

Enhancing Coastal Resilience through Satellite-Based Early Warning and Risk Assessment for Oil Spills in the Benguela Current Region

32nd IAF Workshop With The Support Of The United Nations On “Resilient Coasts, Resilient Earth: Innovative Space Solutions For Coastal Resilience And Emergency Management”

Dr Lizwe Mdakane (CSIR, South Africa)
Sydney, Australia - 26 to 28 September 2025

Outline

- Space for Oceans
 - Project, Services and Partners
- Enhancing Coastal Resilience
 - Context
 - End-user Profile and Needs
 - Solution and Findings
- Impact and Benefits
- Way Forward

Space for Oceans

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NATIONAL OCIMS

The National Oceans and Coastal Information Management System (OCIMS) was developed by the Department of Forestry, Fisheries and the Environment (DFFE) in partnership with the CSIR, SAEON and SAWS through Operation Phakisa.

Decision support tools for the effective governance of South Africa's oceans and coasts

Click on the links below in order to access the tools directly or click on the pictures to learn more

Operational Tools



Fisheries and Aquaculture Support

A satellite remote-sensing product showing where algal blooms are occurring.

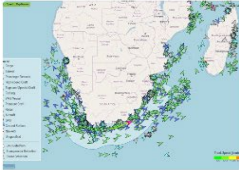
[Launch >](#)



Coastal Operations at Sea

Use of ocean models and sea state parameters.

[Launch >](#)



Integrated Vessel Tracking

This tool is access controlled. Please [contact us](#) if you would like to discuss further.

[Learn more >](#)



EO for Water Quality

Using earth observations (EO) to determine water quality.

[Launch >](#)

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MarCOSIO

MARINE AND COASTAL OPERATIONS FOR SOUTHERN AFRICA AND THE INDIAN OCEAN



BLOG

The ABALOBI Fisher app forecasting features save small-scale fishers time and data!

With the release of the revised ABALOBI Fisher app, small-scale fishers along the West and South coasts now have access to free, detailed weather forecasts and satellite images depicting the most recent water temperatures and marine chlorophyll levels in their fishing grounds.

[READ MORE](#)



BLOG

GMES & Africa eStation Installed at the CSIR

GMES & Africa e-Station was recently installed on the premises of the Council for Scientific and Industrial Research (CSIR) in South Africa. This equipment was a gift from the African Union and European Union Commissions, under the GMES and Africa Program, 2017-2021.

[READ MORE](#)



BLOG

MarCOSIO: Economic Benefit and Analysis Report - TOR

As part of the MarCOSIO deliverables, BCC and WIOMSA has issued a Terms of Reference for the development of an Economic Benefit and Analysis Report.

[READ MORE](#)

MarCOSIO Consortia

Organisation	Country
CSIR (Lead)	South Africa
ABALOB	South Africa
Benguela Current Convention	South Africa, Namibia and Angola
Coastal Oceans Research Indian Ocean East Africa	Kenya
Institute of Marine Sciences, University of Dar es Salaam	Tanzania
Institut Halieutique et des Sciences Marines	Madagascar
Kenya Marine Fisheries Institute	Kenya
Mauritius Oceanography Institute	Mauritius
National Sea Rescue Institute	South Africa
Tanzania Fisheries and Research Institute	Tanzania
University of Eduardo Mondlane	Mozambique
Western Indian Ocean Marine Science Association	Tanzania

12 partners (including lead)

Eight countries



Why Oil Spill Preparedness Matters

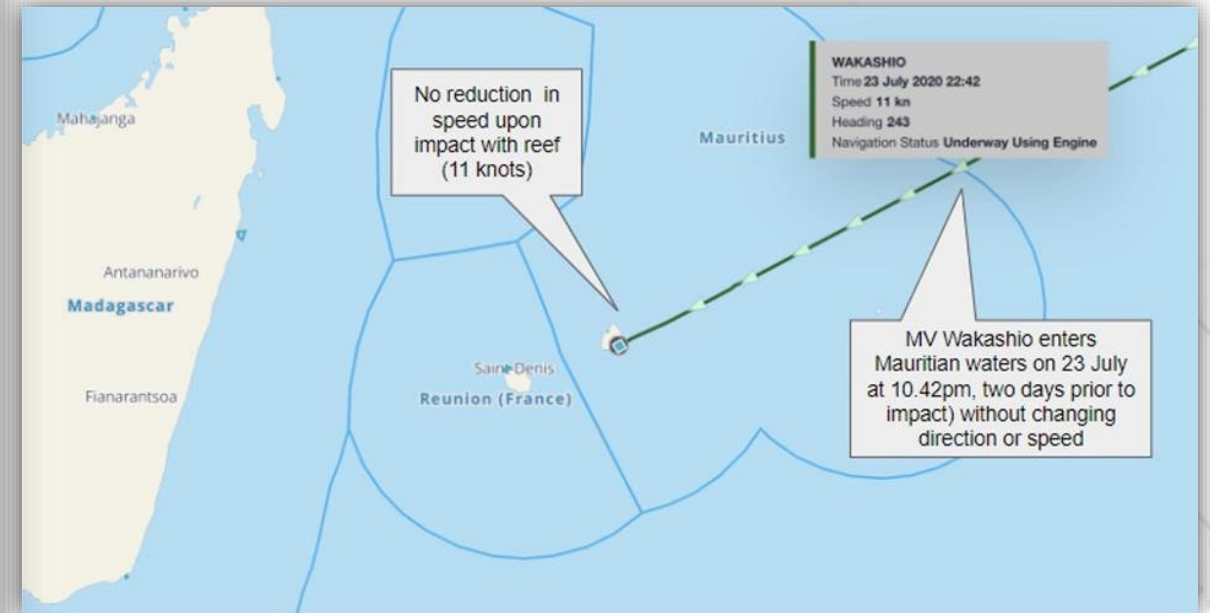
Mauritius' Worst Oil Spill Disaster:

Bulk carrier MV Wakashio ran aground on the 25th July 2020 on the reef barrier in the southeast of Mauritius with an estimated of **1000 tonnes** of oil spilled in the ocean.

The affected area contains two UNESCO Wetlands, **two Marine Protected Areas** and **one nature reserve**.



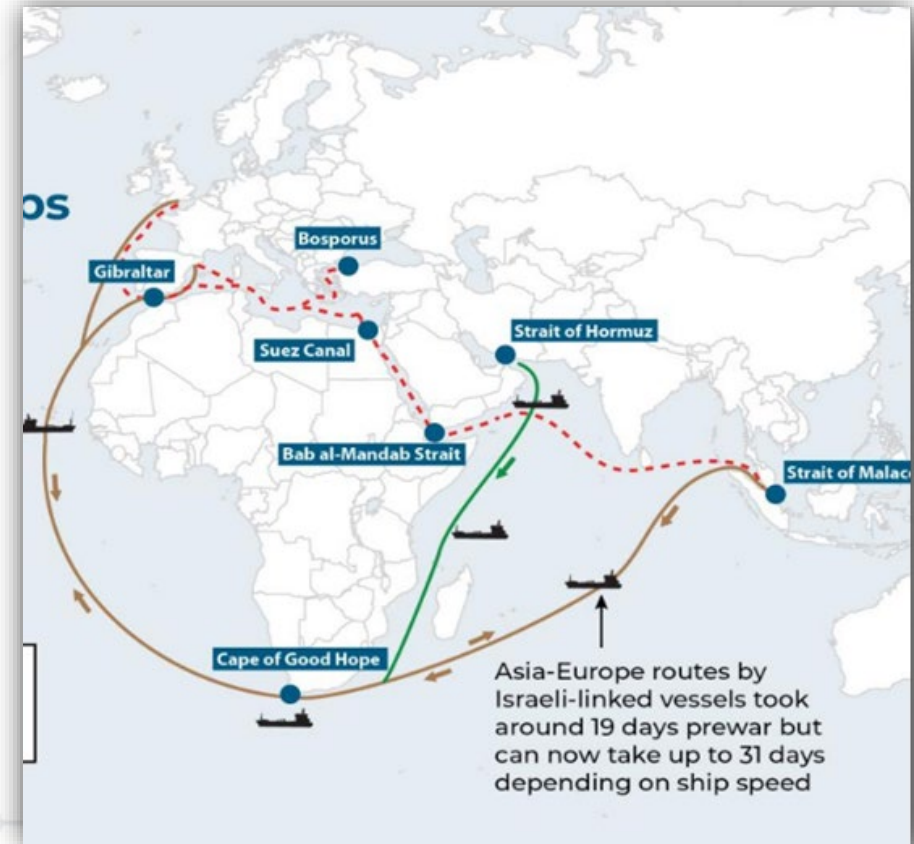
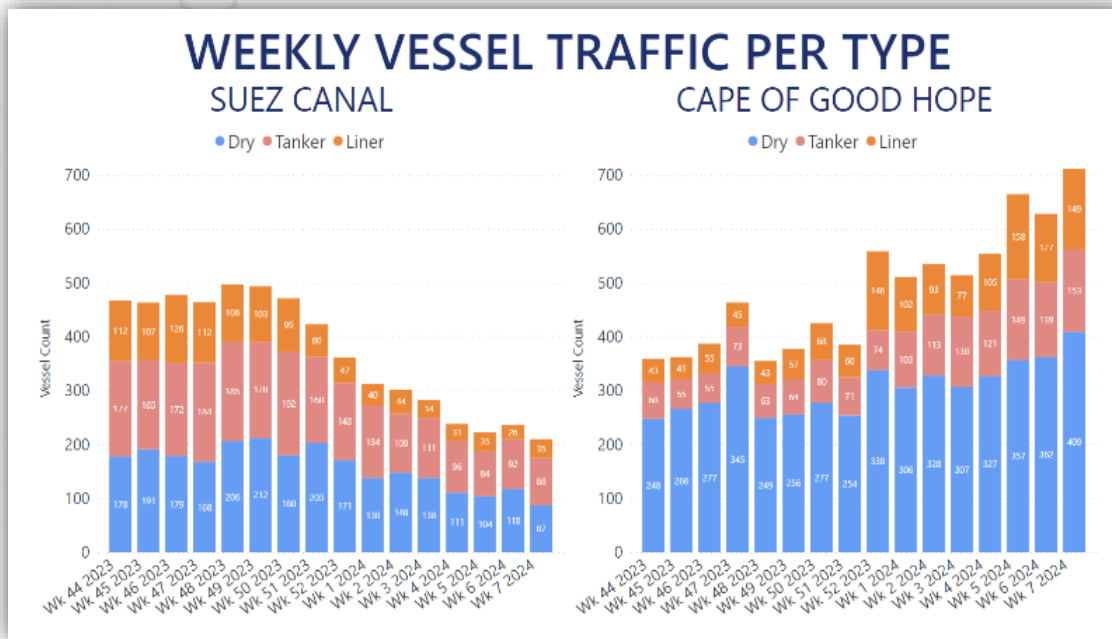
Mauritius Oil Spill Disaster (2020)



Satellite AIS data revealed the speed of 'MV Wakashio' vessel was travelling at 11 knots, which is standard for bulk carrier ships at sea, but more importantly, it did not show any signs of slowing down before impact.

Why Oil Spill Preparedness Matters

Increasing vessel traffic → higher risks for Africa's coasts.



Oil Spill Report in South Africa (OCIMS)

On the 26-07-2025, Pierre de Villiers (SANPARKS) reported in the WhatsApp group

- Oil on beach between Soetfontein and Buffeljags Baai.

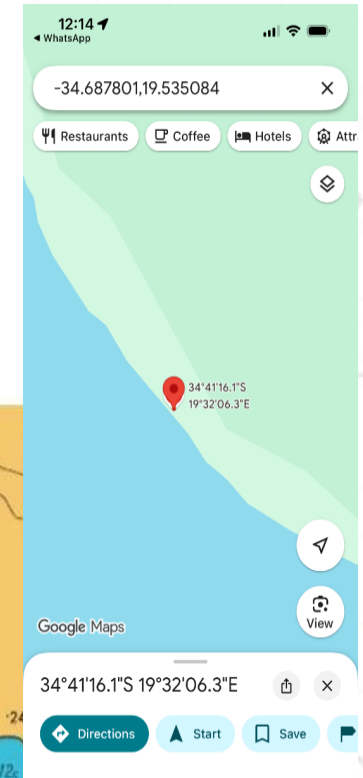
Incident Information

Point of Interest (POI):

- Latitude -34.687801 or 34° 41' 16.1" South
- Longitude 19.535084 or 19° 32' 06.3" East

Search Range: 14-07-2025 to 28-07-2025

- 12 days before 1st sighting,



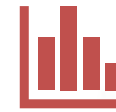
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End-User Needs

- Regional oil spill contingency planning.
- Shared infrastructure & technology for response.
- Access to reliable vessel traffic data.
- Mutual assistance in tackling major incidents.



AIS Data
Collection



Data
Preprocessing



Traffic
Analysis



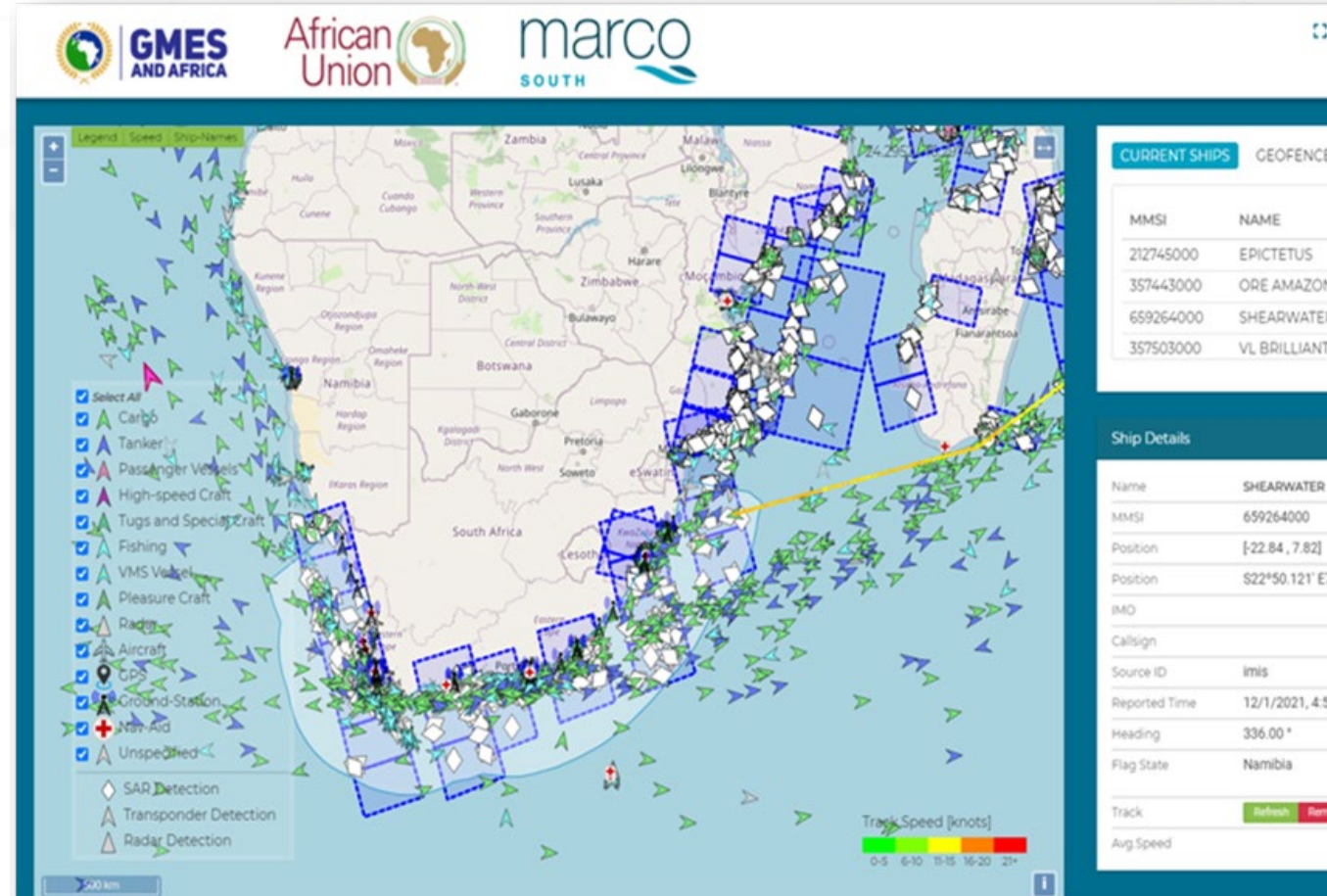
Visualisation



Statistical
Analysis

Solution: MarCOSIO Ship Traffic Monitoring (STM)

- EO + AIS data integrated into STM platform.
- Real-time vessel monitoring & risk profiling.
- Zonal analysis for hotspot identification.



Key Findings & Gaps

- Zonation & Risk Profiling
 - Vessel activity data prepared for BCLME zones
 - Identified hotspots for Namibia & South Africa.
 - Data supports regional oil spill risk model.
- Current preparedness & response is not sufficient.
- Urgent need: integrated early warning + surveillance & reconnaissance.



Figure 4. The zonation of the BCLME

BENGUELA CURRENT LARGE MARINE ECOSYSTEM
OIL SPILL RISK ASSESSEMENT,
PREPAREDNESS AND RESPONSE
(NAMIBIA & SOUTH AFRICA)



Impact & Benefits



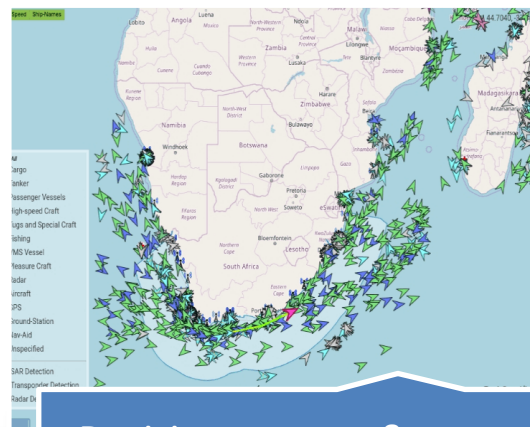
Advancing UN SDGs 13 & 14



Improved preparedness for increased vessel activity.



Access to real-time vessel information.



Decision support & near-real-time monitoring.



Strengthened regional cooperation & capacity.

Way Forward

- Partnerships & Capacity Building
 - Collaboration between BCC, CSIR, GMES & Africa.
 - Service training, demos, online manuals, and user engagement.
- Key Takeaways
 - Space-based monitoring = key to resilient coasts.
 - Strengthen collaboration for early warning systems.
- Call for collaborations:
 - www.csir.co.za
 - <https://ocims.environment.gov.za>
 - <https://marcosio.org>





Thank you

LMdakane@csir.co.za