWA) Leatherback Turtle Population in Preparation for the Development of an Action Plan for Trinidad and Tobago
Virtual attendance at the Ministerial Conference on Marine Litter and Plastic Pollution.
Presented as key note speaker on the topic of " *Snapshot of Marine Pollution in the Western Tropical Atlantic Region*" on the virtual session of the UN Decade Ocean Western Tropical Atlantic series "A Clean Ocean," where sources of pollution are identified, quantified and reduced, and pollutants are removed from the ocean"
IAEA NUTEC Plastics Roundtable for North, Central, South America and the Caribbean on nuclear techniques for controlling plastics pollution.
Virtual Attendance in the Tropical America's Capacity Development Co-Design Workshop. "Deep Sea Capacity Development need in the Western Tropical Atlantic (WTA) and the Eastern Tropical Pacific (ETP) for the Ocean we want" hosted by IOC-UNESCO.
Online participation in the Nineteenth Intergovernmental Meeting on the Action Plan for the Caribbean Environment Programme and the Sixteenth Meeting of the Contracting Parties to the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region Programme (IGM 19/COP16).
Commonwealth Blue Charter- Mapping Mangrove Ecosystems using Satellite Technology.
Virtual attendance to the Fifth Meeting of the Contracting Parties (COP) to the Protocol Concerning Pollution from Land-Based Sources and Activities (LBS) in the Wider Caribbean.
Virtual attendance at the Commonwealth Secretariat' 'Conservation of the Mangrove Ecosystem' to showcase how powerful satellite technology can support the conservation and sustainable management of mangroves in the Commonwealth.
Virtual attendance at the Forum on Multi-Stakeholder Platform- Marine Plastic Litter and Microplastics.
Ministry of the Environment of Peru event: "Regional views of a Global Agreement to combat marine litter and plastic pollution."
Virtual attendance at the UNEP Webinar "What does a life-cycle approach applied to address marine litter and plastic pollution look like?"
Virtual attendance at the Work Session 4: Long Term Strategy Indicator Development and Key Performance Indicators.
Virtual Launch of the Nairobi Group of Friends to Combat Marine Litter and Plastic Pollution.
Online participation in the Pre-meetings to the Ministerial Conference on Marine Litter and Plastic Pollution

Online participation in the Pre-meetings to the Ministerial Conference on Marine Litter and Plastic Pollution
Virtual attendance at the Public Webinar on Partnerships at the Marine Science-Policy Interface jointly hosted by Centre for Resource Management and Environmental Studies (CERMES) together with the Coastal Zone Management Unit (CZMU).
Virtual attendance at the IMA webinar, “Below the Blue; Exploring the Caribbean Deep and Harnessing its Benefits”- World Oceans Day.
Trinidad and Tobago Bureau of Standards World Accreditation Day Webinar S eries.
Virtual attendance at the Challenges and Opportunities in monitoring the sources and pathways of Marine Debris in the Atlantic Ocean- Marine Litter Side Event- All Atlantic Conference. Organised by GEO Blue Planet and EU4OceanOBS, in collaboration with IFREMER, IEES Ocean Engineering Society (OES), the Atlantic International Research Centre (AIRCenter) and OceanPredict.
Online participation in The Inter-American Development Bank (IDB) Compete Caribbean Mariculture Cluster Workshop.
Virtual attendance in the Work Session 3: Long Term Strategy Indicator Development - Agriculture, Forestry and Other Land Use (AFOLU) Sector, Third National Communications (TNC) and Biennial Update Report (BUR) Project.
Virtual attendance in the Work Session: Long Term Strategy Indicator Development and Key Performance Indicators, Third National Communications (TNC) and Biennial Update Report (BUR) Project.
Virtual Attendance at the Convening of Senior Officials of CARICOM on Fisheries, Law of the Sea & Marine Conservation
Virtual attendance at United Conference on Trade and Development (UNCTAD) and the Latin American and Caribbean Economic System (SELA) Webinar, ‘Promoting Substitutes and Alternatives to Plastics for Clean Waters and Sustainable Economic Development in the Caribbean Basin’.
Virtual Attendance at the Commonwealth Blue Charter Action Group Meeting: Coral Reef Protection and Restoration.
Attendance at the Ninth Meeting of the Sustainable Management of Bycatch in Latin America and Caribbean Trawl Fisheries (REBYC-II LAC) National Working Group/Trawl Multi-Sectoral Committee for Bycatch Management and Promotion of Enhanced Livelihood Strategies in the Shrimp Trawl Fishery in Trinidad held at Kapok, Chaguanas.
Online Participation in the Webinar co-hosted by the IMA, “Mangrove forests- leading the fight against climate change”.
Online participation at the Ministry of Trade and Industry webinar, “Tackling Plastic Pollution”.
Virtual participation in the Regional Activity Centre (RAC)/REMPEITC – Regional Seminar on Ballast Water and Invasive Species, Stony Coral Tissue Loss Disease Action Against Marine Pollution.
Virtual attendance in the Consultation of CARICOM National Focal Points RE: Endorsement of PROCARIBE+ Project Identification Form (**PIF)**

Online participation in the Ocean Deoxygenation workshop on Adaptation and Building Resilience,
Virtual Participation in the Caribbean Large Marine Ecosystems (CLME) + Hub Project Steering Committee Meeting
UNEA-5 Side Event Webinar: Tackling Plastic Waste Through the Basel Convention,
Virtual attendance in the Capacity Building Initiative for Transparency (CBIT) Project Validation Workshop.
Virtual attendance in the Stakeholder Meeting: North East, Tobago UNESCO Man and the Biosphere Reserve Sustainable Shark and Ray Management Plan
Virtual Attendance at the Second Meeting of the Scientific and Technical Sub-Commission of the Caribbean Sea Commission.
Online attendance at the National Webinar on “Developing Marine Spatial Planning and the Blue Economy in Trinidad and Tobago" organized by the IMA and IOC-UNESCO.
Virtual participation at the 4th Meeting of the Ad Hoc Open-Ended Expert Group (AHEG-4) on Marine Litter and Microplastics
Online participation in the UNEP webinars- Addressing Single-Use Plastic Products Pollution using a Life Cycle Approach.
Virtual participation in the Preparatory Meeting of the Ad Hoc Open-Ended Expert Group (AHEG) on Marine Litter and Microplastics.
Virtual attendance at the UK Government and Common Seas webinar, Breaking the plastic wave across the Commonwealth.
Virtual attendance at the United Nations Environment Programme (UNEP) and the International Union for the Conservation of Nature IUCN Webinar- ‘Solving the Plastic Pollution Crisis through Hot spotting: An Introduction to the UNEP IUCN National Guidance for Plastic Pollution Hot spotting and Shaping Action.’
Virtual Attendance at the Environmental Policy Planning Department (EPPD) Webinar, Marine Plastic Litter and Micro-plastics.

Presentations Delivered for the Period under Review

1. Banjoo, Darryl. "RAC IMA Long Term Strategy for Biennium 2021/2022." The Caribbean Environment Programme (CEP) - Fifth Meeting of the Contracting Parties to the Protocol Concerning Pollution from Land-based Sources and Activities. Virtual. (Keynote Speech), 26 July 2021.

2. Banjoo, Darryl. "Review on Chemical Oxygen Demand Test in the Upstream Effluent Management Working Group Meeting." The Caribbean Environment Programme (CEP). 16 July 2021, Virtual. Jamaica. Lecture.

3. Banjoo, Darryl. "IMA RAC Strategy and Work Plan 2021/2022." The Caribbean Environment Programme. 22nd June 2021, Virtual. Jamaica. Presentation.

4. Juman, Rahanna and Ruqayyah Thompson. "The Development of ICZM Policy Framework for Trinidad and Tobago." Ministry of Work and Transport. 19 March 2021. Virtual. Trinidad. Presentation.

5. Banjoo, Darryl. "Water Quality Monitoring at the Cunupia and Guayamare Watershed." Integrated Water Resources Management. 19 March 2021. Virtual. Trinidad. Presentation.

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