

National Institute of Oceanography & Marine Sciences

Overview

The **National Institute of Oceanography & Marine Sciences** (Oceanography Division) is dedicated to building understanding and knowledge of the marine environment in Sri Lanka. The division leverages a multidisciplinary team to undertake research and consultancy work for both national and international marine organizations.

The division plays a critical role in ocean monitoring, maritime safety, mineral exploration, and ocean forecasting—essential services that support fisheries, coastal management, maritime transport, and national development. With Sri Lanka's Exclusive Economic Zone (EEZ) spanning 517,000 square kilometers, the oceanography division's work is fundamental to understanding and sustainably utilizing this vast marine domain.

Leadership & Contact

Head of Division

- **Name:** Mr. R.M.R.M. Jayathilaka
- **Designation:** Head (Acting) / Oceanography Division
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Key Functions & Responsibilities

Physical Oceanography Research

- Study of ocean currents, temperature, and salinity patterns
- Wave dynamics and propagation research
- Tidal studies and prediction
- Monsoon circulation analysis
- Ocean stratification and mixing processes
- Upwelling and coastal circulation systems

Ocean Forecasting & Prediction

- Five-day ocean forecasts of winds, currents, waves, and storm surges
- Potential fishing zone forecasting for fishermen
- Maritime safety warnings for shipping

- Oil and chemical spill trajectory prediction
- Coastal flooding and erosion risk assessment
- Integration of satellite data with numerical models

Mineral Exploration

- Heavy mineral identification and evaluation
- Beach sand mineral surveys
- Offshore mineral deposit mapping
- Economic viability assessment of mineral resources
- Environmental impact evaluation of mining activities

Sea Level Monitoring

- Real-time sea level data collection at multiple stations
- Long-term sea level trend analysis
- Climate change impact assessment
- Coastal vulnerability studies
- Contribution to global sea level monitoring networks

Marine Energy Potential

- Ocean energy resource assessment (wave, tidal, thermal)
- Site identification for renewable energy projects
- Feasibility studies for ocean energy conversion
- Contribution to national energy security

Nutrient & Water Quality Studies

- Distribution and transportation of nutrients in oceanic and coastal waters
- Trace metal monitoring in marine environment
- Organic matter cycling research
- Primary productivity assessment
- Ecosystem health indicators

Services Offered

Ocean Forecast System for Sri Lanka

Developed in collaboration with the **University of Western Australia** with Australian Government funding, the system provides:

Daily Forecasts (5-day outlook):

- Wind speed and direction at sea surface
- Ocean current velocity and direction
- Significant wave height and period
- Storm surge predictions for coastal areas

Specialized Applications:

- **Oil Spill Prediction:** Trajectory modeling for rapid response to maritime accidents
- **Chemical Spill Forecasting:** Dispersion patterns for hazardous material releases
- **Fishing Zone Forecasting:** Identification of productive fishing areas based on oceanographic conditions

Public Access:

Forecasts are made available through NARA's website, enabling:

- Fishermen to plan safe and productive fishing trips
- Shipping companies to optimize vessel routing
- Port authorities to manage operations
- Coastal managers to anticipate coastal hazards
- Researchers to understand Sri Lankan coastal dynamics

Advisory Services

- Expert advice to fishermen on sea conditions and fishing zones
- Consultation to shipping industry on maritime operations
- Support to coastal managers on ocean-related development
- Technical guidance to industrial sectors on offshore activities
- Environmental impact consultation for coastal projects

Research & Consultancy

- Joint research expeditions with international institutions
- Consultancy for national development projects
- Environmental monitoring for coastal development
- Data provision for academic research
- Technical support for government agencies

Current Research Projects & Programs

Joint International Expeditions

Collaboration with International Oceanographic Institutions

The division participates in joint research expeditions in the Indian Ocean focusing on:

- **Monsoon Circulation Studies:** Understanding the Southwest and Northeast Monsoon impacts on ocean circulation
- **Oceanographic Parameter Measurement:** Temperature, salinity, dissolved oxygen, nutrients within Sri Lanka's EEZ
- **Climate Research:** Long-term climate variability and change
- **International Collaboration:** Partnerships with leading oceanographic institutes worldwide

Mineral Exploration Programme

Heavy Mineral Deposits off Beruwala

Funded by the **United Nations Revolving Fund**, this program involves:

- Identification of heavy mineral concentrations offshore
- Evaluation of economically important minerals:
 - **Monazite:** Rare earth elements and thorium source
 - **Ilmenite:** Titanium oxide for pigments and titanium metal production
 - **Rutile:** High-quality titanium dioxide
 - **Zircon:** Zirconium for ceramics and nuclear industries
- Environmental baseline studies
- Resource estimation and economic feasibility assessment
- Technology requirements for sustainable extraction

Garnet-Bearing Sand Deposits (Southeastern Coast)

- Prospecting garnet resources in coastal areas
- Quality assessment for industrial applications
- Sustainable mining technology evaluation

Sea Level Monitoring Network

Stations: Trincomalee, Colombo, Kirinda

Capabilities:

- Real-time sea level measurement using tide gauges
- Satellite data transmission to Global Telecommunication System

- Contribution to global climate change monitoring
- Tsunami early warning system support
- Coastal engineering data provision

Applications:

- Port and harbor design and operation
- Coastal protection infrastructure planning
- Climate change adaptation strategies
- Scientific research on sea level rise
- Navigation chart datum establishment

Lagoon Ecosystem Restoration

Restoring Lagoon Dynamics Through Ecosystem-Based Approaches

Research focusing on:

- Hydrodynamic modeling of lagoon systems
- Sediment transport and morphological changes
- Nutrient dynamics and eutrophication
- Ecosystem services valuation
- Community-based management strategies
- Restoration interventions design and monitoring

Potential Fishing Zone (PFZ) Forecasting

Operational Ocean Forecasting for Fisheries

Integration of:

- Sea surface temperature from satellite observations
- Chlorophyll concentration indicating phytoplankton abundance
- Ocean current patterns from numerical models
- Historical fish catch data and fisher knowledge
- Weather forecasts for safe fishing operations

Benefits:

- Reduced fuel costs for fishing vessels
- Increased catch efficiency
- Enhanced safety at sea
- Sustainable fishing through better targeting
- Climate resilience for fishing communities

Facilities & Infrastructure

Ocean Forecasting Infrastructure

- High-performance computing systems for numerical modeling
- Satellite data receiving and processing capabilities
- Real-time data integration from multiple sources
- Web-based forecast dissemination platform
- Model validation and calibration systems

Sea Level Monitoring Stations

- Automated tide gauge systems
- Satellite communication equipment
- Data logging and quality control systems
- Backup power systems for continuous operation
- Meteorological sensors (wind, pressure, temperature)

Research Vessels & Equipment

- Oceanographic research vessels for expeditions
- CTD (Conductivity-Temperature-Depth) profilers
- Water samplers (Niskin bottles, rosette systems)
- Current meters (Acoustic Doppler Current Profilers)
- Wave measurement buoys
- GPS and navigation systems
- Sediment sampling equipment (grab samplers, corers)

Laboratory Facilities

- Water chemistry analysis equipment
- Nutrient analyzers (phosphate, nitrate, silicate)
- Dissolved oxygen titration systems
- Salinity measurement (salinometers)
- Sediment analysis equipment
- Sample storage (refrigeration, freezing)

Data Management Systems

- Oceanographic database management
- GIS and spatial analysis software
- Statistical analysis tools
- Time series analysis capabilities
- Data visualization and reporting systems

International Collaboration

University of Western Australia

- Ocean Forecast System development and maintenance
- Technology transfer and capacity building
- Joint research publications
- Exchange of expertise and training

International Oceanographic Institutions

- Participation in Indian Ocean expeditions
- Data sharing and exchange
- Collaborative research projects
- Access to international ocean observation networks

United Nations Programs

- UN Revolving Fund support for mineral exploration
- Contribution to UN Ocean Decade initiatives
- Sustainable development goal (SDG 14) implementation
- International marine scientific cooperation

Major Achievements

- Establishment of operational Ocean Forecast System serving national needs
- Long-term sea level monitoring contributing to global climate database
- Successful joint expeditions with international partners
- Identification of significant offshore mineral resources
- Development of fishing zone forecasting benefiting fishing communities
- Real-time ocean data provision for maritime safety
- Scientific publications in international journals
- Capacity building of Sri Lankan oceanographers

Future Plans

National Oceanographic Data Centre (NODC)

The division is planning to establish a **National Oceanographic Data Centre** to:

- Centralize all oceanographic data collected in Sri Lankan waters
- Provide public access to ocean data for research and development
- Serve as the national repository for ocean information
- Facilitate data sharing with international databases
- Support evidence-based ocean governance and planning
- Attract ocean-related investments through data availability
- Enhance capacity for ocean science and technology

Benefits for Stakeholders:

- **Researchers:** Access to long-term datasets for scientific studies
- **Investors:** Ocean resource information for business planning
- **Government:** Data for policy formulation and planning
- **Public:** Ocean literacy and awareness
- **International Community:** Sri Lankan contribution to global ocean knowledge

Planned Initiatives

- Expansion of ocean observing network with additional buoys and sensors
- Integration of autonomous underwater vehicles for deep-sea research
- Enhanced ocean forecasting resolution and accuracy
- Climate change scenario modeling for Sri Lankan waters
- Marine spatial planning support with oceanographic data
- Blue economy development through ocean knowledge
- Capacity building through training programs
- International research collaboration expansion

Contribution to National Development

Maritime Safety

- Ocean forecasts reduce risks to fishermen and shipping
- Storm surge warnings protect coastal communities
- Navigation safety through sea state predictions

Fisheries Sector

- Fishing zone forecasting increases catch efficiency
- Fuel savings through targeted fishing operations
- Enhanced safety for fishing fleet

Coastal Management

- Sea level data for coastal infrastructure planning
- Erosion risk assessment and mitigation
- Climate change adaptation strategies

Blue Economy

- Mineral resource identification for economic development
- Ocean energy potential assessment
- Marine spatial planning support
- Ocean tourism development (surfing, diving locations)

Climate Change Research

- Long-term ocean monitoring data for climate studies
- Sea level rise trends for adaptation planning
- Ocean warming and acidification research
- Extreme event analysis (cyclones, storm surges)

Contact Information

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Ocean Forecast Access: Available through NARA website