

# SAIMI MARITIME RESEARCH SYMPOSIUM

12 September 2024

09h00 - 16h00

Nelson Mandela University  
Ocean Sciences Campus

VENUE 5



SAIMI

SOUTH AFRICAN INTERNATIONAL  
MARITIME INSTITUTE

FUNDED BY:



NELSON MANDELA  
UNIVERSITY



# Introduction

The South African International Maritime Institute (SAIMI) is proud to present its inaugural Maritime Research Symposium, to be held as part of the Nelson Mandela Research Week on 12 September 2024. This event aims to showcase ground-breaking research conducted by the Institute, focusing on maritime issues that are key to South Africa's economic growth and development, environmental sustainability, and global connectivity. With a commitment to fostering collaboration, innovation, and knowledge dissemination and exchange, the Maritime Research Symposium will serve as a platform to engage stakeholders, facilitate dialogue, and chart the course for knowledge generation, innovation, growth and sustainability of the maritime sector.

## Objectives

To encourage dialogue on actionable solutions, innovative approaches, and best practices to navigate the evolving maritime landscape with a view to unlocking the sector's full potential.

To promote SAIMI's research excellence by showcasing research initiatives undertaken by SAIMI researchers across various disciplines of the maritime sector.

To facilitate knowledge exchange by fostering interdisciplinary collaboration and knowledge-sharing amongst researchers, industry professionals, policymakers, and academia to address complex maritime challenges.

To enhance stakeholder engagement by providing a platform for stakeholders to interact, share insights, and explore potential partnerships for advancing maritime research, education, and industry development.

## Key Highlights

Presentations by renowned experts in the maritime sector, offering insights into the latest trends, challenges, and opportunities.

Panel discussions bringing together diverse perspectives from academia, industry, government, and civil society to explore critical issues and share experiences.

Networking sessions enabling participants to connect, collaborate, and forge partnerships to drive meaningful impact in the maritime sector.

## Conclusion

The SAIMI Research Symposium 2024 promises to be a milestone event, bringing together stakeholders with a shared commitment to advance maritime research, innovation, and sustainable development. By harnessing collective expertise and fostering collaboration, the aim is to chart a course towards a more progressive, resilient, and inclusive maritime sector.

# SAIMI

## MARITIME RESEARCH SYMPOSIUM

12 September 2024

Thursday 12 September 2024

08:00 - 08:30 Coffee and Registration

Venue 5

08:30 - 10:30 Opening and Welcoming

Mr O Mtati

**A definition of the South African ocean economy and useful applications of this definition.**

Prof S Hosking

**Assessing Ecological Changes and Socioeconomic Dynamics in complex Marine Ecosystems.**

Dr A Towner

**A Review of the Ecotoxicological Effects of Microplastics in South Africa.**

Dr C Sparks

Q&A

10:30 - 11:00 TEA BREAK

11:00 - 13:00

**Fostering an Epistemic Shift through the Maritime and Local Knowledge: A contribution to Advancing the International Decade of Sciences for Sustainable Development.**

Prof Y Seleti

**From Pond to Pill: The Promise of Aquatic Plants in Medicine.**

Dr A-M Kok

**Environmental Conservation, Protection and the Sustainable Use of Marine Ecosystems and Resources in SADC and SA.**

Dr B Mubiwa

Q&A

13:00 - 14:00 LUNCH

14:00 - 16:00

**The Future of Energy is Alternative.**

Prof M Doucoure

**Review and Revision of the STCW Convention and Safe handling of alternative fuels for seafarers.**

Prof M Pourzanjani

**Investigating cybersecurity vulnerabilities on essential communications systems on maritime vessels.**

Mr T Mawer

**Addressing Water Supply Challenges through Aquifers.**

Z. Dlamini and  
M. Ntsongelwa

Q&A and Closure



# ABSTRACTS

## **A Definition of the South African Ocean Economy and Useful Applications of the Definition**

***Professor Stephen Hosking***

In any country both the private and public sectors can benefit from a fuller understanding of sustainable contribution to output (and therefore also employment) of the use of the natural resources of the ocean within the economy. The foundation for the analysis, evaluation and reporting of that contribution is a definition. This study is structured around the aim of developing a definition of the sustainable ocean economy for the purpose of analysing, evaluating and reporting its contribution for the case of South Africa. It develops a definition based on a welfare interpretation of sustainability and the feasibility of evaluating the ocean value added contribution per industrial theme or per geographic region. It recommends that the analysis and evaluation of the South African ocean economy be carried out with reference to this definition and reported in the internationally accepted framework, namely the satellite-account (to the system of national accounts). It concludes that following these recommendations will enable a fuller understanding of ocean economy contribution.

## **Assessing Ecological Changes and Socioeconomic Dynamics in complex Marine Ecosystems**

***Dr Alison Tower***

Marine wildlife tourism may be considered as a sub-sector of the tourism sector. There is little doubt that it makes a significant contribution to South Africa's GDP. The South Africa Tourism Services Association speculates South Africa's market potential is growing exponentially. Socio-economic studies on shark diving provide reason to believe it is a significant element of the composite tourism attractiveness of the local municipalities from which the shark diving sites are accessed. The South African Tourism Act number 3 of 2014 provides 'for the development and promotion of sustainable tourism for the benefit of the Republic, its residents and its visitors'. How can South African municipalities, such as Ray Nkonyeni and Overstrand, best facilitate this by taking advantage of the economic growth opportunities offered by the presence of world-class shark diving sites just off their coastlines? How can the parks and oceans and coasts sections of the national Department of Forestry, Fishing and the Environment and provincial parks and tourism departments best manage the ocean habitats and ecosystems to facilitate the exploitation of this tourism opportunities? The presentation will provide an overview of the significant changes to South Africa's coastal marine ecosystems over the past decade and review elements of the related scientific debate, explaining the advantage of addressing this type of question through a multidisciplinary framework and motivating for such a study for South Africa, utilizing insights from such a study in Australia.

# **A Review of the Ecotoxicological Effects of Microplastics in South Africa.**

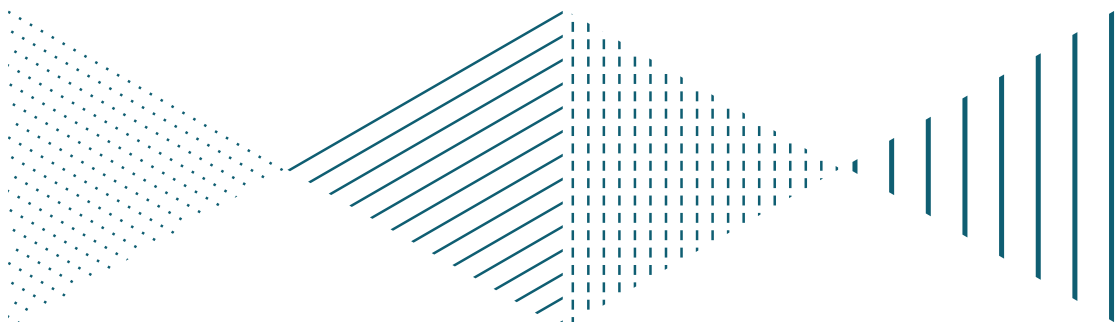
*Dr Conrad Sparks*

The increase in plastic production has resulted in more plastic litter entering ecosystems. The spillage of raw (primary) and degraded (secondary) plastics has produced an increase of smaller plastics, referred to as Microplastics (MPs) when smaller than 5 mm. MPs are present in all ecosystems and increased research efforts over the past few years have indicated that MPs are present in South Africa terrestrial and aquatic ecosystems. Although baseline studies have indicated the presence of MPs in South Africa, the ecotoxicological effects of MPs in South Africa is poorly understood. This review assesses the current knowledge of the effects of MPs in South Africa and identify areas that needs to be addressed to consider management strategies to mitigate the potential impacts of MPs in South Africa.

# **Fostering an Epistemic Shift through the Maritime and Local Knowledge: A contribution to Advancing the International Decade of Sciences for Sustainable Development.**

*Dr Yonah Seleti*

This paper will explore how an epistemology of hope based on Indigenous knowledge systems can foster an epistemic shift in the Maritime Indigenous and Local Knowledge work of the SAIMI Think Tank. The epistemology of hope does not aim to expunge the dominant western paradigms but through expansion and contribute to advancing the International Decade of Sciences. The paper argues that the institutionalisation of transformation in higher education in South Africa through discourses such as the decolonisation of the curriculum has yet to produce results leading epistemic shifts. It argues that the conceptualisation of transformation into policy making were oversimplified and reduced through the elimination of paradox and contradiction in the concept. The call for the decolonisation of the curriculum in higher education shifted attention away from the performance-oriented transformation that focused on quantitative evidence that had ignored the qualitative aspects such as the epistemological for the transformation of the research agenda and the curriculum. Lange 2014 contends that there is knowledge for transformation (the knowledge that needs to be produced in order to make change possible), and that there is knowledge of transformation (which is the knowledge we generate about transformation itself). This paper argues that the IKS knowledge for transformation in the Maritime Indigenous and Local knowledge has been inadequate to shift the epistemic discourses.



# From Pond to Pill: The Promise of Aquatic Plants in Medicine

***Dr Anna-Mari Kok***

Multi-drug resistant forms of tuberculosis and severe non-compliance is impeding total eradication of this infectious bacterial disease. Many people have been relying on traditional remedies together with the current drug regimen for the treatment of associated symptoms of tuberculosis such as coughing and chest related complaints. Toxicity to the liver seems to be a severe obstacle to ensure complete compliance with treatment. The current study focuses on selected indigenous aquatic and semi-aquatic plants found throughout the wetland and estuary regions of South Africa and their potential to act as adjuvants during the treatment of tuberculosis infection. Many aquatic plants have traditionally been used in South Africa for the treatment of bacterial infections, pain and inflammation, amongst others. Investigations into the anti-mycobacterial, antiproliferative, antioxidant and hepatoprotective activity have shown promising results for potential adjuvant treatment. The current study sheds light on the possibility of aquatic and semi-aquatic plants and their cosmeceutical and pharmaceutical potential as part of the blue economy. The results obtained from the current study and the ongoing investigations into the inhibition of inflammation and immunomodulation including nutritional analysis will further support the development of the extracts as possible adjuvants to be taken in conjunction with conventional tuberculosis treatment.

# Environmental Conservation, Protection and the Sustainable Use of Marine Ecosystems and Resources in SADC and SA.

***Dr Brian Mubiwa***

The prevailing development models – characterised by rapid growth of coastal population and human settlements, unsustainable practices (including illegal, unreported and unregulated (IUU) fishing), offshore oil and gas exploration and production, deep sea mining (DSM), climate change impacts, poor early warning systems, increased waste/pollution from land-based sources, outdated waste management infrastructure, insufficient enforcement and inadequate governance – is yielding an unprecedented convergence of interrelated environmental challenges, with adverse ripple effects on marine environments. Within this backdrop, this on going study aims to understand better, existential and emerging environmental challenges/pressures (including drivers) bedeviling Southern Africa's maritime space (oceans/seas/coasts), decipher opportunities/enablers that can be harnessed in a sustainable Blue/Ocean Economy. By extension, the study endeavours to highlight innovative and effective interventions ('low hanging fruits' / 'quick wins') to identified challenges as well as suggest key roles that SAIMI could play as a catalyst. Findings from a desktop study are augmented (and juxtaposed against) perceptions of a broad range of stakeholders across the maritime environmental spectrum. The desktop review confirmed the increased in frequency, intensity and duration of climate-induced disasters, diverse manifestations of biodiversity/nature loss and the scourge of marine plastic pollution. Juxtaposing 'what science is saying' and the insights from key informants denotes areas of convergence — climate action, biodiversity/nature action and waste/pollution action are remarkable development opportunities; but also areas of divergence — whether offshore oil and gas, and deep-sea mining (DSM) should be regarded as challenges or opportunities, significance of different challenges, and 'potentials' of different interventions. The outcome gave confirmed that a 'balancing act' is necessary — environmental conservation (and protection) should be advanced, albeit with a view to enable resource utilisation for socio-economic outcomes.

# **The Future of Energy is Alternative**

***Prof Moctar Doucoure***

Fossil fuels are increasingly impacting on sustainable development and employment. A strategic shift from fossil fuel-based energy to alternative energy is a requisite for sustainable development. This is particularly the case in South Africa considering that a significant number of Africans lack affordable energy which is inextricably linked to every other critical sustainable development goals; employment cyclicality in the fossil fuel industry is increasing with decreasing opportunity; renewable resources are moving to the forefront and could force changes to the design and operation of the national infrastructure; technology and digitalisation driving sustainability outcomes are based on the commitment to carbon-neutrality in major industries; the Renewable Energy Independent Power Producer Procurement Programme (REIPPP) is outperforming almost all targets, and is becoming the gold standard for public-private partnerships; and international trade will require alignment with net-zero targets in key export markets through regulatory mechanisms such as the Carbon Border Adjustment Mechanism of the European Union. The future of energy is thus alternative and this calls for a shift in skills development toward renewable energy and green hydrogen. Growth opportunities in refining, chemicals, steel production, glass manufacturing, and transportation underscore the potential for green hydrogen to drive innovation, create jobs, and foster economic development. The skills required for the alternative energy economy are critically technical skills and encompass the entire value chain of renewables and green hydrogen – generation/production, storage, distribution, and industrial use. In this presentation, growth in renewable energy and hydrogen economy will be used to make the case for alternative energy as the energy of the future. Riding the shifting energy tides will enable a sustainable energy-related development in (South) Africa.

## **Review and Revision of the STCW Convention and Safe Handling of Alternative Fuels for Seafarers.**

***Prof M Pourzanjani***

This presentation will provide an overview and update on the process involved with the review and revision of the STCW Convention, and areas that have been identified so far as either redundant or gaps which requires attention. One particular area that will be covered is the sea time requirement and if part of that can be covered in a simulated environment.

## **Investigating Cybersecurity Vulnerabilities on Essential Communications Systems on Maritime Vessels.**

***Mr Tshepo Mawer***

The current research study focuses on a systematic investigation into the cybersecurity incidents that have taken place in the maritime industry, specifically for maritime vessels. This paper determines a map of digital dataflow of the communication systems on a maritime vessel, and then derives insights about cybersecurity vulnerabilities in those systems through the incidents that have taken place. The research study found that the GNSS communication and the IT systems of a maritime vessels communication network were the most targeted by cyber threats.



# Addressing Water Supply Challenges through Aquifers

*Ms Zizonke Dlamini; Mr Dumisa January and Ms Mandilakhe Ntsongelwa*

Climate change has led to an increase in the frequency and intensity of natural disasters, particularly droughts, which pose a significant threat to water security globally and in South Africa. The country has faced substantial social and economic losses due to these hydro-climatic extreme events, with the agricultural sector suffering million-rand losses annually. This paper explores the potential of the utilisation of aquifers, particularly offshore aquifers, as a solution to address water supply challenges in drought-prone regions of South Africa. It provides an overview of the different types of aquifers, their characteristics, and the global context on the utilisation of offshore aquifers as an emerging water resource. The paper examines the national context of South Africa, highlighting the country's diverse aquifer systems and ongoing research on groundwater-surface water interactions. It then investigates the geological and hydrological context of the NMBM, the key water supply challenges faced, and the efforts to explore aquifers as a potential solution. While offshore aquifers present a promising opportunity to supplement water resources, the paper also acknowledges the challenges associated with their utilisation, such as technical difficulties, environmental concerns, and higher costs compared to traditional water sources. The paper concludes by outlining the necessary steps, including feasibility studies, environmental impact assessments, and the development of sustainable management strategies, to address these challenges and maximise the potential of offshore aquifers in South Africa.





# SPEAKER PROFILES



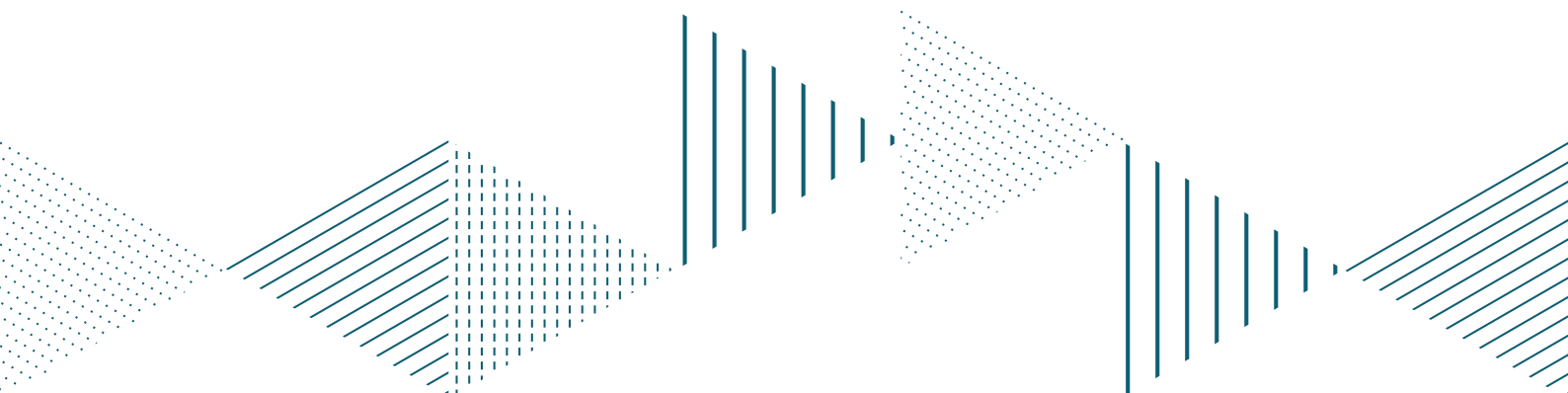
## **Professor Stephen Hosking**

Prof Hosking completed his PhD in Economics at Rhodes University. His academic appointments were with Rhodes University, the University of Cape Town, the University of Port Elizabeth (later to become the Nelson Mandela University), the Cape Peninsula University of Technology and the University of Johannesburg. He headed departments at the Nelson Mandela University and Cape Peninsula University of Technology. He currently enjoys appointments as researcher with the Public and Environmental Economics Research Centre, University of Johannesburg and the South African International Maritime Institute, Nelson Mandela University. He has consulted in the fields of applied human capital theory, environmental and resource economics and public policy and has authored over 100 scientific papers, leading over 20 externally (to the university) funded projects.



## **Dr Alison Tower**

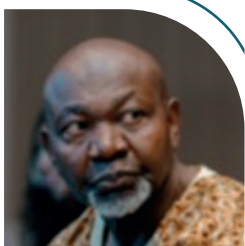
Dr. Alison Towner is a Marine Biologist with nearly two decades of experience in shark research. She began her academic journey by earning a BSc Honours degree in Marine Biology from the University of North Wales, Bangor, in 2006. Her scientific career took root in Gansbaai, South Africa, where she has been deeply involved in shark research since 2007. Dr. Towner's MSc thesis, completed at the University of Cape Town in 2013, was on the spatial ecology of white sharks, laying the groundwork for her extensive research in this area. She further advanced her expertise with doctoral research at Rhodes University, where she led pioneering studies on the interactions between killer whales and white sharks in South Africa. This research examines these interactions' ecological, economic, and safety implications, providing critical insights into the region's marine ecosystems. With a robust background in marine biology and a specialised focus on shark ecology, Dr Towner continues her Postdoctoral research in this field, contributing significantly to the conservation and understanding of Southern Africa's marine environments.





## **Dr Conrad Sparks**

Dr Conrad Sparks is the Acting Research Chair: Oceans Economy and Acting Director for the Centre for Sustainable Oceans at CPUT. His current research interests are in coastal litter, microplastics and ocean accounts (focusing on plastics). He heads a microplastics lab at CPUT where microplastics are extracted from water, sediment and biological samples. Dr Sparks manages numerous research projects on plastic / microplastics and has published more than 30 research articles, mostly related to microplastics, over the past 5 years. Dr Sparks is currently supervising 5 Masters and 8 Doctoral students. He is a Steering Committee member of the Scientist Coalition and an Executive Committee member of SETAC Africa.



## **Dr Yonah Seleti**

Dr Yonah Seleti is a Research Expert at the South African International Maritime Institute. He has previously served as a member of SAIMI Advisory Board, representing the Department of Science and Innovation. He worked at the Department of Science and Innovation substantially as the Chief Director for Science Missions and acted for several years as Deputy Director General for the Research Development and Support. He has played a significant role in leading the implementation of the South African government Indigenous Knowledge Policy and the advancing the development of the Indigenous Knowledge Act of 2019. He has participated in international forums such as the World Intellectual Property Organisation Intergovernmental Committee of Genetic Resources, Traditional Knowledge and Folklore as a leader of the South African delegation and one of the Vice Chairs of the committee. Over the years he has worked as an academic at several universities including the University of KwaZulu-Natal, National University of Lesotho and University of Zambia. He has been a visiting professor at the Tulane University in New Orleans (USA) and Roskilde University in Denmark.



## **Dr Anna-Mari Kok**

Dr Kok completed her undergraduate and postgraduate degrees in Genetics and Medicinal Plant Sciences. She is part of the prestigious Golden Key Honours Society and has received bursaries such as the NRF Innovation and Scarce Skills bursaries. She has made several appearances in both national and international conferences, seminars and workshops as a speaker on the pathogenic disease, tuberculosis and the indigenous South African medicinal plants available for treatment. She has previously co-supervised two Honours and three Masters students to completion and is currently the co-supervisor of one PhD student. She has published several manuscripts and book chapters covering topics such as adjuvants for infectious disease such as tuberculosis and the gut microbiome and is co-editing a book together with Prof Namrita Lall that features monographs of underexplored and indigenous plants from South Africa. She is one of the postdoctoral fellows supported by SAIMI in collaboration with University of Pretoria where she is investigating the potential of semi-aquatic and aquatic plants as adjuvants to aid in the treatment of tuberculosis. This project aims to not just investigate the biological activity of the selected plants but includes the development of a product prototype.





## **Dr Brian Mubiwa**

Dr Brian Mubiwa (PhD) is a versatile academic, regional urban planner and passionate environmentalist. Academically, he holds qualifications in Geography, Applied Remote Sensing and GIS, Environmental Studies, and a PhD in 'Urban Development, Transport and Energy'. With 15 years of experience attained through active participation in various commissioned projects in policy development, strategy formulation, project management/coordination, joint programming, mainstreaming environmental considerations, as well as project/programme implementation — at regional, national and sub national levels. Those opportunities and experiences have proved valuable platforms to deepen his understanding of the Triple Planetary Crisis (i.e. Climate Change, Biodiversity/Nature loss, and Waste/Pollution) in its multiple manifestations, and innovative interventions thereto. Areas of interest include: sustainable development; amalgamated climate action (adaptation and mitigation); biodiversity (ecosystem) conservation, restoration and rehabilitation; disaster risk management; pollution/waste management and waste circularity (separation at source, recycling, upcycling, waste to energy), research and environmental advocacy/outreach. Dr Brian has worked for the United Nations Environment Programme (UNEP) since 2019, as the Technical Focal Point for the Southern Africa Sub-Regional Office. In July 2024, he was appointed Research Associate at the South African International Maritime Institute (SAIMI).



## **Prof Moctar Doucoure**

Moctar Doucouré is a research expert in SAIMI, and co-founder and past managing director of AEON - Africa Earth Observatory Network. He was associate professor in geophysics at Nelson Mandela University where he managed the Karoo shale gas baseline research programme. He previously held the positions of chief operating officer of AEON at the University of Cape Town, and principal specialist geophysicist at De Beers Group Exploration. Prior to these positions, he was senior researcher in geosciences at UCT and postdoctoral Mellon fellow at the Bernard Price Institute of Geophysical Research at Wits University.

Moctar Doucouré has an engineering degree in exploration geophysics from the Hydrocarbon Institute of Algiers and a doctorate in global geophysics from Université Paris VII, France.





## Prof M Pourzanjani

Malek was trained as a Deck Officer by Y-ARD of Glasgow and served on merchant ships for 11 years. He left the merchant navy to read for a BSc (Hons) in Maritime Technology at the University of Wales followed by PhD at the University of Exeter. He stayed on as a lecturer in Marine and Systems Dynamics at University of Exeter until he joined Southampton Solent University as Principal Lecturer in Maritime Technology, leading to Professor and Dean of the Maritime Faculty. He was then appointed as Professor Maritime Safety at the University of Portsmouth. Malek has held various senior management positions in academia including INMARSAT Professor of Maritime Affairs World Maritime University (UN), President and Principal Australian Maritime College, Pro Vice-Chancellor University of Tasmania, President Raffles University, President Netherlands Maritime Institute of Technology, and Chief Executive South African International Maritime Institute. His main area of interest is maritime safety which spans the whole spectrum of ship design and operation, in particular education and training and human factors. He has been the lead investigator on many Research Council and EC-funded projects and has published extensively in this area. He has supervised over 20 higher degrees and has acted as the external examiner for 31 higher degrees in the UK, Canada, Egypt, the Netherlands, Australia, Sweden, Norway and Trinidad and Tobago. He is a Chartered Engineer an active member of professional institutions, a Fellow and Council member of the Nautical Institute, Fellow and Council member of the IMarEST. He is a member of the Marine Technical Committee of the International Federation of Automatic Control (IFAC) and the Founder of the Manoeuvring and Control of Marine Craft (MCMC) series of conferences now run by the IFAC, and deputy editor of the journal of Marine Science and Technology. He has in the past worked as a consultant to the Canadian Government, and the International Maritime Organisation. He is currently Head of Naval Education and Chair of the Academic Titles Committee at MLA.



## Mr Tshepo Mawer

Tshepo Mawer is a master's candidate in the Department of Electrical and Electronic Engineering Science at the University of Johannesburg. His current field of interest is in cybersecurity. He is currently working part-time as a research assistant for the South African International Maritime Institute.







## **Ms Mandilakhe Ntsongelwa**

Mandilakhe Ntsongelwa is the statistical analysis researcher at SAIMI. Her current research interests are in data recording, analysis and interpretation in the maritime space.



## **Ms Zizonke Dlamini**

Zizonke Dlamini is a researcher at SAIMI and is a dedicated and enthusiastic marine biologist who strongly focuses on intertidal rocky shores, DNA barcoding, macroalgae and intertidal diversity. Zizonke has a passion for marine conservation and sustainability resource utilization, particularly in coastal communities. Currently pursuing a master's degree in marine biology, Zizonke is investigating the interactions between intertidal invertebrates and macroalgae. This research aligns with her commitment to ensuring that marine resources are used sustainably, benefiting both the environment and the communities that depend on them.







**PHYSICAL ADDRESS**

Ocean Sciences Campus, Gomery Avenue  
Summerstrand, Port Elizabeth, SOUTH AFRICA

**POSTAL ADDRESS**

PO Box 77000, Nelson Mandela University  
Port Elizabeth, 6031, SOUTH AFRICA



**S A I M I**

SOUTH AFRICAN INTERNATIONAL  
MARITIME INSTITUTE

FUNDED BY:



**WEBSITE**

[www.saimi.co.za](http://www.saimi.co.za)