

## FUTURE PLANNING

Research domain of Physical and Space Oceanography Division

- Monitoring physical properties of sea water.
- Ocean renewable energy (wind, tidal, wave).
- Marine hydrography and navigation.
- Research on Air- Sea interaction (Cyclone, Sea level rise, Monsoon, Upwelling etc.).
- Coastal engineering (Erosion, Accretion, Sediment transport, Integrated Coastal zone management).
- Ocean Monitoring by Satellite, remote sensing and GIS technology.
- Potential fishing ground identification, Coral reefs status, Harmful Algal Bloom, marine pollution etc.
- Coastal management and monitoring.
- Build marine GIS database.
- Ocean state forecasting using Numerical simulation and ocean model development.

## SCIENTISTS



**Muhammad Shahinur Rahman**

Scientific Officer

**Research Interest:**  
Remote Sensing & GIS,  
MSP, Bio-physical Coupling  
of the Ocean, Blue Carbon,  
Climate Change.

Phone : +88-01925-555797  
E-mail : shahin@bori.gov.bd



**Rupak Loodh**

Scientific Officer

**Research Interest:**  
Ocean Dynamics & Modeling  
Operational Oceanography &  
Forecasting, RS & GIS,  
Computer Simulation.

Phone : +88-01912-696029  
E-mail : rupak@bori.gov.bd



**Siraj Uddin Md. Babar Chowdhury**

Scientific Officer

**Research Interest:**  
Geophysical fluid dynamics &  
ocean circulation, cyclone  
Simulation & ocean modeling  
ocean currents.

Phone : +88-01732050054  
E-mail : babar@bori.gov.bd

### Contact Information

Physical and Space Oceanography Division  
Bangladesh Oceanographic Research Institute  
Ministry of Science and Technology  
Cox's Bazar

Phone: 02334445214  
Email: info@bori.gov.bd  
Website: www.bori.gov.bd

## PHYSICAL AND SPACE OCEANOGRAPHY DIVISION



**Bangladesh Oceanographic Research Institute**  
Ministry of Science and Technology

Oceans provide us sufficient food and protein. As an oceanographer (or ocean literate people), we may focus on oceanographic processes that influence of ocean just as the agriculturist or farmers are looking on the processes of weather and climate. The ocean influence not only atmospheric weather and climate (temperature changes, currents, etc.), but the oceanic weather fertilizes the sea by different oceanic processes (storm surge, eddies, upwelling and down-welling etc.). Most of the oceanographic processes are studied at the physical oceanography.

### PHYSICAL OCEANOGRAPHY

Physical oceanography studies the distribution of oceans, tides, and waves, as well as the distribution of various physical properties of oceans such as temperature, salinity, dissolved chemical elements, concentrations of gases, and so on. Physical oceanography research methods include theory, direct observation and computer simulation. Physical oceanography often studies the dynamics of the Earth's climate and the prediction of future images. Physical oceanography also plays a role in improving the quality of livelihood in the coastal and estuarine regions through sustainable development.

### WHY IMPORTANT PHYSICAL OCEANOGRAPHY

Physical oceanography is important for understanding the oceanic processes. The following things that could be explained by understanding the physical processes of ocean.

- Heat storage and transport in the ocean.
- The exchange of heat with the atmosphere and the role of the ocean in climate.
- Wind and thermal forcing of the surface mixed layer.

- The wind-driven circulation including the Ekman circulation, Ekman pumping of the deeper circulation, and upwelling.
- The dynamics of ocean currents, including geostrophic currents and the role of vorticity.
- The formation of water types and masses.
- The deep circulation of the ocean.
- Equatorial dynamics, El Niño, and the role of the ocean in weather.
- Numerical models of the circulation.
- Waves in the ocean including surface waves, inertial oscillations, tides, and tsunamis.
- Waves in shallow water, coastal processes, and tide predictions.

### SPACE OCEANOGRAPHY

With the advancement of science, satellites have been launched into space, which makes it possible to easily study large areas of the ocean. Monitoring and detailed research on marine ecosystems and sea water temperature, salinity, water clarity, sea water level etc. are conducted through satellite derived remote sensing technology.

### PHYSICAL AND SPACE OCEANOGRAPHY DIVISION, BORI

Physical and Space Oceanography division is one of the six departments established by the Bangladesh Oceanographic Research Institute Act, 2015 (Article 8). The division currently has equipment like CTD, rosette sampler, echo sounder, total station, spectrophotometer etc. This division strives to contribute to the Sustainable Development Goals (SDG) of the country through the collection of required oceanographic data on the coastal areas, islands and open ocean of Bangladesh.

### RESEARCH PROJECT (ALREADY DONE OR RUNNING)

YEAR	RESEARCH TITLE
2017-2018	Investigate the status, Coastal Upwelling and Spatial-temporal variability of stratification with reference to Chlorophyll & Nutrients around Saint Martin's Island, Bangladesh.
2018-2019	Spatio-temporal variability of stratification along the Cox's Bazar.
2019-2020	Spatial and temporal variations of surface Chlorophyll and nutrient in the coastal area of Kutubdia Island.
	Beach profiling along the coast of Cox's Bazar.
2020-2021	Beach profiling along Marine drive road Cox's Bazar.
	Detecting floating marine debris in the eastern coastal zone of Bangladesh using remote sensing technique.
2021-2022	Blue Carbon stock assessment in the Maheshkhali Channel and the Naf river estuary of Bangladesh.
	Distribution Mechanism of Physicochemical Parameters in Maheshkhali Estuary, Northern Bay of Bengal.

## RESEARCH LIST

**2017-2018:** Determination of Sedimentological & Mineralogical Composition and Sediment Province Analysis of the Nearshore Area of Saint Martin Island, Bangladesh

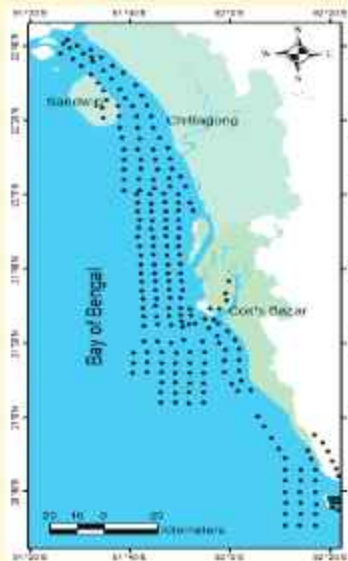
**2018-2019:** Determination of Sedimentological & Mineralogical Distribution and Sediment Province of the Nearshore Area of Cox's Bazar-Teknaf, Bangladesh

**2019-2020 to 2021-2022:** Determination of Sedimentological & Mineralogical Distribution to delineate sedimentary process of the Nearshore Area of Maheshkhali-Kutubdia, Bangladesh



**2022-2023:** Investigation of Sedimentology and Mineralogy of the Coastal Marine Area of the Chattogram Region of Bangladesh Coastal Sand dune sampling locations map (Teknaf to Cox's Bazar).

## SURVEY MAP



In the last five years, the Geological Oceanography Division has conducted about 7500 square kilometers of surveys and collected samples in the Eastern Coastal Zone of Bangladesh.

## BRIEF

The activity of Geological Oceanography Division (GEOD) started by the mandate of BORI Act, 2015 (article 8) with the starting of BORI. Research activity has been started on 2017-2018 FY with taken a R&D project in the nearshore area of Saint Martin's Island. In the next FY 2018-2019, a R&D project has been taken on the nearshore area of Teknaf to Maheshkhali Island. During research and survey, seabed sediment sample has been collected in the coastal and nearshore area of north-eastern part of Bay of Bengal covered about 5000 sq. km. A cruise has been operated with the help of Bangladesh Navy BNS Saibal on December 2018 and the survey area was about 900 sq. km, distance was 50 km seaward from the coastline of the Cox's Bazar. During 2019-2023, three consecutive research and field surveys carried out in the coastal marine area of Maheshkhali-Kutubdia and Chattogram region (Kutubdia to Feni) for sedimentological and heavy mineral investigations and for the baseline study of geological oceanography parameter. In total, the study area covered about 7500 sq. km of coastal marine area along the eastern to middle coastal zone of Bangladesh.



Observing Poly-metallic Nodules, Ferromanganese Crust, Poly-metallic Sulphides and Hydrothermal Vent during training in Russia.

## SCIENTIST IN THE GEOLOGICAL OCEANOGRAPHY DIVISION



**MD. ZAKARIA**  
Senior Scientific Officer and Head  
Email: zakaria@bori.gov.bd  
Office: 02334462606  
Phone: 8801917019838



**MOHAMMAD MOZAMMEL HOSSAIN KHAN**  
Scientific Officer  
Email: mozammel@bori.gov.bd  
Phone: 8801682971346

## ADDRESS

Geological Oceanography Division  
2<sup>nd</sup> floor, Institute Building, BORI Campus  
Pechar dwip, Marine Drive Road, Ramu, Cox's Bazar

# BORI GEOLOGICAL OCEANOGRAPHY DIVISION



**Bangladesh Oceanographic Research Institute**  
Ministry of Science and Technology

## LIST OF PUBLICATIONS

- Zakaria, M., & Islam, M.T. (2023c), Assessment of Organic Carbon and Carbon Stock in the Sediments of the Estuarine Area of Naf River and Maheshkhali Channel, Bangladesh: Investigating the Influence of Sediment Texture and Depositional Conditions, Songklanakar Journal of Science and Technology, 45(5), 552-560.
- Zakaria, M., Islam, M.T., & Haider, S.M. (2023b), Coastal and nearshore sediment data along the eastern coastal zone of Bangladesh of the northern Bay of Bengal, Data in Brief, Vol.47, <https://doi.org/10.1016/j.dib.2023.109028>
- Zakaria, M. & Islam, M.T. (2021), Determination of Sediment Distribution and Suspended Sediment Discharge in the Kutubdia Channel of Bangladesh, The Journal of NOAMI, Vol. 37, Number 1&2.
- Zakaria, M. (2020), Sediment Distribution and Texture of the Nearshore Area Around Cox's Bazar, Bangladesh, Paper presented at International Conference on Earth & Environmental Sciences and Technology (ICEEST), Faculty of Earth and Environmental Sciences, University of Dhaka, Bangladesh, 25-30 January.
- Zakaria, M. & Islam, M.T. (2019c), Analysis of Relative Tectonic Activity using Morphometric parameter of the Reju Khal Drainage Basin of Cox's Bazar, Bangladesh, The Journal of NOAMI, Vol. 36, Number 1, June 2019.



Survey to identify morphological features and formation process of the coastal sand dune along the coastal area of Cox's Bazar by GEOD scientist.



A fossil of Belen Whale of Mio-Pliocene Epoch has been recorded in the Saint Martin's Island. A geological Museum has been set up in the division's corridor where geological rock and mineral specimen, geological map of Bangladesh, Geological Event has been displayed.



## LIST OF SCIENTIFIC EQUIPMENT

- |                                    |                                     |
|------------------------------------|-------------------------------------|
| ● Petrographic Microscope          | ● High Intensity                    |
| ● Stereoscopic Microscope          | ● Electrostatic Plate Separator     |
| ● Gravity Corer                    | ● Portable Spectrophotometer        |
| ● Van Veen Grab Sampler            | ● Vacuum Filtration Unit            |
| ● Ekman Grab Sampler               | ● Laboratory Oven                   |
| ● Hand Auger Set                   | ● DI Water Plant                    |
| ● Van Dorn Water Sampler           | ● Distilled Water Plant             |
| ● Niskin Water Sampler             | ● Laboratory Sieve                  |
| ● Ruttner Water Sampler            | ● Shaking Unit                      |
| ● Muffle Furnace (1400C)           | ● Geological Field Survey Equipment |
| ● Muffle Furnace (1400C)           |                                     |
| ● Laboratory Mineral Shaking Table |                                     |
| ● Dry Roll Magnetic Separator      |                                     |



GEOD Scientist identified a large dead coral in the beach area of Patuartek, Cox's Bazar indicates it was a favorable condition for coral development in this area.



Seafloor sediment samples, water column parameters (i.e., Temperature, DO, Turbidity, pH, Salinity, TDS, etc.), Seawater samples, Depth, and Secchi depth were collected by the scientist during a marine cruise. Sediment samples were used for grain size distribution, sedimentary petrography, heavy mineral distribution, geochemistry, and elemental analysis of the seafloor sediment; water parameters and TSS for sediment dynamics studies; and Secchi depth for transparency measurement. The laboratory analysis was conducted using standard procedures. Sieve analysis, hydrometer analysis, heavy mineral separation, and petrographic microscope analysis were used during laboratory measurements. In addition, Organic Carbon and micro-foraminifera in sediment were measured using the samples.

## RESEARCH GRANT

This division received research grant from Ministry of Science and Technology during 2018-19, 2020-21, and 2021-22 FY as R&D special allocation. Two research articles has been published using the research results where one was to delineate landslide prone area in Cox's Bazar and other was determination of Organic Carbon stock in the sediment of Naf River and Maheshkhali Channel.

## INTERNATIONAL TRAINING

- Completed training on "Exploration and development of mineral resources of the World Ocean - Exploration and development of mineral resources of the ocean" during 4-20 June 2022 in Saint Petersburg, Russia organized by Saint Petersburg State University, MNRE of the Russian Federation, and VNIIOkeangeologia and International Seabed Authority (ISA).
- Completed training on Exploration for Polymetallic Nodules during 14-31 May, 2021, organized by Deep Ocean Resources Development Co., Ltd. (DORD), Japan and ISA.
- Completed training on "Study and Exploitation of Mineral Resources in the Ocean" during 26 October to 13 November, 2020 at Saint Petersburg State University, organized by MNRE, Russian Federation and ISA.
- Participated in the training course on "Understanding Sea Level: data analysis and applications" during 12-14 October, 2020, organized by ITCOcean, INCOIS, India.
- Completed 20 days 2018 Overseas Training Program on Marine Spatial Planning for Bangladesh, Organized by Blue Economy Cell, Ministry of Science and Technology, Bangladesh and Fujian Institute of Oceanography (FJIO), China held on 10-29 October, 2019.
- Completed training on Ocean Research: Basic of Observation and Instrumentations held in CSIR-National Institute of Oceanography (CSIR-NIO), Goa, India during 16-30 August, 2018.

## SERVICE

Three Thesis students, 18 internship students, and technical advice for Marine Drive Road have been provided by the divisions. Besides, this division is involved in the development activities of the institute by preparing Development Project proposals (DPP).

## AT GLANCE CHEMICAL OCEANOGRAPHY DIVISION

Chemical oceanography encompasses the study of the chemical components of the oceans, their reactions, and their pathways of transformation. We study both organic and inorganic compounds, particulate and dissolved material, and the ocean sediments. The pathways that compounds follow affect the global cycling of elements such as carbon and nitrogen, and are often intimately related to biological activity. We undertake our research in environments such as mangroves and saline lakes, salt marshes, and deep ocean sediments. We combine field observations, laboratory experiments, and computer models to understand factors affecting chemical compositions and how they vary in time and space.

Chemical oceanography is the study of ocean chemistry and the behavior of the chemical elements within the Earth's oceans. It is a broad and complex study of the metamorphosis that the chemicals within oceans, living marine organisms, and the ocean floor undergo. The ocean contains a multitude of chemicals; some are natural, and others are man-made. These chemicals enter the sea in a number of ways. The ocean is unique in that it contains in greater or lesser quantities-nearly every element in the periodic table. Rivers and streams bring freshwater into the ocean along the coast line. Freshwater brings the chemicals which have been dissolved into it from natural weathering and human activities. Examples of this would be the weathering of rocks or soils, industrial sources like agriculture, power plants, or manufacturing facilities, and pollution from nearby towns and cities. Chemicals can also enter the oceans through the atmosphere by dissolving or dissipating. Substances like aerosols and pesticides can enter this way. Other ways chemicals can enter the ocean are through ocean exploration, the shipping industry, and the harvesting of oil. Many chemicals introduced to the ocean can be harmful to the ecosystems within it.

## SERVICES

- Research work supervision and laboratory support
- Collaborative research
- Chemical measurement support
- Laboratory testing support
- Sea Food testing support
- Training support
- EIA, EMP, ESIA support
- Ocean Literacy
- Others



## SCIENTISTS



**MD. HASHIBUL ISLAM**  
Principal Scientific Officer  
Email: hasib@bori.gov.bd  
Cell: +88017176565888

**Research Field**  
Chemical Oceanography, Pollution, Toxicology, Corals, Ocean Acidification, OC, pH, Chemical extraction from different marine resources, Hydrocarbon, sedimentology, heavy and trace metal.



**MD. TARIKUL ISLAM**  
Senior Scientific Officer  
Email: taru@bori.gov.bd  
Cell: 01711511529

**Research Field**  
Marine Ecology, Ocean Acidifications, Corals, Nutrients Dynamics, Marine Pollution, Marine Invertebrates, Sea water chemistry.

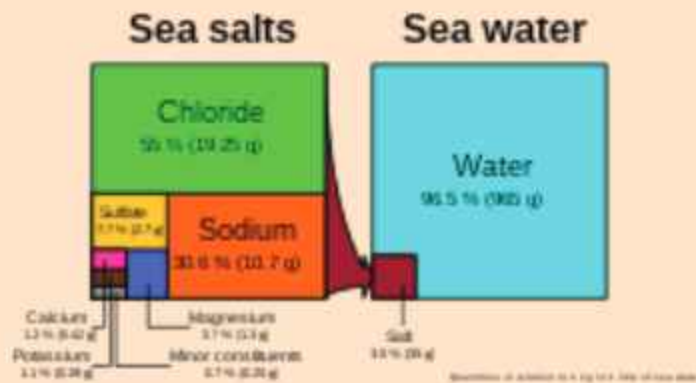
Address

**BANGLADESH OCEANOGRAPHIC RESEARCH INSTITUTE**  
RAMU, COX'S BAZAR 4730  
PHONE: +88-034152540  
WWW.BORI.GOV.BD

# CHEMICAL OCEANOGRAPHY DIVISION



**Bangladesh Oceanographic Research Institute**  
Ministry of Science and Technology



Total Molar Composition of Seawater (Salinity = 35)		Seawater elemental composition (salinity = 3.5%) [citation needed]	
Component	Concentration (mol/kg)	Element	Percent by mass
H <sub>2</sub> O	53.6	Oxygen	85.84
Cl <sup>-</sup>	0.546	Hydrogen	10.82
Na <sup>+</sup>	0.469	Chlorine	1.94
Mg <sup>2+</sup>	0.0528	Sodium	1.08
SO <sub>4</sub> <sup>2-</sup>	0.0282	Magnesium	0.1292
Ca <sup>2+</sup>	0.0103	Sulfur	0.091
K <sup>+</sup>	0.0102	Calcium	0.04
C <sub>T</sub>	0.00206	Potassium	0.04
Br <sup>-</sup>	0.000844	Bromine	0.0067
B <sub>T</sub> (total boron)	0.000416	Carbon	0.0028
Sr <sup>2+</sup>	0.000091		
F <sup>-</sup>	0.000068		

## HISTORY OF CHEMICAL OCEANOGRAPHY

Early inquiries into marine chemistry usually concerned the origin of salinity in the ocean, including work by Robert Boyle. Modern chemical oceanography began as a field with the 1872–1876 Challenger expedition, which made the first systematic measurements of ocean chemistry.

## INSTRUMENTS

Chemical oceanographers collect and measure chemicals properties of seawater using the standard toolset of analytical instruments as well as spectrophotometer, multiparameter, Fluorometer, DO meter, pH meter, BOD & COD meter, Inverted and Stereo Microscopes, Different kind of plankton collection gears, Niskin water sampler and CTD etc.

## CONDUCTED RESEARCH

1. Exploration of Coral Resources of the Bay of Bengal, Bangladesh (FY: 2023-2024)
2. Biochemical Composition, Occurrence & Distribution Pattern of Commercially Important Marine Crabs of Bangladesh (FY: 2023-2024)
3. Biochemical Composition and Antimicrobial Activity of Haemolymph of Horseshoe Crabs with Occurrence and Habitat Distribution along the Coastal Area of Bangladesh (FY: 2022-2023)
4. Developing a Comprehensive Strategy for Monitoring, Conservation and Restoration of Corals at Saint Martin's Island, Bangladesh (FY: 2021-2022)
5. Influence of physicochemical parameters on abundance and distribution of phytoplankton composition along the east coast of Bay of Bengal, Bangladesh (FY: 2021-2022)
6. Phytoplankton assemblages in the south eastern coastal area of the Bay of Bengal, Bangladesh with special reference to environmental variables (FY: 2020-2021)
7. Biochemical composition, occurrence, habitat distribution and cultivation of green mussel (*Perna viridis*) in south eastern coastal waters of Bangladesh (FY: 2019-2020)
8. Monitoring of ocean acidification with special reference to coral bleaching at Saint Martin's Island, Bangladesh (FY: 2019-2020)
9. Seasonal variation of physiochemical parameters and its impacts on coral associated biodiversity in the Saint Martin's Island, Bangladesh (FY: 2018-2019)
10. Adaptive response to global warming and ocean acidification of different marine invertebrates inhabit in Saint Martin's Island, Bangladesh. (FY: 2017-2018)

## JOURNAL PUBLICATIONS

1. Bhuyan, M.S., Haider, S.M.B., Das, M.K., Mojumder, I.A., Das, M., & Islam, M.T. (2023). Identifying Threats and Reduction Measures of Emerging Plastic Pollution in The Coral-Bearing St. Martin's Island, Bangladesh, *The Journal of NOAMI*, 37(1-2):103-121.1.
2. Bhuyan, M. S., Haider, S. M. B., Meraj, G., Bakar, M. A., Islam, M. T., Kunda, M., & Bhat, M. A. (2023). Assessment of Heavy Metal Contamination in Beach Sediments of Eastern St. Martin's Island, Bangladesh: Implications for Environmental and Human Health Risks. *Water*, 15(13), 2494. [https:// doi.org/10.3390/w15132494](https://doi.org/10.3390/w15132494).
3. Farhaduzzaman, A.M., Khan, M.S., Hasan, M., Islam, R., Osman, M.H., Shovon, M.N.H., Haider, S.M.B., Kunda, M., Islam, M.T., Bhuyan, M.S. (2023). Seaweed Culture, Post-Harvest Processing, and Market Generation for Employment of Coastal Poor Communities in Cox's Bazar. *Journal of Applied Life Sciences and Environment*, 56: 231-244.

4. Bhuyan, M.S., Bat, L., Senapathi, V., Kulandaisamy, P., Sekar, S., Haider, S.M.B., Meraj, G., Islam, M.T., Kunda, M., Alam, M.W., Rabaoui, L. (2024). A review on sea cucumber (Bengali: Somuddro Sosha) as a bioindicator of heavy metal contamination and toxicity. *Marine Pollution Bulletin* (Elsevier), 199: 115988.
5. Bhuyan, M.S., Haider, S.M.B., Kunda, M., Islam, M.T., Husain, S.K.A., Chowdhury, E., Mojumder, I.A. (2023). Is Seaweed Culture A Sustainable Approach To Climate Change Adaptation? *Journal of NOAMI*, 38 (In press).
6. Haider, S.M.B., Islam, M.T., Alam, M. (2022). The Morphometric Variability Of The Mangrove Horseshoe Crab (*Carcinoscorpius Rotundicauda*) From The Coastal Area Of Cox's Bazar, Bangladesh. *International Journal of Novel Research and Development (IJNRD)*. © 2022 IJNRD | Volume
7. Mandol, S., Bhuyan, M. S., Islam, M. N., Altrin, J. A., Al-Imran, M., Islam, M. T., & Karthikeyan, S. (2022). Granulometric and geomorphological characteristics of Rezu Khal canal, Bangladesh: Inferences for sustainable ecosystem and management. *Acta Ecologica Sinica* (Elsevier).
8. Haider, S.M.B., Bhuyan, M.S., Sharif, A.S.M., Islam, M.T., Kibria, A.S.M.M., Peas, M.H. (2022). JellyFish (*Lobonemoides robustus* Stiasny, 1920) Bloom in the Cox's Bazar Coast during 3-4 August 2022: Factors Identification and Minimization Approaches. *Journal of Oceanography & Marine Environmental System*, 6: 01-17.
9. Haider, S. M. B., Islam, M. T., & Islam, M. S. (2022). Present scenario of coral diversity at Saint Martin's Island, Bangladesh. *International Journal of Fisheries and Aquatic Studies*, 10: 1-15.
10. Islam, M. T., Al Nahian, S., Mahbub-E-Kibria, A. S., Emon, S., & Biswas, S. Seasonal Nutritional Variability of Green Mussel (*Pernaviridis*) at Maheshkhali Estuary, Cox's Bazar, Bangladesh. *IOSR Journal of Environmental Science, Toxicology and Food Technology*, 15: 34-41.
11. Islam, M. T., Sharif, A., Mahbub-E-Kibria, M., Emon, S. B., & Biswas, S. (2018). Seasonal variation of physico-chemical characteristics in the South Eastern coastal waters of Cox's Bazar, Bangladesh. *International Journal of Science and Research*, 8: 1283-1289.

## BOOK PUBLICATIONS

1. Haider, S.M.B., Islam, M.T., Bhuyan, M.S., Rabaoui, L. J., Abroguena, J.B.R., Atiya, M.S.H., Sharif, A.S.M., Un Nabi, M.R., Tomascik, T. (2023). *Corals of the St. Martin's Island, Bangladesh: An Illustrative Guide*
2. Md. Simul Bhuyan; Abu Sayeed Muhammad Sharif; Md. Tarikul Islam; Md. Rashed Un Nabi; Mrityunjoy Kunda; Towhida Rashid (2024). *Pictorial Dictionary of Seaweed: A Complete Compilation of Terminology*.

coast of Cox's Bazar during 2022. Scientist of the division identified the species (*Balaenoptera edeni* Anderson, 1878). Now a team is working to preserve its skeleton at BORI premise as a part of whale research and education.

## MARINE FISHERIES REFERENCE MUSEUM

The scientists are working to develop a Marine fisheries reference museum.

## RESEARCH AND DEVELOPMENT PROJECTS (2023-2024)

- Phylogenetic identification and biochemical composition of 10 commercial seaweeds of Bangladesh
- Present status of potential non-conventional Marine species and their contribution in the blue economy of Bangladesh.
- Investigation of jellyfish resources and their potential as blue foods and high-value bio products.
- Assessment of bacterial diversity and antibiotic sensitivity pattern in marine microbial community after anthropogenic perturbation in the water of south-eastern coast of Bangladesh.
- Variability of chlorophyll-a and phytoplankton community structure with tides in response to physico-chemical parameters of estuarine water of Cox's Bazar, Bangladesh.



**ABU SAYEED MUHAMMAD SHARIF**  
Senior Scientific Officer  
Research Interest  
Marine Ecology, Phycology, Planktology, Corals, Mariculture Molecular Biology and Genetics.



**DR. SEEMA RANI**  
Senior Scientific Officer  
Research Interest  
Marine Biodiversity Conservation, Ecosystem Service Valuation & Risk Assessment, Marine Resource Management, Integrated Coastal Zone Management, Ocean Governance & Blue Economy.



**ABDULLAH AL MAMUN SIDDIQUI**  
Senior Scientific Officer  
Research Interest  
Coastal Zoning Management, Marine Biotechnology, Fish Population Dynamics & Marine Fisheries Resource Management, Socio Economic Study, Marine Spatial Planning and Blue Economy.



**SYNTHEIA TOWHIDI**  
Senior Officer  
Research Interest  
Primary Productivity, Phytoplankton diversity & Ecology, Seaweed Taxonomy, Effect of Climate change & pollution phytoplankton.



**BIPASHA SUR**  
Scientific Officer  
Research Interest  
Marine Microbial Biodiversity, Marine Pollutants Assessment (Toxin, Plastic), Medicinal Value of Seaweeds & Marine Therapeutics, Marine Taxonomy.



**MD. SIMUL BHUYAN**  
Scientific Officer  
Research Interest  
Marine Biology, Marine Fisheries, Marine Ecology, Marine Pollution.



**MD. HANIF BISWAS**  
Scientific Officer  
Research Interest  
Medicinal value of Seaweed and non-conventional marine species, Development of Artificial Breeding Technique of Marine species (coral, fishes) Marine biodiversity.



**SHOWMITRA CHOWDHURY**  
Scientific Officer  
Research Interest  
Marine ecology, Marine biotechnology, Genetics & molecular biology, Blue economy and Marine pollution.

# BIOLOGICAL OCEANOGRAPHY DIVISION



**Bangladesh Oceanographic Research Institute**  
Ministry of Science and Technology

**Address**  
Biological Oceanography Division  
2<sup>nd</sup> floor, Institute Building, BORI Campus  
Pechar dwip, Marine Drive Road, Ramu, Cox's Bazar

## BIOLOGICAL OCEANOGRAPHY DIVISION

Biological oceanography is the study of how organisms affect and are affected by the physics, chemistry, and geology of the oceanographic systems. The branches of Biological oceanography deals with marine and coastal flora & fauna with their ecology and ecosystem, habitat and restoration, diversity and distribution pattern, biochemical composition and their extraction, molecular biology, genetics, cultivation and production for knowledge gap filling and socio economic and environmental development.

BORI is established for Oceanographic Research with five major divisions in 2018. The Biological Oceanography Division (BOD) at BORI has been conducting research on seaweed since 2018. A group of seven scientists joined the division in 2022 with multidimensional research interests of biological oceanography. The division is working to develop modern research facilities for analytical laboratory, plankton laboratory, molecular and genetic laboratory, microbiology laboratory. The division is equipped with different biological sampling gear and instruments from surface to bottom including diving and snorkelling facilities. The scientists of the Division are involved in finding potential marine resources focusing sustainable blue economy development, SDG and Delta Plan through Research & Development (R&D) Projects. So far 20 MSc thesis and BSc projects were supervised from this division.

## MAJOR RESEARCH OUTCOMES BOD (2018-2023): SEAWEED RESEARCH

The scientists of the division has been working to explore potential commercial seaweeds since 2018.

- 143 seaweeds are identified of which 35 Chlorophyta, 74 Rhodophyta and 34 Phaeophyta species from the Saint Martin's Island.
- 5 Agarophyte, 6 carragenophyte and 4 alginophyte seaweeds were explored and successfully extracted respective hydrocolloid.
- 12 seaweeds were examined for potential nutrition content;

### SEAWEED CULTIVATION METHOD DEVELOPMENT

Scientist of the division developed seaweed cultivation methods in different coastal conditions. In the next JICA adopted the BORI's seaweed cultivation methods and is disseminating them among the coastal community of cox's Bazar under an MoU between BORI and JICA for five years (2022 to 2027).

### CORAL RESEARCH

BORI researcher explored 42 coral species from Saint Martin's Island by diving and snorkelling of which 32

hard corals, 9 soft corals from the lagoons and sea bottom rocks. The division is working for coral habitat restoration.

### PLANKTON RESEARCH

BORI scientists participated a survey in the Bay of the Bengal by Dr. Fridtjof Nansen oceanographic research vessel. The Collected phytoplankton and zooplankton samples which were analyzed and identified 220 taxa of phytoplankton and 109 taxa of zooplankton.

### JELLYFISH RESEARCH

Some hundreds of dead jellyfish were trapped along the Cox's Bazar coast, during august 2022. BORI scientists identified the species (*Lobonemoides robustus Stiasny, 1920*) and discovered that it is commercially important edible jellyfish that. It can be a potential blue economy component through harvest, processing and exporting.

### SANDUNE BIO-SHIELD VEGETATION RESEARCH

The scientists of BORI explored 71 sand dune plants species from the coast of Sonadia Island that are important for dune formation and protection of coastal erosion.

### INVESTIGATION OF WHEAL

Two dead wheals were trapped in the





Figure : (a) Ghost crab entangled with fishing nets; (b) Macroplastics along the western part of Sonadia Island, (c) & (d) sample collection from the study area.

### OIL POLLUTION RESEARCH

The Eastern Coastal Zone extends from Teknaf upazila to Mirsarai upazila along the estuary of the Feni river and it is the most stable part of Bangladesh coast. This zone has become an aggregate of many rivers and dozens of tributaries that are considerably polluted. In recent decades, almost an average of 50% of the total oil production was transport of oil in the marine worldwide, including south eastern coast as fishing boat activity, shipping line and cargo activities both domestic or international. Coastal waters are collected from selected sampling points and analyzed in the laboratory by using the APHA 5520 B method applied as Liquid-Liquid, Partition-Gravimetric Method. The average concentration of oil and grease in south eastern coastal water and its surroundings is 0.985 ug/l or 0.985 ppb. Oil-Grease contaminants were detected and distributed in each sampling station with a variety of concentrations. The results indicated that the level of oil-grease obtained in most of these waters are lower than the threshold value for normal marine animations based on the US EPA water quality criteria guidelines. It is necessary to monitor and evaluate the environmental quality of this coastal zone through analyzing seawater and sediment samples frequently. In case of an oil spills incident both from the off-shore incidents or tanker shipping, environmental baseline data has been provided. Strict supervision is needed for all ships and boats across these waters, including ships docking process and oil dumping waste.



### SCIENTISTS



#### ABU SHARIF MD. MAHBUB-E-KIBRIA

Senior Scientific Officer & Head

Research Interest  
Marine Pollution, Marine Oil Pollution  
Oil Spill Risk Assessment (OSRA), Climate  
Change, Coastal Environmental Management, EIA.

Phone : +88-01712-884707

E-mail : kibria@bori.gov.bd



#### MIR KASHEM

Scientific Officer

Research Interest  
Blue Carbon, Air-sea interaction, Marine  
Disasters, (Cyclone, Storm Surge & Saline Water  
Intrusion), Biogeochemistry of Ocean, Climate  
Change, Marine Pollution, EIA, CZM.

Phone : +88-01710-359532

E-mail : mirkashem@bori.gov.bd



#### SULTAN AL NAHIAN

Scientific Officer

Research Interest  
Micro-Plastic, Marine Debris, Oil spill, Ecological  
Modeling and, Marine conservation.

Phone : +88-01610-624426

E-mail : nahian@bori.gov.bd



#### MD. ALAMGIR HOSSAIN

Scientific Officer

Research Interest  
Ocean Environmental Pollution, Climate Change  
Environmental Impact Assessment (EIA)  
Coastal Disaster

Phone : +88-01722503307

E-mail : alamgir@bori.gov.bd



#### MD. HASANAT ARAFIN

Scientific Officer

Research Interest  
Weather forecasting & simulation  
Geographical information system (GIS) & Remote  
Sensing (RS), Sustainable coastal management,  
Disaster, Management, Ocean Pollution

Phone : +88-01787908613

E-mail : arafin@bori.gov.bd



#### AHSAN HABIB NAYAN

Scientific Officer

Research Interest  
Ocean Pollution  
Ocean Climate  
Sea Level Rise  
Global Warming

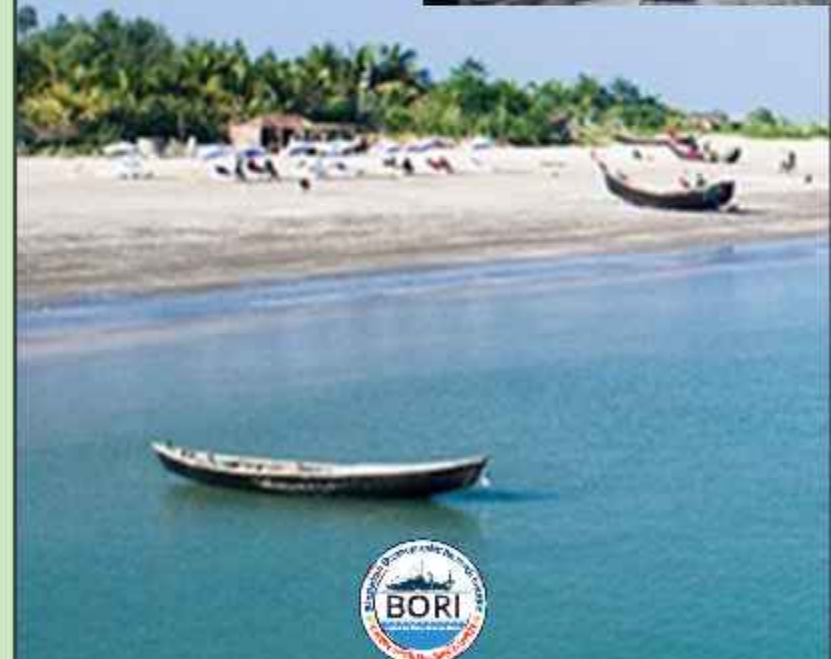
Phone : +88-01749872997

E-mail : ahsan@bori.gov.bd

### ADDRESS

Environmental Oceanography and Climate Division  
1<sup>st</sup> floor, Institute Building, BORI Campus  
Pechar dwip, Marine Drive Road, Ramu, Cox's Bazar

# Environmental Oceanography and Climate Division



Bangladesh Oceanographic Research Institute  
Ministry of Science and Technology

## EOCD AT A GLANCE

"Marine Environment covers not only the ocean, but estuaries (e.g., bays), which are coastal areas where the sea water is diluted with freshwater coming from rivers and streams, or sometimes groundwater."

-Judith S. Weis

Environmental Oceanography and Climate Division (EOCD) is concerned in marine, coastal and estuary environments as these environments have been suffering diverse modes of degradation, including pollution with xenobiotic compounds, accelerated input of dissolved plant nutrients, discharge of untreated industrial effluents and physical modifications ranging from unplanned coastal constructions and developments.

The EOCD is engaged in investigating and monitoring the marine pollutions of the Bay of Bengal as a part of baseline study through Research and Development (R&D) projects. The Research activity of EOCD has been started in 2017-2018 FY with a R&D project: Determination of marine pollution by coastal water quality monitoring and mapping marine litter loads around the Coastal Area of Saint Martin Island.

EOCD has been getting fund for research projects under the "Special Allocation for Science and Technology" from Ministry of Science and Technology (MoST) which has been implemented in respective Fiscal Years.

EOCD provides services as analysis of water quality parameters (Water Temperature, Salinity, Conductivity, pH, Total Dissolved Solids (TDS), Total Suspended Solids (TSS), Dissolved Oxygen (DO), Biological Dissolved Oxygen (BOD) and Chemical Dissolved Oxygen (COD)) and Local Meteorological parameters (Air Temperature, Wind Speed, Wind Direction and Relative Humidity).

## BLUE CARBON RESEARCH

### What is Blue Carbon?


- Organic carbon captured and stored by coastal marine plants like mangroves, seagrasses, and tidal marshes.
- These ecosystems have high productivity and exceptional carbon burial rates, exceeding even terrestrial ecosystems.
- Carbon storage in Blue Carbon habitats occurs underground in low-oxygen sediments, leading to slow decomposition and long-term storage.

### Blue Carbon Ecosystem of Bangladesh

Bangladesh boasts a unique treasure trove of blue carbon ecosystems, particularly the awe-inspiring Sundarbans mangrove forests. These vibrant ecosystems play a crucial

role in mitigating climate change and safeguarding the Bangladeshi coastline. Total areas of blue carbon ecosystems is about 2.1 million hectares in Bangladesh (Hasan et al. 2013).

Type of Blue Carbon Ecosystem in BD	Area(ha)	Main locations
Mangroves	441,455	Sundarbans (West Coast)
Seagrasses	660,048 886,523	River-estuary Coastal water <5m depth
Tidal Marshes	111,585	Deltaic Coast
Macroalgae	-	-



### Blue Carbon Status of Bangladesh

- Total blue carbon stock in the Bangladesh Sundarbans is estimated at ~91.19 Tg (Rahman et al., 2015).
- Oligohaline zones hold the highest stock (~45.60 Tg), followed by mesohaline (~30.69 Tg) and polyhaline zones (~14.90 Tg) (Rahman et al., 2015)
- Ecosystem carbon stocks in natural mangroves range between 115 and 256.6 Mg C ha<sup>-1</sup> (Ahmed et al., 2017; BFD, 2015; Kamruzzaman et al., 2018; Majumder et al., 2019; Mitra et al., 2011; Nellemann & Corcoran, 2009).

### Benefits and Importance

*Offers a key mechanism for transitioning to low-carbon economies through:*

- National carbon inventories (NDCs)
- Market-based mechanisms for carbon offsets

*Creates economic value through:*

- Carbon trading
- Diversifying livelihood options, especially in developing countries e.g., Bangladesh provides valuable ecosystem services including coastal protection, fisheries support, and biodiversity conservation.

### Challenges and Solutions

- Blue Carbon habitats are highly threatened, facing rapid degradation and loss especially in coastal area of Bangladesh.
- Quantification of carbon stocks and fluxes is crucial for establishing carbon markets and informing policy.
- Effective restoration and protection requires good governance models with strong community involvement.

### Blue Carbon as Part of the Blue Economy

Blue Carbon, stored in coastal plants like mangroves, saltmarshes and seagrasses, is a powerful climate tool within the Blue Economy. It captures carbon, boosts economies (through carbon markets and diverse livelihoods), and protects coasts. Despite threats, effective restoration and good governance, with local communities at the center, can unlock its full potential for a sustainable future.

## RESEARCH ON PLASTICS POLLUTION

From 2018 to 2023, five projects have been conducted to study plastic pollution along the coastal areas of Bangladesh. The project areas covered Saint Martin's Island, Cox's Bazar, Maheshkhali, Sonadia, and the Sundarbans. These projects were undertaken to establish a baseline dataset on plastic pollution along the coastal areas of Bangladesh. During the fiscal years 2021-22 and 2022-23, an in-depth study was undertaken to investigate the presence of microplastics within the organs of fish in the southeastern and western coastal regions. In the preceding fiscal year, a comprehensive examination focused on the coastal regions of Saint Martin Island, Cox's Bazar, and Maheshkhali. Previous study placed a primary emphasis on monitoring the quality of coastal water and assessing the abundance of marine plastic debris, encompassing macroplastics, mesoplastics, and microplastics, along the coastline. The study aimed to uncover the sources, types, intensity, and root causes of pollution, aiming for a comprehensive understanding of the issue. Plastic litter was quantified along the shoreline in three categories—microplastics (≤ 5mm), mesoplastics (5mm to 2.5 cm), and macroplastics. Additionally, pollution maps were created to provide detailed insights into litter intensity, the origins of litter, and specific locations most affected by pollution. These study will identify the plastic pollution level along with the sources, types and fates of the marine plastic pollution into the sea. On the other hand, according to UN's Sustainable Development Goal (SDG) number 14- 'life below water', each country has to achieve their targets related to marine pollution reduction especially by reduction of marine debris loads from the coastal areas. The 1st target says- "By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution" (SDG 14.1). Besides, There are four big challenges for the Bangladesh Delta Plan (BDP) 2100 where water quality is the 3rd. The BDP 2100 envisioned 3 higher level national goals and 6 specific goals that contribute to achieving these higher level goals. In the BDP 2100 specific goal 2, 3 and 4 directly accentuate the water security, Conserve and preserve wetlands and ecosystems (BDP 2100). In election manifesto 2018 government is committed to reduce every kind pollution to achieve the goals of SDG-14, BDP 2100 and Perspective Plan 2021-2041 (Election Manifesto 2018). This project will contribute not only to develop a knowledge-based baseline scenario of marine coastal pollution but also will contribute to achieve the target of SDGs-14, BDP 2100, PP 2021-2041 and safe, climate resilient and prosperous delta.

## RESEARCH LIST

- Trend detection of temperature and rainfall in the coastal region of Bangladesh.
- Statistical Analysis and Future Prospecting of Non-conventional Marine Fisheries and Algae Resources in the Cox's Bazar District of Bangladesh.
- Forecasting of rainfall in the coastal region of Bangladesh based on time series analysis.
- A project has been under implementation for developing International standard Oceanographic Data Center where an ocean observing system will be included in BORI .



## OCEANOGRAPHIC DATA CENTER BANGLADESH OCEANOGRAPHIC RESEARCH INSTITUTE COX'S BAZAR



## BRIEF

- A data center is a facility composed of networked computers and storage that businesses or other organizations use to organize process, store and disseminate large amounts of data.
- With the establishment of Bangladesh Oceanographic Research Institute (BORI), Oceanographic Data Centre has been created as a country's first data center in the Oceanography field.
- The mandate of Oceanographic Data Centre of BORI is to serve as a "data-primer" for students and those in other fields of research who are interested in carrying out research involving the analyses of data in the oceanographic sciences.



## ADDRESS

Oceanographic Data Center  
Phone: 02334445217  
E-mail: [tania@bori.gov.bd](mailto:tania@bori.gov.bd)



# OCEANOGRAPHIC DATA CENTER



**Mst. Tania Islam**  
Scientific Officer & Head  
Oceanographic Data center



**Bangladesh Oceanographic Research Institute**  
Ministry of Science and Technology

## LIST OF PUBLICATIONS

- Islam, M.T., Zakaria, M. and Loodh, R. (2023), Forecasting Of Rainfall In The Area Of Sitakunda And Patenga Of Bangladesh Using Box-Jenkins Arima Approach, The Journal of NOAMI Vol. 38, Number 1&2.
- Islam, M. T. and Zakaria, M., (2019b). Forecasting of Maximum and Minimum Temperature in the Cox's Bazar Region of Bangladesh based on Time Series Analysis, IOSR Journal of Mathematics (IOSR-JM), Vol. 15 (5), pp. 56-67
- Zakaria, M. and Islam, M.T. (2023), Determination of Sediment Distribution and Suspended Sediment Discharge in the Kutubdia Channel of Bangladesh, The Journal of NOAMI Vol. 37, Number 1
- Islam, M. T. and Zakaria, M., (2019a), Interdependency between Rainfall and Temperature using Correlation Analysis in the Barishal District of Bangladesh, IOSR Journal of Mathematics (IOSR-JM), Vol. 15 (5), pp. 49-55
- Zakaria, M., Islam, M.T., Haider, S.M. (2023), Coastal and nearshore sediment data along the eastern coastal zone of Bangladesh of the northern Bay of Bengal, Data in Brief, Vol.47, <https://doi.org/10.1016/j.dib.2023.109028>
- Zakaria, M. and Islam, M. T. (2019c), Analysis of Relative Tectonic Activity using Morphometric parameter of the RejuKhal Drainage Basin of Cox's Bazar, Bangladesh, The Journal of NOAMI, Vol. 36, Number 1, June 2019.
- Loodh. R., Talokder, R.A.M., Rahman. S.M., Alam, U.M. and Islam, M.T. (2023). Assessment Of In-Situ, Satellite And Model Derived Physico-Chemical Conditions Around Saintmartin's Island, North-Eastern Bay Of Bengal, The journal of NOAMI, Vol.38
- Zakaria, M. and Islam, M. T. (2023), Assessment of Organic Carbon and Carbon Stock in the Sediments of the Estuarine Area of Naf River and Maheshkhali Channel, Bangladesh: Investigating the Influence of Sediment Texture and Depositional Conditions, Songklanakarin Journal of Science and Technology.

## KEY ACTIVITY OF ODC

- Its main task is to organize the data gathered from Ocean.
- Gathering Oceanographic data from National, Regional, and International Programs.
- Evaluating the Data's quality.
- Ensuring the long-term preservation of the Data & accompanying information essential for accurate interpretation of the Data.
- Making Data available nationally and internationally in accordance with governmental norms and regulations.

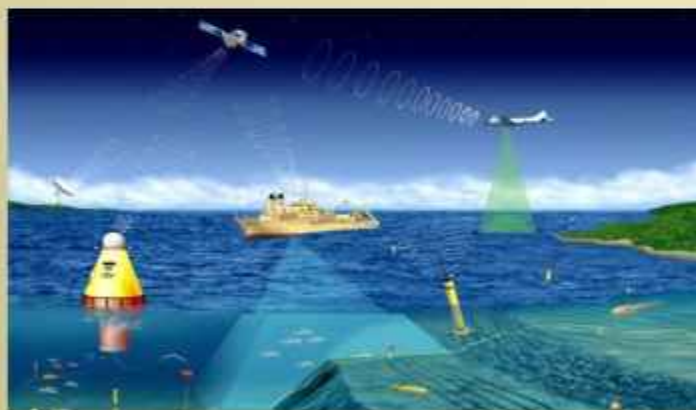


## FUNCTION OF THE ODC

- Obtaining research data, carrying out quality assurance, and archiving.
- Daily data collection from buoys, ships, and satellites; prompt processing of the data; and delivery of outputs to various research projects and/or other facilities in accordance with governmental norms and regulations.
- Directly informing data collectors of the quality control outcomes as part of the system's quality assurance module.
- Assisting in the creation of data management strategies, systems to support large-scale experiments, monitoring systems, etc.
- Publishing statistical studies and atlases of oceanographic variables. Disseminating data via the Internet and other channels (including on CD-ROM, DVD, etc.) in accordance with governmental norms and regulations.

## DATA COULD INCLUDE THE FOLLOWING DISCIPLINES

- Physical Oceanography
- Chemical Oceanography
- Marine Contaminants/pollution
- Marine Biological/Fisheries
- Marine Geology/Geophysics
  - Marine Meteorology



## FUTURE PLANNING

- Implementation of short-term, mid-term and long-term planning for blue economy.
- Monitoring marine biodiversity based on AI.
- System development for the International Data Assembly.
- Sea Level Observing System development.
- Modeling of deep sea resources based on AI.
- Marine observing system.
- Marine Environmental & Information Network develop.
- General Bathymetry Chart of Ocean.
- Numerical modeling & forecasting of Ocean process.
- Analysis & modeling of Ocean process.
- Stochastic and fractal methods in coastal morphodynamics.
- Application of soft computing techniques in coastal study.
- Application of Multivariate Statistical Techniques for Characterization of
- Groundwater Quality in the Coastal area.
- Coastline evolution based on statistical analysis and modeling.
- Managing Marine Environmental Pollution Using Artificial Intelligence.

