LIGHTHOUSE
A Monthly Technical Magazine
Private Circulation Only
R.L. INSTITUTE OF NAUTICAL SCIENCES
TVR Nagar, Aruppukottai Road, Madurai - 625 022
Published by Marine Engineers and Navigators Association [MARENA]
VOYAGE 26 FEBRUARY - 2026 CALL 02

BEYOND BOUNDARIES: RETHINKING MARINE PROTECTED AREAS FOR OCEAN RECOVERY

Er.Balan Muthuramalingam, Principal RLINS

Humanity has reached a decisive moment in its relationship with the ocean. For centuries, the sea has served as a source of food, a global trade route, and, regrettably, a repository for waste. This prolonged exploitation has placed immense pressure on marine ecosystems. Today, however, there is growing international recognition that urgent action is needed to restore ocean health. At the center of this global effort lies the establishment of Marine Protected Areas (MPAs).

Marine Protected Areas are designated regions of the ocean where human activities are regulated to conserve marine biodiversity and ecosystems. They are widely regarded as a cornerstone of global marine conservation strategies. Over the past several decades, the growth of MPAs has been remarkable. Since the 1960s, their global coverage has expanded at an annual rate exceeding eight percent. The last decade, in particular, has witnessed the creation of several large-scale MPAs in remote regions, many of which strictly prohibit commercial extraction of resources such as fish, oil, and minerals.

A significant milestone in marine conservation is the protection of 1.55 million square kilometres of the Ross Sea in Antarctica, now recognized as the largest conservation area of any kind in the world. Notably, nine of the ten largest protected areas on Earth are marine. Despite these impressive achievements, MPAs currently cover only about four percent of the global ocean, compared to roughly fifteen percent of land areas that are protected. International agreements, including commitments under the Convention on Biological Diversity and the United Nations Sustainable Development Goals, have aimed to increase marine protection targets. However, coverage alone does not guarantee success.

The effectiveness of Marine Protected Areas varies significantly. While some MPAs demonstrate remarkable recovery of fish populations and ecosystem health, others struggle to achieve meaningful outcomes. Earlier research emphasized biological and physical factors such as the size, age, location, and connectivity of protected areas. Although these aspects are important, recent studies reveal that social and management factors are equally, if not more, influential.

A comprehensive global analysis of hundreds of MPAs highlights critical capacity gaps in management. Many protected areas lack adequate staffing, reliable funding, and consistent scientific monitoring. The findings are concerning: a large proportion of MPAs fail to meet even half of the necessary standards for effective management. Only a minority are sufficiently funded or guided by scientific data, and very few report adequate staffing levels. These deficiencies significantly affect conservation outcomes.

The situation can be compared to constructing a hospital without providing doctors, equipment, or operational funding. Simply establishing a structure does not ensure public health. In the same way, declaring an ocean area as “protected” does not automatically restore marine ecosystems. Effective conservation requires trained personnel, scientific oversight, enforcement of regulations, and long-term financial commitment.

Encouragingly, even with management shortcomings, many MPAs still show positive ecological outcomes. Well-managed protected areas often experience significant increases in fish biomass compared to surrounding unprotected waters. In some cases, improved staffing capacity alone has been shown to dramatically enhance

LIGHTHOUSE
A Monthly Technical Magazine
Published by Marine Engineers and Navigators Association [MARENA]
R.L. Institute of Nautical Sciences, Madurai.
VOYAGE 26 | CALL 02 | Feb 2026

conservation results. These ecological gains also generate economic benefits. Healthy fish populations can spill over beyond reserve boundaries, supporting fisheries and benefiting coastal communities. Tourism operators likewise profit from thriving marine ecosystems that attract divers and nature enthusiasts.

Another crucial insight emerging from recent research is the importance of integrating social sciences into marine conservation. The success of MPAs is closely linked to governance, leadership, stakeholder involvement, and community cooperation. Studies of small-scale fisheries reveal that strong local leadership, social cohesion, and fair enforcement of rules are often more decisive than physical characteristics of the ecosystem. When communities participate in decision-making processes and perceive benefits from conservation, compliance improves and long-term sustainability becomes more achievable.

Looking ahead, the future of marine conservation must shift from a focus on expansion alone to an emphasis on effective management. Expanding coverage without strengthening capacity risks creating "paper parks" — protected areas that exist in legislation but lack real-world impact. To avoid this, governments and international organizations must prioritize sustainable funding mechanisms, invest in training skilled personnel, enhance scientific monitoring systems, and strengthen enforcement measures. Technological advancements such as satellite monitoring and data-driven fisheries management can further improve transparency and accountability.

The ocean plays a fundamental role in regulating the Earth's climate, supporting global food security, facilitating trade, and sustaining immense biodiversity. Protecting it is not merely an environmental objective; it is an economic and social imperative. Marine Protected Areas offer a powerful tool to restore marine ecosystems, but their success depends on more than boundaries drawn on a map.

Ultimately, the true measure of marine conservation will not be how much of the ocean we designate as protected, but how effectively we manage and sustain those protected areas. The health of our oceans — and the well-being of future generations — depends on turning commitment into meaningful action.

Courtesy – researchgate.net

CONTENTS

1. Beyond Boundaries : Rethinking 1
2. Smart Ships & IOT-Based 3
3. Lighthouses : Timeless Guardians 4
4. The Port of Virginia Strengthens 5
5. Marpol : The Global Framework 6
6. Maritime Week Celebrations - 2026 7
7. Life of a Seafarer 8

SMART SHIPS & IOT-BASED ELECTRICAL MONITORING

Prof. S. Thiagarajan, Senior Faculty

A Practical Perspective from Marine Electrical Training

The maritime industry is steadily moving toward digital transformation. During classroom discussions with cadets, one common question often arises: "How different will ships be in the next 10–15 years?" The answer is already visible—ships are becoming smarter, more connected, and increasingly data-driven. The integration of IoT-based electrical monitoring is at the centre of this change.

Traditionally, shipboard electrical systems depended heavily on manual watch keeping, routine log entries, and periodic maintenance schedules. Engineers would record generator parameters every hour—voltage, frequency, load, temperature—and act only when abnormal readings were noticed. While this system worked effectively for decades, it largely depended on human observation and experience.

Today, smart ships operate differently. Electrical panels, generators, propulsion motors, and auxiliary systems are fitted with intelligent sensors that continuously monitor performance. Parameters such as insulation resistance trends, winding temperatures, bearing vibrations, harmonic distortion, and load fluctuations are automatically recorded and analysed. Instead of waiting for a failure, the system provides early warning signals.

From a training perspective, this shift is very significant. Cadets must now understand not only how to operate switchboards manually, but also how to interpret data analytics dashboards. For example, if a generator shows gradual temperature rise over several days, a smart monitoring system can indicate possible ventilation blockage or overloading well before a trip occurs. This predictive approach reduces blackout risks—one of the most critical emergencies onboard.

Another important aspect is energy efficiency. Ships function as floating power stations, and improper load management leads to excess fuel consumption. IoT-based monitoring helps optimize generator running hours, balance load sharing, and improve power factor. Such measures directly contribute to emission reduction goals encouraged by the International Maritime Organization. As future marine engineers and Electro-Technical Officers (ETOs), cadets must recognize that efficient electrical management is no longer optional—it is an environmental responsibility.

During discussions with students, many express concern about whether automation will replace human roles. In reality, smart technology does not eliminate the engineer's role; it enhances it. Data systems can detect abnormalities, but interpretation and decision-making still depend on professional knowledge. A well-trained engineer can correlate sensor data with practical onboard conditions such as humidity, load variation, or maintenance history.

Remote diagnostics is another growing trend. Electrical performance data can be shared with shore-based technical teams for guidance. In complex troubleshooting situations, this support reduces downtime and ensures quicker restoration of systems. However, increased connectivity also introduces cybersecurity concerns. Protecting automation networks from unauthorized access is now part of modern marine electrical competence.

Looking ahead, developments such as AI-assisted load management, digital twin simulations of power systems, and battery-integrated propulsion will become more common. Therefore, maritime training institutions must adapt their curriculum to include digital literacy alongside strong electrical fundamentals.

In conclusion, Smart Ships and IoT-based Electrical Monitoring represent not just technological progress, but a shift in professional mind-set. The marine engineer of tomorrow must be equally comfortable with a megger and a monitoring dashboard, with a circuit diagram and a data trend graph. As educators and professionals, preparing cadets for this evolving reality is both a responsibility and an opportunity.

The ocean remains unchanged—but the way we manage power at sea is undergoing a remarkable transformation.

LIGHTHOUSES: TIMELESS GUARDIANS OF THE SEA.

Mr. Mitul Kanojia (GP Rating)

Standing tall against crashing waves and fierce storms, lighthouses have long been symbols of hope and protection. For centuries, these majestic towers have guided sailors safely through uncertain waters, becoming silent guardians of the sea.

Built along rocky coastlines, near shallow waters, and at dangerous sea routes, lighthouses serve a vital purpose. Their powerful lights, magnified through specially designed lenses, shine across vast stretches of ocean. Each lighthouse has its own unique flashing pattern, known as its "characteristic." This distinctive signal helps sailors identify their location, especially during foggy nights, heavy storms, or complete darkness.

Even in today's world of advanced GPS systems and satellite navigation, lighthouses remain dependable. Technology can sometimes fail due to bad weather or technical issues, but a lighthouse continues to shine steadily. Many are also equipped with foghorns that send out strong sound signals when visibility is poor, ensuring that ships can avoid hidden dangers.

Beyond their practical function, lighthouses hold deep cultural and emotional significance. They represent safety, guidance, and resilience. For coastal communities, they are landmarks rich in history and tradition. For sailors, they are reassuring signs that land is near and safety is within reach.

Though modern technology has transformed maritime navigation, lighthouses continue to connect the past with the present. They remind us that even in an age of satellites and digital systems, a steady light in the darkness still matters.

Courtesy - freepik.com

THE PORT OF VIRGINIA STRENGTHENS ITS COMMITMENT TO SAFETY

Ms. Dhanshri Ravindra Misar (GP Rating)

The Port of Virginia® is taking strong steps to improve safety across all its terminals and offices. The organization is following a layered approach to identify the most common and critical risks in its operations. By doing this, the port aims to reduce workplace injuries, reportable incidents, and lost workdays. Safety is not just a rule at the port—it is a core value.

Recently, this effort was recognized by Signal Mutual, the insurance carrier for The Port of Virginia. The company presented its prestigious Executive Leadership Award to Joseph P. "Joe" Ruddy, Chief Operating Officer of Virginia International Terminals (VIT). VIT is the privately held company that operates the terminals for The Port of Virginia.

While the award was presented to Ruddy, he emphasized that the recognition belongs to the entire organization. According to him, the achievement reflects the port's collective commitment to building a strong culture of safety. The ultimate goal is to eliminate injuries and lost workdays and to become the safest port in North America.

Ruddy stated that safety is a shared responsibility. The port works closely with its labor partners, guests, contractors, and employees to ensure everyone remains protected. The vision is clear: every person who comes to work should return home in the same condition at the end of the day.

Last fall, port leadership introduced an organization-wide initiative to further strengthen its safety culture. As part of this initiative, the port launched an internal safety brand called "We Protect What Matters." The organization has also collaborated with the International Longshoremen's Association (ILA) and team members across departments to identify high-risk areas and implement effective safety measures.

Through teamwork, awareness, and strong leadership, The Port of Virginia continues to move toward its goal of creating one of the safest working environments in North America.

Keypoint: **the most important idea is that safety is everyone's responsibility and the goal is to make sure every worker goes home safely every day.**

Courtesy : marineinsight.com

MARPOL: The Global Framework for Preventing Marine Pollution from Ships

Mr. Aditya (GP Rating)

The oceans are the lifeline of global trade, carrying more than 80 percent of the world's goods across continents. While shipping is essential to economic development, it also poses significant environmental risks. Oil spills, chemical discharges, sewage, garbage dumping, and air emissions from ships can severely damage marine ecosystems. To address these challenges, the International Convention for the Prevention of Pollution from Ships (MARPOL) was established as the world's primary treaty to prevent marine pollution caused by ships.

MARPOL was adopted in 1973 under the International Maritime Organization (IMO), a specialized agency of the United Nations responsible for maritime safety and environmental protection. Following several major oil spill disasters in the 1970s, the convention was strengthened by the 1978 Protocol. Together, they are commonly referred to as MARPOL 73/78. Today, the convention applies to the vast majority of the global shipping fleet, making it one of the most important international environmental agreements.

The structure of MARPOL is divided into six annexes, each dealing with a specific type of pollution. Annex I focuses on preventing oil pollution from operational discharges and accidental spills. It requires ships to maintain oil record books, install pollution prevention equipment, and follow strict procedures for handling oil. Annex II regulates noxious liquid substances carried in bulk, ensuring that chemical pollutants are carefully managed and discharged only under controlled conditions.

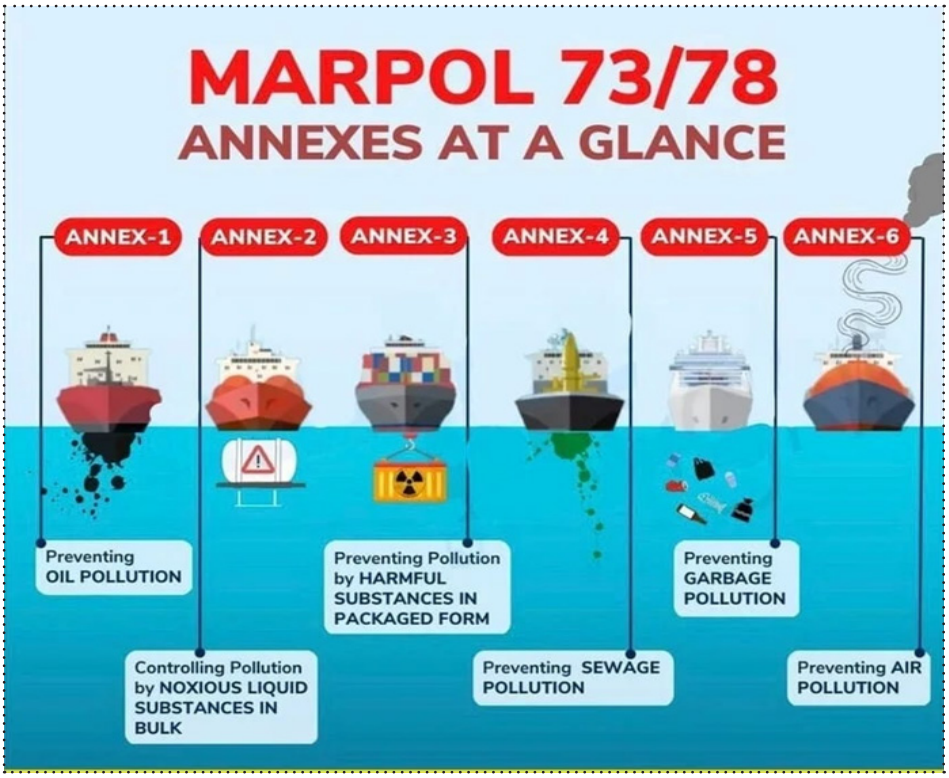
Annex III addresses harmful substances transported in

packaged form. It sets rules for proper labeling, documentation, and stowage to minimize environmental risks. Annex IV controls sewage discharge from ships, requiring treatment systems or restrictions on disposal near coastal areas. Annex V deals with garbage management and strictly prohibits the dumping of plastics into the sea, playing a key role in combating marine plastic pollution. Finally, Annex VI targets air pollution by limiting sulfur oxides (SOx), nitrogen oxides (NOx), and other harmful emissions, while also promoting energy-efficient shipping practices.

One of MARPOL's greatest strengths is that it is legally binding. Member countries are responsible for enforcing its regulations through inspections, certification, and penalties for non-compliance. Ships must carry valid certificates proving adherence to MARPOL standards, and port states have the authority to inspect foreign vessels to ensure compliance. This international cooperation strengthens global efforts to protect marine environments.

Over the decades, MARPOL has significantly reduced oil spills, improved waste management at sea, and lowered harmful emissions from ships. It continues to evolve in response to new environmental challenges, including climate change and the need for greener shipping technologies. By setting strict international standards, MARPOL balances economic growth with environmental sustainability.

In conclusion, MARPOL remains a cornerstone of maritime environmental protection. It demonstrates how global cooperation can safeguard the oceans while allowing international trade to flourish responsibly.



Courtesy -imo.org

Maritime Week Celebrations – 2026

Our institution proudly celebrates Maritime Week from April 1 to April 5, marking April 5 as National Maritime Day. This special week highlights the importance of the maritime industry and honors the contribution of seafarers to global trade and economic development.

As part of the celebrations, a Sports Week was inaugurated on February 24 to encourage team spirit and active participation among students. The event began with a badminton tournament, in which students from the GME, GPR, and ETO departments enthusiastically participated.

The Sports Week was formally inaugurated by our respected Principal, who encouraged the students to actively engage in both academic and extracurricular activities. The event fostered unity, sportsmanship, and a strong sense of camaraderie among the participants, making it a memorable start to the Maritime Week celebrations.

Faculty Development Program on ME Engine

A Faculty Development Program (FDP) on ME Engine was successfully conducted on 21st February 2026 at 11:00 a.m. in the RLINS Board Room.

The session was led by our senior faculty Er. Pravin Kumar, who provided a clear and detailed explanation of the ME Engine. He elaborated on its working principles, key components, and practical applications, making the session highly informative and engaging. The FDP provided a valuable platform for faculty members to clarify their doubts, exchange ideas, and update their knowledge in line with current maritime industry standards. The interactive discussion session at the end further strengthened the learning experience.

Overall, the program was highly informative and beneficial. It significantly contributed to improving the technical expertise of the participants and reinforced the institution's commitment to academic excellence and continuous professional development.

LIFE OF A SEAFARER

Mr. Deepak kumar (GP Rating)

The life of a seafarer working on a ship is full of discipline, responsibility, and adventure. A seafarer spends most of their time at sea, away from family and friends, sometimes for many months. The day usually begins early in the morning with assigned duties such as cleaning the deck, maintaining equipment, checking ropes and mooring lines, and assisting officers with navigation-related tasks. Life onboard follows a strict routine based on watchkeeping schedules, which means a seafarer must remain alert and active at any hour of the day or night.

Weather conditions also play a significant role in daily life. Calm seas make work easier, but rough weather demands extra caution, strength, and teamwork. Despite the challenges, a seafarer develops valuable skills such as discipline, time management, technical expertise, and teamwork. Life at sea also builds mental strength, teaching patience and the ability to handle emergencies calmly. Safety drills, emergency exercises, and maintenance work are regular parts of the routine, ensuring that both the crew and the vessel remain secure throughout the voyage.

Life at sea is not only about hard work; it also brings unique experiences and opportunities. A seafarer travels to different countries and ports, witnessing beautiful sunrises and sunsets over the vast ocean. The peaceful view of endless water and the sound of waves create a special connection between the seafarer and the sea. However, the profession requires sacrifice. Being away from loved ones during festivals, birthdays, and important family events can be emotionally challenging. Communication with family may be limited, depending on network availability at sea. Therefore, emotional strength is just as important as physical strength for a seafarer.

Onboard, the crew becomes like a second family. Seafarers from different states and countries work together, share stories, celebrate small occasions, and support one another during difficult times. This cultural exchange broadens their perspectives and fosters mutual respect and understanding among crew members.

A seafarer's life also involves continuous learning and career growth. Working on a ship provides practical knowledge of navigation, cargo operations, ship maintenance, safety procedures, and maritime laws. Many seafarers aim to rise through the ranks by gaining sea time, clearing competency examinations, and enhancing their professional skills. Discipline and strong performance can open opportunities for promotion to higher positions.

The profession demands physical fitness, mental alertness, and strict adherence to safety regulations. Emergencies such as fire, man overboard situations, or machinery failure require immediate and coordinated action, and every seafarer must clearly understand their role. Though the life of a seafarer is tough and demanding, it builds character, courage, and responsibility. The pride of sailing across oceans, contributing to global trade, and being part of the maritime industry makes the hardships worthwhile. For many, the sea is not just a workplace but a way of life filled with honor, resilience, and adventure.

Courtesy - marnect.com