February 2026

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Navigator Bangladesh: An Ambassador of Maritime Bangladesh, 6th edition, February '26 is published by Savor International Ltd. This publication is intended to be distributed among target readers and stakeholders of maritime and associated industries.

Editorial

Welcome to the sixth edition of Navigator, your trusted guide through the ever-evolving currents of the maritime world. This issue shines a spotlight on Bangladesh's Blue Economy, centered around the Bay of Bengal, which offers transformative economic potential through the sustainable use of marine resources. Following the resolution of maritime boundary disputes, Bangladesh has expanded its Exclusive Economic Zone, unlocking opportunities in fisheries, gas hydrates, minerals, and renewable energy. Despite challenges such as overfishing, pollution, and climate change, the Blue Economy could contribute up to 10% of GDP by 2030, generating billions in revenue and millions of jobs. Regional cooperation, strategic investments, and environmental stewardship are key to ensuring long-term success, as explored in our cover story, "Blue Economy: Charting Bangladesh's Maritime Renaissance in the Bay of Bengal."

Commodore Md Shafiul Bari, Director General, Department of Shipping discusses Bangladesh's maritime future, focusing on the Blue Economy, offshore wind energy, and deep-sea exploration. He highlights progress in digitizing services, addressing cadet placement challenges, and improving safety standards. Bari also touches on decarbonization efforts, ship recycling, and inland waterway safety, emphasizing the need for stronger compliance and enforcement to accelerate sectoral growth and attract investment.

In conversation with Kritwik Barua of Vulkan Bangladesh, we explore how the company navigates price sensitivity, market volatility, evolving customer expectations, and technological transition—and at the same time building a defensible competitive position rooted in engineering credibility, reliability, and long-term value creation.

Additionally, in our company profile section, we feature Twin RHVAC Systems. Our product catalogue highlights Vulkan's Naval Technology portfolio.

Thank you for sailing with us through yet another exciting chapter. Together, let us continue navigating toward a maritime future that is innovative, sustainable, and inclusive.

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Where Creative Excellence Meets Proven Results

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SINGAPORE ACCELERATES GLOBAL TRADE EFFICIENCY WITH AI-DRIVEN PORT OPERATIONS

Singapore has taken another decisive step toward reinforcing its status as a global maritime and logistics leader by advancing the use of artificial intelligence (AI) across port operations. The city-state is integrating AI-enabled systems to optimize vessel traffic management, berth allocation, yard planning, and cargo flow — technologies designed to reduce congestion and improve turnaround times at one of the world's busiest ports.

These AI solutions allow port operators to analyze real-time data on vessel movements, weather conditions, and cargo volumes, enabling smarter decision-making and predictive planning. By automating complex operational processes, Singapore aims to improve overall port productivity while maintaining high safety and reliability standards for international shipping.

The initiative supports Singapore's broader strategy to future-proof its maritime sector amid growing global trade volumes and increasing competition among major ports. With supply chains becoming more time-sensitive and digitally integrated, AI-powered port management is expected to enhance Singapore's attractiveness as a preferred transshipment and logistics hub.

Beyond efficiency gains, the move also aligns with sustainability goals by reducing vessel waiting times and fuel consumption, contributing to lower emissions. Industry stakeholders view the adoption of AI as a critical enabler for long-term growth in maritime trade, particularly as ports worldwide race to adopt smart technologies.

Singapore's continued investment in digital infrastructure underscores its commitment to innovation-led growth, ensuring that its maritime ecosystem remains competitive, resilient, and ready to support global trade flows well into the future.

Source: Maritime and Port Authority of Singapore

BANGLADESH AND APM TERMINALS SEAL LANDMARK DEAL TO EXPAND CONTAINER TRADE CAPACITY

Bangladesh has strengthened its maritime trade ambitions with the signing of a US$550 million concession agreement with APM Terminals to develop and operate the Laldia Container Terminal at Chattogram Port. The long-term public-private partnership marks one of the country's most significant foreign investments in port infrastructure to date.

Under the agreement, APM Terminals will design, build, equip, and manage the terminal, introducing modern container-handling technology and global operational standards. Once completed, the facility is expected to significantly enhance Chattogram Port's capacity, allowing it to accommodate larger container vessels and handle rising trade volumes more efficiently.

The project is widely viewed as a transformational step for Bangladesh's export-driven economy, particularly for the ready-made garments sector, which relies heavily on reliable maritime logistics. Improved port efficiency is expected to reduce cargo dwell times, lower logistics costs, and strengthen Bangladesh's competitiveness in international markets.

Government officials have highlighted that the project will also generate employment, facilitate skills transfer, and attract additional private investment into the country's maritime and logistics sectors. For APM Terminals, the agreement represents a strategic expansion in South Asia, reinforcing its role in supporting global supply chains.

As regional trade continues to grow, the Laldia Container Terminal is expected to play a critical role in positioning Bangladesh as a stronger maritime trade hub in the Bay of Bengal.

Source: The Daily Star / APM Terminals

VIETNAM EMERGES AS A KEY BREAKBULK AND CONTAINER SHIPPING POWERHOUSE IN SOUTHEAST ASIA

Vietnam is rapidly consolidating its position as one of Southeast Asia's most dynamic maritime trade hubs, driven by rising breakbulk and container shipping activity across its ports. Strategic investments in port infrastructure, combined with strong manufacturing growth, have significantly increased cargo volumes moving through Vietnamese terminals.

Industry observers note that Vietnam's ports are increasingly handling project cargo, heavy lifts, and containerized goods supporting sectors such as energy, construction, and industrial manufacturing. Improved connectivity to major global shipping routes has further strengthened Vietnam's role within regional and international supply chains.

Port operators have expanded terminal capacity and upgraded handling equipment to meet growing demand, while logistics providers continue to enhance hinterland connectivity. These developments have enabled Vietnam to attract new shipping services and diversify its cargo base, reducing dependency on any single trade lane.

Vietnam's rise reflects broader shifts in global manufacturing and trade patterns, with companies seeking resilient and cost-effective production bases in Southeast Asia. The country's expanding maritime capabilities are playing a crucial role in supporting these shifts by ensuring efficient export and import flows.

As trade volumes continue to grow, Vietnam is expected to further invest in port modernization and logistics infrastructure, strengthening its long-term competitiveness and cementing its status as a key maritime gateway in the region.

Source: Breakbulk.News

PORT KLANG'S CONTINUED GROWTH REINFORCES MALAYSIA'S ROLE IN GLOBAL MARITIME TRADE

Port Klang has continued its upward trajectory, reinforcing Malaysia's position as a major maritime and logistics hub in Southeast Asia. Strategic infrastructure investments and operational improvements have enabled the port to handle increasing container volumes while maintaining efficient turnaround times for shipping lines.

Located along the vital Strait of Malacca, one of the world's busiest shipping lanes, Port Klang plays a critical role in facilitating east-west trade flows. Ongoing expansion projects and improved port connectivity have strengthened its appeal to global carriers seeking reliable transshipment and gateway services.

The port's growth supports Malaysia's broader economic and trade objectives, helping local exporters gain smoother access to international markets while attracting foreign direct investment into logistics and manufacturing. Industry stakeholders credit the port's success to continuous capacity upgrades, digital initiatives, and strong collaboration between public and private sector operators.

As global trade patterns evolve, Port Klang's strategic location and expanding capabilities position it well to capture future growth in regional and international cargo movements. The port's development also reflects ASEAN's rising importance in global supply chains.

Source: The Star / Bernama

SOUTHEAST ASIA INVESTS HEAVILY IN SMART PORTS TO STRENGTHEN TRADE COMPETITIVENESS

Countries across Southeast Asia are accelerating investments in modern port infrastructure and smart technologies to support long-term trade growth. Governments and private operators are expanding terminals, upgrading equipment, and adopting digital platforms to improve efficiency and resilience across maritime supply chains.

These investments are driven by rising trade volumes, increasing vessel sizes, and the need for faster cargo handling. Automation, data analytics, and digital logistics systems are being deployed to reduce turnaround times and improve coordination between ports, shipping lines, and hinterland transport networks.

Industry analysts highlight that smart port development is becoming a critical differentiator for attracting global shipping services. Ports that can offer reliability, transparency, and efficiency are better positioned to support complex, time-sensitive supply chains.

The regional push for port modernization also supports broader economic integration within ASEAN, facilitating smoother intra-regional trade and enhancing connectivity with global markets. As Southeast Asia continues to play a growing role in global manufacturing and consumption, efficient maritime infrastructure will remain essential.

Collectively, these investments are expected to future-proof the region's ports, ensuring they remain competitive and capable of supporting sustainable trade growth in the years ahead.

Source: Federation of Business Information Services (FEBIS)

WÄRTSILÄ AND SINOCREW LAUNCH ADVANCED SEAFARER TRAINING CENTRE IN CHINA

International technology group Wärtsilä and Sinocrew Maritime Services have inaugurated a state-of-the-art maritime training centre in Beihai, China, aimed at equipping seafarers with skills for the next generation of decarbonisation and maritime technologies.

The new facility, part of the Beihai International Seafarer Training Center (BISTC), features advanced marine simulators and specialist training programs focused on sustainable cruise operations and emerging ship technologies. The partnership also signed a framework MOU to establish the Maritime Advancement in Simulation, Technology and R&D Services (MASTERS) initiative, designed to continuously evolve seafarer competencies for a rapidly advancing industry.

Officials noted that the training centre will serve the wider ASEAN region, supporting efforts to upskill the maritime workforce in technologies such as alternative fuels, energy-efficient vessel systems, and digital navigation tools. As shipping decarbonisation accelerates globally, seafarers with advanced technical expertise will be essential to safe and efficient operations.

This initiative reflects broader industry trends toward investing in human capital alongside technological progress, ensuring that maritime professionals are prepared for the evolving demands of global trade.

Source: Wärtsilä / The Maritime Executive

HONG KONG MARITIME WEEK ADVANCES DIGITAL TRADE PLATFORMS AND GREEN FUEL BUNKERING

The 2025 Hong Kong Maritime Week highlighted significant advancements in digital trade facilitation and energy transition initiatives within Asia's maritime sector. Organisers revealed plans to launch a Port Community System harnessing AI, blockchain, and cloud computing, which will enable real-time cargo tracking and seamless data exchange across transport modes.

This system aims to streamline customs declarations, improve supply chain transparency, and unlock new opportunities for trade financing. The development reflects Hong Kong's strategic drive to enhance its competitive edge as a digital trade and logistics hub in Asia.

In tandem, Hong Kong is progressing its green maritime fuel bunkering action plan, positioning the port to offer commercial bunkering services for a range of low-carbon fuels. This initiative supports shipping lines' decarbonisation goals and aligns with broader regional commitments to sustainability.

Maritime Week also showcased discussions on regulatory sandboxes for logistics innovation and the growing importance of technology in fostering resilient and efficient trade infrastructure.

Source: Hong Kong Maritime Week official release

PAKISTAN'S MARITIME SECTOR POSTS RECORD PROFIT AFTER MAJOR REFORMS

Pakistan's maritime sector achieved a record Rs100 billion (around US$360 million) profit in 2025, driven by comprehensive reforms that modernised port operations, improved efficiency, and streamlined regulatory frameworks. The Federal Minister for Maritime Affairs, Muhammad Junaid Anwar Chaudhry, described 2025 as a "transformative year" marked by more than two dozen initiatives spanning legislation, digitisation, infrastructure upgrades, and workforce development.

These measures helped reduce operational costs and align Pakistan's maritime standards with international conventions, unlocking the sector's true potential and enhancing its role as a regional trade hub. Improvements included the adoption of digital systems for port clearances and logistics coordination, stronger policy frameworks for shipping and fisheries, and enhanced alignment with International Maritime Organization standards. The profit milestone reflects growing confidence in Pakistan's blue economy and interest from global trade partners looking to engage with more efficient, transparent port services. This progress positions Pakistan to expand export competitiveness, attract investment, and build long-term trade connectivity across Asia and beyond — a clear positive step for the nation's maritime trade prospects.

Source: APP / Pakistan Maritime Affairs

INDIAN PORTS EXPAND CAPACITY WITH INFRASTRUCTURE & TECHNOLOGY INVESTMENT

India's ports are rapidly enhancing capacity and throughput as terminal projects and technology investments gain momentum. Industry reports indicate that several major Indian ports are expanding with new deep-water terminal projects and modern handling equipment, positioning the country to handle more than 50 million TEUs (twenty-foot equivalent units) in the coming years. These developments include investments in automated logistics systems, advanced cargo handling cranes, and digital platforms designed to reduce vessel turnaround times and boost trade competitiveness. The infrastructure push aligns with India's broader maritime vision, which emphasises port modernisation, seamless customs connectivity, and growth in both exports and imports. As

India integrates new technologies and scales port operations, it is better positioned to support global supply chains and offer greater reliability to international shipping lines. This trend reflects sustained commitment to building efficient trade corridors that serve domestic and regional markets while enhancing India's role in global maritime commerce.

Source: Journal of Commerce / Indian port sector report

SRI LANKA'S PORT OF COLOMBO SETS HISTORIC CONTAINER THROUGHPUT RECORD IN 2025

The Port of Colombo has achieved a major milestone in 2025, recording a historic high in container throughput that underscores Sri Lanka's growing stature as a key maritime trade hub in South Asia. According to official figures, the port handled 8,291,178 twenty-foot equivalent units (TEUs) during the year, marking the largest volume in its history and reflecting sustained growth in both transshipment and domestic cargo activity.

This record performance represents a significant year-on-year increase over the 7.79 million TEUs handled in 2024, reinforcing Colombo's strategic position along major East-West shipping routes and its appeal as a preferred transshipment gateway for global carriers. The port's growth has been driven by coordinated efforts across all operating terminals, including the Sri Lanka Ports Authority (SLPA) facilities and key private-sector partners.

A pivotal factor in this achievement has been the operational ramp-up of the Colombo West International Terminal (CWIT) — Sri Lanka's first fully automated deep-water container terminal, operated through a joint venture between the Adani Group, John Keells Holdings, and the SLPA. The state-of-the-art facility has expanded the port's capacity to efficiently handle ultra-large container vessels, boosting productivity and reducing turnaround times for shippers.

Beyond transshipment, Colombo has also seen robust growth in domestic cargo movements, signaling stronger import and export activity tied to Sri Lanka's broader economic recovery. Industry analysts highlight that disciplined investment in infrastructure, enhanced terminal operations, and strategic collaborations with international partners have been central to the port's success.

With global trade patterns continuing to evolve, Colombo's milestone throughput underscores its rising prominence in regional logistics and its potential to further expand trade flows across the Indian Ocean and beyond in the coming years.

Source: Port of Colombo Records Historic High of 8.29 Million TEUs in 2025 — LankaTalks

NEW ORLEANS AND NORWAY PARTNER TO DRIVE MARITIME INNOVATION AND TRADE GROWTH

The World Trade Center New Orleans has entered a strategic partnership with Innovation Norway, marking a significant step toward strengthening maritime innovation, clean technology development, and international trade collaboration. The agreement brings together public agencies, private companies, and research institutions to accelerate solutions across the maritime value chain.

The partnership focuses on advancing clean shipping technologies, port modernization, and workforce development, while also promoting trade links between the Gulf Coast of the United States and Northern Europe. Norway's global leadership in maritime decarbonisation, offshore energy, and digital shipping solutions positions the collaboration as a catalyst for innovation-driven growth.

New Orleans, a key logistics and maritime hub on the Mississippi River, is expected to benefit from access to Norwegian expertise in green vessels, port electrification, and smart maritime systems. The initiative also aims to create opportunities for startups and small businesses to engage in cross-border projects, pilot new technologies, and scale

commercial solutions.

Industry leaders highlighted that international partnerships are becoming increasingly important as ports and shipping companies navigate digitalisation, climate targets, and evolving global trade flows. By aligning expertise and investment, the collaboration seeks to strengthen supply chain resilience and competitiveness.

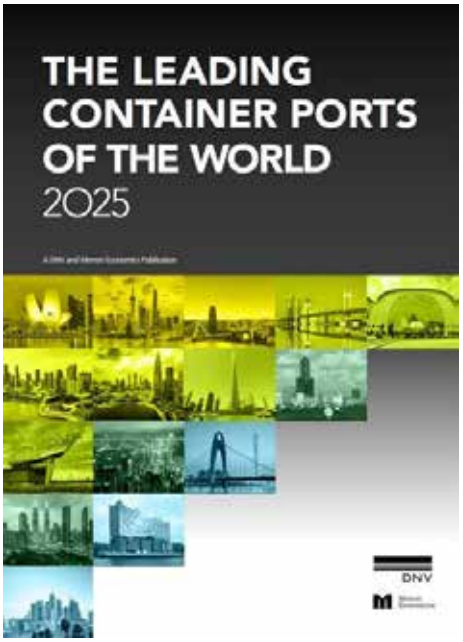
The agreement underscores a broader global trend of maritime clusters working together to accelerate technology adoption and sustainable trade infrastructure, positioning both regions to capture long-term economic benefits from the evolving blue economy.

Source: New Orleans CityBusiness

GLOBAL CONTAINER PORT RANKINGS HIGHLIGHT TECHNOLOGY AND INFRASTRUCTURE AS KEY DIFFERENTIATORS

A newly released global benchmark ranking of container ports highlights how technology adoption, infrastructure investment, and sustainability initiatives are reshaping competitiveness across the maritime sector. The assessment evaluates ports based on productivity, connectivity, digitalisation, environmental performance, and customer value.

The report confirms that modern ports are no longer judged solely on cargo volume, but increasingly on their ability to deliver fast, reliable, and transparent logistics services. Automated terminals, data-driven vessel scheduling, and port community systems are emerging as critical tools for improving efficiency and reducing congestion.



Sustainability has also become a major performance indicator, with ports investing in shore power, energy-efficient equipment, and emissions monitoring systems. These initiatives not only support environmental compliance but also attract shipping lines seeking greener supply chains.

Industry analysts note that ports performing strongly in the rankings have pursued long-term infrastructure strategies aligned with trade growth projections. Deep-water berths, expanded container yards, and improved hinterland connectivity are enabling ports to handle larger vessels and growing cargo volumes.

As global trade continues to evolve, the benchmark serves as a roadmap for port authorities and investors seeking to strengthen operational resilience and future-proof maritime infrastructure. The findings reinforce the importance of integrated digital and physical investments in sustaining global trade flows.

Source: MarineLink

AUSTRALIA ACCELERATES PORT MODERNISATION TO SUPPORT GLOBAL TRADE CONNECTIVITY

Australia's maritime logistics sector is undergoing a significant transformation as ports invest heavily in modern infrastructure, digital supply chains, and smart logistics systems. These upgrades aim to enhance trade efficiency, improve cargo visibility, and support growing import and export volumes.

Photo: Australian Port

Port authorities and terminal operators are expanding capacity through deeper channels, upgraded container handling equipment, and improved intermodal connections linking ports with inland transport networks. At the same time, digital platforms are being introduced to streamline customs processes, scheduling, and cargo tracking.

These developments are strengthening Australia's position as a key gateway for trade across the Pacific and beyond. Industry stakeholders highlight that efficient ports are essential for supporting Australia's resource exports, agricultural trade, and manufactured goods, while also ensuring reliable access to global markets.

Technology-driven logistics solutions are helping reduce turnaround times and operating costs, making Australian ports more attractive to global shipping lines. Analysts note that the combination of physical infrastructure investment and digital innovation is critical for long-term competitiveness.

As global supply chains become more complex, Australia's port modernisation efforts reflect a broader international shift toward resilient, technology-enabled maritime trade systems.

Source: Vocal Media

AFRICAN PORTS ADVANCE GREEN SHIPPING COMPLIANCE TO STRENGTHEN TRADE COMPETITIVENESS

Ports across Africa are accelerating efforts to align with global green shipping standards, supported by guidance and financing from the African Development Bank (AfDB). The initiative aims to modernise port operations while enhancing trade competitiveness and environmental performance.

Key areas of focus include energy-efficient port equipment, digital monitoring systems, and policy reforms that support low-carbon maritime operations. By adopting cleaner technologies, African ports are positioning themselves to meet evolving international regulations and customer expectations.

Improved environmental performance is also seen as a pathway to attracting new shipping services and trade investment. Ports that demonstrate compliance with global standards are better positioned to integrate into international supply chains and reduce long-term operational risks.

The AfDB has emphasised that green port development supports broader economic goals by improving logistics efficiency, reducing costs, and strengthening regional trade corridors. These reforms are expected to generate employment, support industrial growth, and enhance connectivity across the continent.

The push toward sustainable port infrastructure highlights Africa's growing role in global maritime trade and its commitment to future-ready logistics systems.

Source: LogUpdate Africa

PORTS WORLDWIDE INVEST IN HIGH-TECH INFRASTRUCTURE TO MEET FUTURE TRADE DEMAND

Ports across Europe, the Americas, Africa, and Oceania are embracing large-scale infrastructure and technology upgrades to support growing global trade volumes. Investments include terminal expansion, automation, artificial intelligence, and alternative fuel infrastructure.

Many ports are deploying smart systems to optimise vessel scheduling, cargo handling, and energy usage, while electrification projects such as shore power are reducing emissions at berth. These developments are helping ports improve efficiency, reliability, and sustainability simultaneously.

Infrastructure projects are also extending beyond port boundaries, with inland logistics corridors and digital freight platforms improving end-to-end supply chain connectivity. Industry experts note that ports adopting integrated approaches are better positioned to handle future trade volatility.

Photo: Australian Port

As vessel sizes increase and supply chains demand faster turnaround times, modern port ecosystems are becoming essential for global commerce. The trend underscores a worldwide shift toward resilient, technology-driven maritime gateways capable of supporting long-term economic growth.

Source: Ship Universe

INNOVATIVE PLAN TO CONVERT CRUISE SHIP PLASTIC WASTE TO OIL TARGETS LOWER EMISSIONS AND PORT POLLUTION

A pioneering initiative is underway to convert cruise ship plastic waste into usable oil directly at ports, aiming to tackle two critical environmental challenges: maritime emissions and marine litter. The project involves deploying advanced waste-to-energy systems at strategic port locations, where plastic refuse collected from cruise ships will be processed into synthetic fuel, reducing landfill dependence and cutting greenhouse gas emissions.

Cruise ships generate significant volumes of plastic waste annually, including packaging, single-use items, and other materials. Traditional disposal methods often involve offloading waste for landfill or incineration, creating both logistical challenges and environmental hazards. By turning waste into oil, ports can provide a sustainable circular solution that supports cleaner shipping operations while generating an energy resource.

The technology leverages pyrolysis and catalytic conversion, enabling high-efficiency transformation of complex plastic polymers into fuel suitable for port operations or industrial use. Experts note that integrating these systems into port infrastructure also aligns with international sustainability initiatives, such as the International Maritime Organization's (IMO) strategy on reducing shipboard waste and carbon intensity.

Pilot programs are being planned in several European and North American ports, with the potential to expand globally. Cruise operators have expressed interest, recognizing that waste-to-oil conversion could help meet corporate sustainability targets, enhance brand reputation, and reduce operational costs associated with waste disposal.

Industry observers suggest that if widely adopted, the approach could significantly cut maritime plastic pollution, reduce emissions, and support circular economy objectives, marking a step forward in green port innovation.

Source: Blue Economy News

COCA-COLA INVESTS $120,000 IN OCEANHUB AFRICA TO ADVANCE PLASTIC WASTE INNOVATION

Coca-Cola has contributed $120,000 to the OceanHub Africa initiative, reinforcing the company's commitment to reducing marine plastic pollution and supporting innovative solutions in coastal regions. OceanHub Africa is a startup accelerator focused on developing scalable technologies to address ocean plastic challenges, including collection, recycling, and repurposing strategies.

The funding will support research and pilot projects that convert collected plastic into sustainable materials or energy, enabling African ports, coastal communities, and shipping companies to implement practical circular solutions. OceanHub Africa partners with local governments, universities, and private-sector stakeholders to create market-ready innovations that enhance marine ecosystem health while generating economic opportunities.

Coca-Cola's investment aligns with the company's broader global sustainability agenda, which includes a goal to collect and recycle one bottle for every bottle sold by 2030. Beyond funding, the partnership will leverage technical expertise and logistical networks to improve waste management systems along critical shipping corridors and in port cities.

Startups supported by OceanHub Africa are exploring solutions such as high-efficiency recycling, biodegradable packaging, and energy recovery from plastics, all contributing to cleaner oceans and sustainable maritime trade practices. By enabling the adoption of these technologies, the initiative aims to reduce the environmental footprint of the shipping and beverage industries simultaneously.

Observers emphasize that private-public collaborations like this demonstrate how corporate investment in maritime sustainability can catalyze technological innovation, improve trade logistics, and enhance regional blue economies.

Source: Blue Economy News

THERMAL DRONE TECHNOLOGY MONITORS DOLPHIN HEALTH WITHOUT DISRUPTING ECOSYSTEMS

Researchers are deploying thermal drones to monitor dolphin populations in coastal waters, enabling real-time health assessments without disturbing natural behaviors. Traditional methods, such as boat-based observation or tagging, can be invasive and stressful for marine mammals. Thermal imaging offers a non-intrusive, technology-driven alternative, capable of detecting body temperature, activity levels, and even stress indicators from a safe distance.

The technology employs infrared sensors mounted on drones, producing high-resolution thermal maps that reveal physiological data in challenging marine environments. Scientists can monitor large groups of dolphins simultaneously, track movement patterns, and detect potential health concerns before they escalate. This approach reduces human intervention while providing critical data for conservation and marine ecosystem management.

Beyond research, thermal drone monitoring has potential applications in port management and shipping operations, allowing authorities to minimize vessel interactions with sensitive species and comply with environmental regulations. Early detection of distressed marine life can also inform sustainable coastal development projects, including offshore infrastructure and maritime trade corridors.

Conservationists have noted that integrating drone technology with AI-driven data analytics could revolutionize marine biodiversity monitoring, enabling scalable, continuous observation in oceans worldwide. By combining cutting-edge imaging, remote sensing, and predictive modeling, this approach supports both ecosystem health and maritime industry compliance with environmental standards.

Experts predict that such technology could become standard practice in ports and shipping lanes, balancing trade efficiency with sustainable marine stewardship.

Source: Blue Economy News

PORT OF HAMBURG LAUNCHES IPORTUS PROJECT TO BRING SEMI-AUTONOMOUS VESSELS INTO ROUTINE OPERATIONS

The **Port of Hamburg Authority (HPA)** has officially launched the *iPORTUS* research initiative, a pioneering effort to integrate **semi-autonomous surface vessels (ASVs) and remote-controlled low-emission craft** into everyday port operations. This project marks a significant milestone in the port's strategic modernization plan, blending automation, safety, and sustainability to enhance maritime logistics in one of Europe's busiest gateways.

Funded with approximately **€1.7 million (~US$2 million)** under Germany's Ihatec II program, the iPORTUS consortium brings together industry, research institutions, and government partners, including the HPA, Fraunhofer Center for Maritime Logistics and Services (CML), and Kongsberg Maritime Germany GmbH. The core goal is to develop, test, and validate technologies that allow autonomous and remotely supervised vessels to safely operate alongside conventional craft in complex harbor environments.

Central to the initiative is not only technology development but also **regulatory and cybersecurity frameworks** that will enable broader deployment of autonomous systems in maritime settings. By establishing remote operations centers (ROCs) and ensuring robust safety protocols, iPORTUS aims to demonstrate how low-emission vessels can reduce environmental impact while improving efficiency and traffic coordination in port waters.

Port authorities and logistics operators across Europe have shown growing interest in automation as global trade volumes rise and sustainability expectations tighten. As autonomous technologies evolve, ports like Hamburg — already a leader in digital integration — are positioning themselves at the forefront of next-generation maritime infrastructure, accelerating trade flows while reducing emissions and operational costs.

Projects such as iPORTUS reflect the broader trend toward **digital transformation in maritime logistics**, where automation, data analytics, and remote operations collectively contribute to smarter, cleaner, and more resilient port ecosystems. As these technologies mature, ports globally are expected to adopt similar strategies to stay competitive in the evolving trade landscape.

Source: Hamburg Port Authority / iPORTUS Consortium

PORT OF PIRAEUS RETAINS EUROPEAN TOP-TIER STATUS AS CONTAINER TRAFFIC REBOUNDS

The Port of Piraeus in Greece has maintained its position among Europe's most vital maritime gateways, reporting a notable rise in container throughput as global trade patterns adjust following recent shifts in shipping routes and logistics demand. Despite broader industry disruptions — such as rerouted traffic around Africa and temporary slowdowns in the Red Sea — Piraeus demonstrated operational resilience and growth, reinforcing its strategic role in Mediterranean and trans-European trade corridors.

Recent figures indicate that Piraeus continues to rank among the top five container ports in Europe, with robust volumes driven by diversified cargo flows and expanding cooperation with major carriers. The port's performance highlights its capacity to adapt to fast-changing logistics conditions while sustaining growth in imports and exports.

Industry analysts note that ports capable of quickly adjusting operations—whether through hinterland connectivity, digital infrastructure, or responsive logistics services—are best positioned to capture displaced cargo and new trade opportunities arising from shifting maritime routes. Piraeus's continued success underscores the competitive advantage of integrated port systems and strategic partnerships with international shipping lines.

The port's resilience is evidenced by steady traffic recovery even as global supply chains navigate geopolitical and environmental challenges. As carriers gradually restore scheduled services around traditional routes like the Suez Canal, Piraeus stands ready to support renewed trade flows and larger vessel calls, further strengthening its contribution to European maritime commerce.

With continued investment in terminal capacity, digital logistics platforms, and seamless connectivity to road and rail networks, the Port of Piraeus is expected to remain a critical hub for containerized trade across Europe and the Mediterranean. Its performance highlights how modern infrastructure and adaptive operations can sustain growth in the face of global market uncertainties.

Source: Cyprus Mail / GTP

UPCOMING MARITIME EXHIBITIONS: FEBRUARY TO MAY 2026

FEBRUARY 2026

- **LNG 2026 (21st International Conference & Exhibition on Liquefied Natural Gas) Dates**: February 2–5, 2026 **Location**: Qatar National Convention Centre (QNCC), Doha, Qatar (Asia/Middle East) **Importance**: A premier global forum for the LNG industry, featuring executive sessions, technical workshops, and a large exhibition showcasing the full LNG value chain. It's crucial for networking among producers, buyers, and tech innovators amid the energy transition and rising demand for cleaner fuels.
- **Annual Offshore Support Journal Conference, Awards & Exhibition 2026**

  Dates: February 3–4, 2026 **Location**: London, UK **Importance**: The largest annual gathering for offshore support vessel owners, operators, and suppliers, with an exhibition highlighting vessel technologies, awards recognizing innovation, and sessions on decarbonization and operations. Essential for industry leaders in offshore energy and support services.
- **EUROMARITIME 2026**

  Dates: February 3–5, 2026 **Location**: Marseille Exhibition Center (Parc Chanot), Marseille, France **Importance**: Focuses on the maritime and inland waterway sectors, with an expo, conferences, and B2B meetings on shipbuilding, repair, ports, and tech. It's vital for European and global stakeholders promoting sustainable blue economy growth and cross-sector collaboration.
- **Breakbulk Middle East 2026**

  Dates: February 4–5, 2026 **Location**: Dubai World Trade Centre, Dubai, UAE (Asia/Middle East) **Importance**: Dedicated to project cargo, heavy-lift, and breakbulk shipping, featuring exhibitions of logistics solutions, sessions on EPC bids, carrier capacity, and risk management. Key for regional trade in energy and infrastructure projects, fostering deals in a high-growth Middle East market.
- **Subsea Expo 2026**

  Dates: February 4–5, 2026 **Location**: Aberdeen, UK **Importance**: Europe's largest subsea exhibition and conference, showcasing underwater technologies, ROVs, and offshore innovations. Critical for energy transition discussions, networking among 150+ exhibitors, and advancing subsea engineering amid global offshore wind and oil/gas shifts.
- **Maldives Marine Expo 2026**

  Dates: February 5–8, 2026 **Location**: Maldives (specific venue TBA) **Importance**: An international

expo for marine-related businesses to exhibit products and services in shipbuilding, equipment, and tourism. Important for small island nations and Asia-Pacific stakeholders, emphasizing sustainable marine development and regional networking in a tourism-dependent economy.

- **Blue Innovation Symposium 2026**

  Dates: February 9–12, 2026 **Location**: Providence, Rhode Island, USA **Importance**: Focuses on ocean innovation, with exhibitions on blue tech, sustainability, and policy. Key for global collaboration on marine research, attracting academics, industry, and policymakers to drive advancements in ocean health and economy.

- **World Maritime Forum Copenhagen 2026**

  Dates: February 17–18, 2026 **Location**: AC Bella Sky Convention Center, Copenhagen, Denmark **Importance**: Features an expo and sessions on decarbonization, regulations, digital tech, AI, and cyber safety. Essential for global shipping leaders to address IMO compliance and innovation, with strong networking in a hub for sustainable maritime practices.

MARCH 2026

- **13th Annual World Ocean Summit & Expo 2026**

  Dates: March 4–5, 2026 **Location**: Lisbon, Portugal (tentative, based on previous editions) **Importance**: Turns ocean governance ambitions into actionable strategies, with an expo on innovation and investment. Attracts 800+ attendees and 120 speakers; vital for global policy on sustainable oceans, climate resilience, and blue finance.

- **Oceanology International 2026**

  Dates: March 10–12, 2026 **Location**: ExCeL London, Royal Docks, London, UK **Importance**: World's leading ocean tech exhibition, with 500+ exhibitors showcasing subsea, sensors, ROVs, and data tools. Crucial for professionals in exploration, protection, and sustainable ocean operations, featuring live demos and expert sessions.

- **CMA Shipping 2026**

  Dates: March 10–12, 2026 **Location**: Stamford, Connecticut, USA **Importance**: Exhibition and conference on policy, finance, digitalization, and decarbonization in shipping. Key for U.S. and global stakeholders to navigate regulations and commercial strategies, with networking among shipowners and suppliers.

- **MTS Buoy Workshop 2026**

  Dates: March 23–26, 2026 **Location**: St. Petersburg, Florida, USA (hosted by Florida Institute of Oceanography and University of South Florida) **Importance**: Focuses on buoy systems for oceanographic and weather monitoring, with exhibitions, tours, and networking. Important for designers, operators, and users to exchange on tech advancements in marine data collection.

- **Asia Pacific Maritime (APM) 2026**

  Dates: March 25–27, 2026 **Location**: Marina Bay Sands Expo, Singapore (Asia) **Importance**: Major Asia-Pacific exhibition for shipbuilding, workboats, offshore tech, and retrofits, with buyer programs. Essential for regional trade, innovation in wind support, and connecting yards with global suppliers amid Asia's shipping boom.

- **ASEAN Wind Energy 2026**

  Dates: March 25–27, 2026 **Location**: Bangkok, Thailand (Asia) **Importance**: Exhibition on wind technologies, offshore solutions, and energy storage. Key for Southeast Asia's renewable push, connecting leaders for market opportunities in offshore wind and sustainable energy.

- **Ocean Connect Asia 2026**

  Dates: March 31–April 1, 2026 **Location**: Sands Expo & Convention Centre, Singapore (Asia) **Importance**: Advances marine, hydrographic, and uncrewed tech with exhibitions under the theme of innovation and autonomy. Vital for Asia's ocean science economy, part of Geo Connect Asia for cross-industry collaboration.

APRIL 2026

- **Offshore Arabia 2026**

  Dates: April 13–15, 2026 **Location**: Dhahran, Saudi Arabia (Asia/Middle East) **Importance**: Exhibition on offshore engineering, subsea tech, AI, and decarbonization. Aligns with Saudi's net-zero goals, showcasing innovations for efficiency and sustainability in a major oil/gas region.

- **Argus Green Marine Fuels Asia Conference 2026**

Dates: April 15–16, 2026 **Location**: Singapore (Asia) **Importance**: Focuses on green fuels for shipping, with exhibitions on alternatives like LNG and hydrogen. Important for Asia's decarbonization efforts, gathering 400+ experts on policy and tech transitions.

- **Singapore Maritime Week 2026**

  Dates: April 20–24, 2026 **Location**: Multiple venues, Singapore (Asia) **Importance**: Comprehensive week with exhibitions, conferences, and delegations on ports, tech, and green corridors. A global hub event for policy, automation, and resilience, attracting international maritime leaders.

- **Sea Japan 2026**

  Dates: April 22–24, 2026 **Location**: Tokyo Big Sight, Tokyo, Japan (Asia) **Importance**: Biennial international maritime exhibition on shipbuilding, equipment, automation, and safety. Key for Japan's market, highlighting yard tech, electrification, and global supply chains in Asia's shipbuilding powerhouse.

- **Intermodal Asia 2026**

  Dates: April 22–24, 2026 **Location**: SWEECC, Shanghai, China (Asia) **Importance**: Leading exhibition for containers, IoT tracking, leasing, and depot tech. Essential for Asia's logistics sector, focusing on reefer innovations, repairs, and supply chain efficiency.

MAY 2026

- **Shippax Ferry Conference 2026**

  Dates: May 5–7, 2026 **Location**: Onboard ferry route Genoa–Olbia–Genoa, Italy **Importance**: Onboard conference with exhibition elements on ferries, RoPax, and passenger ops. Key for fleet renewal, alternative fuels, and port interfaces, offering unique networking in a practical setting.

- **TOC Europe 2026**

  Dates: May 19–21, 2026 **Location**: Hamburg, Germany **Importance**: Premier port and terminal exhibition on equipment, automation, and supply chains. Vital for global operators, showcasing TOS platforms, quay tech, and throughput strategies in Europe's logistics hub.

- **Seagriculture World 2026**

  Dates: May 19–21, 2026 **Location**: Bangkok, Thailand (Asia) **Importance**: International seaweed conference with trade show on value chains for food, biofuels, and bioplastics. Attracts 200+ participants from 30+ countries; important for sustainable blue economy growth in Asia.

- **OCEANS Sanya 2026Dates**: May 25–28, 2026 **Location**: Sanya, China (Asia) **Importance**: IEEE/OES conference with exhibit hall on ocean tech, deep-sea exploration, marine AI, and offshore wind. Key for Asia-Pacific research and industry, themed "To the Sea, To the Deep" for innovation and collaboration.

Show Preview

SINGAPORE MARITIME WEEK 2026: CHARTING THE FUTURE OF MARITIME EXCELLENCE

As the maritime world converges on Singapore from April 20 to 24, 2026, the 20th edition of Singapore Maritime Week (SMW) promises to be a landmark gathering. Organized by the Maritime and Port Authority of Singapore (MPA), this flagship event transforms the city-state into a global hub for innovation, collaboration, and ambition. Under the theme "Actions Meet Ambition," SMW 2026 will spotlight how the industry is turning bold commitments into tangible progress amid geopolitical shifts, climate imperatives, and digital disruptions. With over 35,000 attendees expected—building on last year's record—expect a vibrant mix of conferences, exhibitions, and networking that could shape policies and partnerships for years to come. For stakeholders in Bangladesh, where maritime trade drives 90% of exports, this event offers prime opportunities to connect with Asian and global players, especially in areas like sustainable fuels and port efficiency.

A Milestone Edition: Celebrating Two Decades of Maritime Momentum

SMW has evolved from a local affair into Asia's premier maritime platform, drawing leaders from shipowners, ports, tech firms, and policymakers worldwide. This year's edition marks its 20th anniversary with a renewed focus on "progress, partnerships, and purpose," emphasizing actionable strategies for a resilient future. Key drivers include the IMO's net-zero goals, EU emissions regulations, and Asia's booming trade corridors—topics that resonate deeply with emerging markets like Bangladesh, where ports like Chittagong are eyeing green upgrades.

The week kicks off with pre-events like the SMF City Cycle 2026 (April 18-19), a by-invitation cycling tour connecting stakeholders across Singapore's maritime ecosystem. The main program unfolds across multiple venues, blending high-level dialogues with hands-on exhibitions. Highlights include the SMW Welcome Reception on April 20, fostering informal networking, and the grand SMW Conference on April 21-23, where geopolitical trends, digitalization, decarbonization, and talent development take center stage.

Program Highlights: From Policy to Practice

SMW 2026's agenda is packed with over 50 events, including flagship conferences, technical seminars, and receptions. The overarching theme encourages "actions" in critical areas: navigating geopolitical tensions, accelerating digital tools like AI and blockchain for supply chains, slashing emissions through alternative fuels, and building a skilled workforce for tomorrow's fleets.

A standout is the EXPO@SMW (April 21-23 at Suntec Singapore Convention and Exhibition Centre, Halls 403-405), Asia's leading maritime exhibition. Open from 10:00 AM to 5:00 PM, it will feature cutting-edge displays on vessel tech, port automation, and sustainable solutions. Attendees can explore interactive zones, live demos, and B2B meetings, making it a hotspot for deal-making.

To give a snapshot, here's a table outlining the core program:

Date	Key Events	Focus Areas	Venue/Notes
April 18-19 (Sat-Sun)	SMF City Cycle 2026	Ecosystem networking via cycling tour	Various Singapore locations; by invitation
April 20 (Mon)	SMW Welcome Reception	Informal kickoff with global leaders	TBA; sets tone for partnerships
April 21 (Tue)	SMW Conference Opening; EXPO@SMW Day 1	Geopolitical trends, digitalization	Suntec Singapore; conference sessions + expo
April 22 (Wed)	SMW Conference; EXPO@SMW Day 2	Decarbonization, talent development	Suntec Singapore; deep dives into fuels and skills
April 23 (Thu)	SMW Conference Closing; EXPO@SMW Day 3	Innovation wrap-up, future outlooks	Suntec Singapore; awards and receptions
April 24 (Fri)	Side Events & Delegations	Policy roundtables, site visits	Multiple venues; tailored for international groups

(Data aggregated from official SMW program overview.) This structure ensures a blend of inspiration and practicality, with sessions addressing real-world challenges like green corridors in the Bay of Bengal—relevant for Bangladesh's LNG bunkering aspirations.

Exhibitors and Innovations: Where Tech Meets Talent

EXPO@SMW will host a diverse array of exhibitors, from classification societies to tech innovators, showcasing solutions for a net-zero maritime era. Early confirmed participants include giants like the American Bureau of Shipping (ABS), China Classification Society (CCS), DNV, Itochu Corporation, OneCare Group, and Pacific International Lines—representing a mix of global expertise in vessel certification, shipping operations, and digital tools.

Expect booths highlighting LNG and hydrogen propulsion, AI-driven port management, and workforce training platforms. For instance, DNV's presence underscores advancements in decarbonization audits, while ABS might demo sustainable ship designs. This exhibition isn't just a display—it's a catalyst for collaborations, with past editions sparking multimillion-dollar deals.

Here's a table of select exhibitors and their anticipated focuses:

Exhibitor	Core Expertise	Highlighted Innovations	Relevance to Asia/ Bangladesh
American Bureau of Shipping (ABS)	Classification & Certification	Sustainable vessel tech, emissions compliance	Supports green retrofits for Asian fleets
China Classification Society (CCS)	Ship Surveys & Standards	Digital twins for operations	Enhances efficiency in trade routes like Bay of Bengal
DNV	Risk Management & Assurance	Decarbonization strategies, alternative fuels	Key for Bangladesh's LNG import growth
Itochu Corporation	Trading & Logistics	Supply chain innovations	Ties into regional energy and garment exports
OneCare Group	Maritime Services	Talent development programs	Addresses skills gaps in emerging markets
Pacific International Lines	Shipping & Container Ops	Green corridor initiatives	Boosts sustainable trade for South Asia

(Based on official exhibitor lists and event previews.) These players reflect SMW's global draw, with a strong Asian emphasis.

Opportunities for Growth and Connections

In a year where maritime trade faces headwinds from geopolitical risks and climate targets, SMW 2026 is more than an event—it's a strategic imperative. Attendees can engage in policy dialogues that influence IMO frameworks, explore funding for green tech, and forge ties with over 100 countries represented. For Bangladesh-based professionals like those in Dhaka's shipping sector, it's a gateway to partnerships with Singaporean firms, potentially accelerating projects like Matarbari's deep-sea port or hydrogen pilots.

Registration opens soon via the official site, with options for expo passes, conference access, and group delegations. As MPA notes, this week is where "ambition meets action," promising insights that could propel the industry toward a sustainable horizon.

Show Review

BIMOX 2025: NAVIGATING THE FUTURE OF MARITIME INNOVATION

Dhaka — At the **International Convention City Bashundhara (ICCB)**, the **7th Bangladesh International Marine & Offshore Expo (BIMOX 2025)** charted a compelling course for the country's maritime and offshore industries from **October 30 to November 1, 2025**. As Bangladesh's flagship platform for marine technology, shipbuilding, port logistics and offshore engineering, this year's edition blended commercial dynamism with strategic dialogue, setting a new benchmark for the sector's growth trajectory.

From Inception to Industry Pillar: The Evolution of BIMOX

Launched in **2018**, the Bangladesh International Marine & Offshore Expo was envisioned as a dedicated space for the nation's burgeoning marine economy. The inaugural event — held in Chittagong and backed by industry stakeholders — brought together shipbuilders, maritime technologists and global buyers at a time when Bangladesh's riverine and coastal markets were just gaining international notice.

In the years that followed, BIMOX matured rapidly. The **2019 edition** cemented its role as a regional showcase, giving voice to local shipyards and foreign OEMs alike, and by **2022**, with its 4th edition, the event expanded scope to embrace ship recycling, offshore oil and gas support, logistics, and process automation — reflecting the industry's widening horizon.

BIMOX 2023 and 2024 further strengthened the expo's stature. The 5th edition attracted high-profile participants and government dignitaries, including the State Minister for Shipping, while international machinery and marine solution providers showcased cutting-edge engines and propulsion systems. In 2024 — its 6th iteration — the expo doubled down on sustainability themes and technology transfer, spotlighting locally produced, class-certified marine coatings and advanced maritime equipment.

Through each cycle, BIMOX has mirrored Bangladesh's own maritime ascent: from a river-centric economy to a **blue-economy player with global links**, export ambitions, and an expanding shipbuilding footprint.

BIMOX 2025: A Summit for Innovation and Strategy

This year's expo lived up to that legacy. Organised by **Savor International Limited**, BIMOX 2025 featured a deep roster of exhibitors and cutting-edge technologies across shipbuilding, marine propulsion, port infrastructure, dredging and offshore services.

The inauguration — led by **Rear Admiral Mohammad Musa** of the Bangladesh Navy — set a tone of strategic collaboration. High-level participation from the Bangladesh Coast Guard, industry associations, and international firms underscored the event's role as both a **business marketplace** and a **policy-shaping forum**.

More Than an Expo: Conversations That Matter

Beyond static displays and product stands, BIMOX 2025 excelled in providing **thought leadership platforms**. Panel discussions and seminars tackled the future of sustainability in ship operations, the integration of digital systems across ports and fleets, and investment frameworks for green technologies. These discussions resonated with a maritime community increasingly aware that innovation must be paired with **environmental stewardship** and **resilient infrastructure**.

Delegates noted a rising interest in automated port solutions, eco-friendly hull coatings, and next-generation navigation systems — signposts of where the sector is heading in the decade ahead.

Bridging Local Strengths and Global Opportunities

Perhaps BIMOX's greatest achievement this year was its role in **connecting Bangladesh's domestic excellence with global industrial currents**. With Bangladesh home to more than 100 shipbuilders and over 120 registered shipyards, local expertise is abundant — but global integration has historically been fragmented. BIMOX 2025 helped bridge that divide, attracting partners and customers from Europe, Asia and beyond.

For local manufacturers demonstrating cost-competitive yet high-quality solutions, the expo has become a launchpad for export leads and strategic alliances. International companies, meanwhile, gained insights into a market ripe with potential for both supply chain anchoring and technology deployment.

Looking Ahead: The Maritime Outlook

As BIMOX charts its course toward the **8th edition in 2026**, the narratives emerging from this year's show point to an industry at an inflection point — one where **commercial opportunity**, **technological innovation** and **sustainable practice** must converge.

For Bangladesh's maritime community — from shipbuilders and port operators to policymakers and technologists — BIMOX 2025 was not just a trade fair, but a **milestone in an ongoing journey** toward global relevance and regional leadership.

NAVIGATING BANGLADESH'S MARITIME FUTURE

AN INTERVIEW WITH COMMODORE MD SHAFIUL BARI (ND), OSP, NDC, PSC, BN DIRECTOR GENERAL, DEPARTMENT OF SHIPPING

Commodore Md Shafiul Bari joined the Bangladesh Navy in January 1990 and was commissioned in the Executive (Operations) branch on 1 July 1992. Over a distinguished naval career spanning more than three decades, he has held a wide range of command, staff, and instructional appointments at home and abroad. A Navigation and Direction specialist, he completed advanced professional courses in Pakistan, India, and Bangladesh, and is an alumnus of the National Defence College, Mirpur.

He has commanded multiple frontline naval platforms including missile boats, offshore patrol vessels, a guided missile frigate, and BNS Dhaka, and has served as Director Naval Training at Naval Headquarters. His international assignments include Liaison Officer with UNAMID in Darfur and Defence Attaché to Sri Lanka and Maldives. Prior to his current appointment as Director General of the Department of Shipping, he served as Member (Operation) of the Chattogram Port Authority. In recognition of his service, he was awarded a Chief of Naval Staff Commendation in 2016.

Q: How do you see the role of the Department of Shipping evolving to support the Blue Economy, particularly in areas like offshore wind energy and deep-sea resource exploration?

A:
The Department of Shipping is the maritime administrator of Bangladesh, which means all maritime activities fall under its regulatory framework. The Blue Economy is fundamentally driven by maritime operations—ships, seafarers, exploration, and regulation.

To engage in offshore wind energy or deep-sea exploration, the country needs specialized vessels, trained navigators, and certified seafarers. Ships cannot operate without competent manpower. At the Department of Shipping, we regulate and train seafarers in compliance with the STCW Convention, which is the global standard for training, certification, and watchkeeping.

Bangladesh is a member of the International Maritime Organization (IMO), which has developed more than 60 conventions and protocols. As a responsible member state, we ensure compliance with these standards. For emerging sectors such as offshore wind and deep-sea resource exploration, our role is to frame regulations, ensure maritime safety, and support research and survey operations. Exploration and responsible extraction of marine resources are essential pillars of the Blue Economy.

Q: What progress has been made toward building a paperless maritime administration under your leadership?

A:
Digital transformation has been a major focus. Following government directives, we have worked extensively to transition from paper-based systems to digital platforms. So far, 24 services provided by the Department of Shipping have been fully digitalized. These include ship registration, initial and annual surveys, post-docking surveys, and certification services. Seafarer documents and certificates are now issued online.

Previously, seafarers had to physically visit our offices—particularly in Chattogram—for sign-on and sign-off procedures. This process has now been fully digitalized, significantly reducing delays, travel burdens, and administrative inefficiencies. We are steadily moving toward a fully paperless maritime administration.

Q: Despite a global shortage of officers, many Bangladeshi cadets are waiting for placement. How is the Department addressing this challenge?

A:
This issue has two dimensions: competency development and placement capacity. While there is a global shortage of officers, Bangladesh produces a large number of cadets every year—more than 700 cadets and around 500 ratingsannually.

However, Bangladesh currently has only 104 flag vessels, each typically accommodating two cadets per shift. This means only about 200 cadets are placed annually, leaving many waiting.

To address this, I have instructed shipowners to take more cadets per vessel, wherever feasible. Even adding one extra cadet per ship can significantly reduce the backlog. We are also actively engaging with international shipping companies, including firms in Singapore and China, to create overseas placement opportunities.

This challenge requires a collective effort involving the government, shipping companies, training institutions, and the Bangladeshi maritime diaspora.

Q: What steps are being taken to improve Bangladesh's flag state performance and reduce Port State Control detentions?

A:
Port State Control detentions are a serious concern. Over the past two years, we have experienced 25 to 30 detentions, particularly involving bulk carriers, which are more prone to deficiencies.

To address this, we have intensified inspections through the Mercantile Marine Office in Chattogram. Our surveyors are conducting more rigorous pre-departure inspections and working closely with shipowners to rectify deficiencies before vessels sail.

We maintain continuous communication with operators whose ships trade internationally. The objective is simple: stronger inspections at home lead to fewer detentions abroad.

Q: How is the Department guiding shipowners through the global shift toward green shipping and decarbonization?

A:
Decarbonization and net-zero emissions are major global priorities, but the international community remains divided on implementation. Bangladesh has adopted a balanced and pragmatic approach.

We are implementing the IMO Green Voyage 2050 National Action Plan, supported by international expertise. However, Bangladesh is a resource-constrained country with over 40,000 vessels running on conventional fuels. An abrupt transition to alternative fuels would significantly increase operating costs.

Our focus is on gradual emission reduction, improved efficiency, and realistic compliance with international regulations, rather than an immediate shift to net-zero targets.

Q: Ship recycling is becoming a major opportunity for Bangladesh. How do you view its future potential?

A:
Globally, nearly 60,000 ships are expected to reach end-of-life within the next five years. To handle this responsibly, ship recycling yards must comply with the Hong Kong Convention.

Bangladesh currently has 17 compliant ship recycling yards, and within the next year, this number is expected to increase to 25 or 26. This positions Bangladesh to handle almost one-fifth of the global ship recycling demand.

With proper policy support and access to financing, this sector can generate significant foreign currency earnings and enhance Bangladesh's reputation as a responsible maritime nation.

Q: What initiatives are in place to improve safety across inland waterways?

A:
Inland waterway safety is a top priority. We have already digitalized the inland vessel survey system to improve transparency.

Due to manpower constraints—only seven surveyors for nearly 20,000 inland vessels—we have introduced body cameras for surveyors to ensure inspections are properly conducted. We have also intensified inspections of passenger vessels, focusing on firefighting equipment, crew training, certification, and safe manning.

Compliance is the key to preventing accidents. When vessels meet safety standards and crews are properly trained, risks are significantly reduced.

Q: What is the most critical bottleneck you aim to address during your tenure as Director General?

A:
The biggest challenge is not the absence of regulations but implementation and compliance. Bangladesh has adequate rules for maritime safety and security, but enforcement and awareness remain inconsistent.

Education, understanding, and cooperation are essential for effective implementation. During my tenure, I have also focused on making the sector more investor-friendly by advocating for reduced tariffs and supportive policies.

Shipping is already a USD 1 billion industry for Bangladesh. With coordinated efforts, regulatory clarity, and compliance, it has the potential to grow significantly and contribute even more to the national economy.

Interview

ENGINEERING VALUE BEYOND PRICE: VULKAN BANGLADESH AND THE CASE FOR LONG-TERM PERFORMANCE

Kritwik Barua, Vulkan Bangladesh

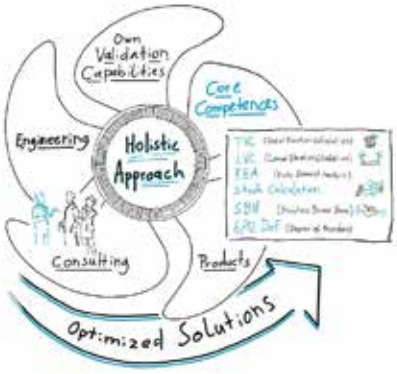
In a market where purchasing decisions are often driven by upfront cost, Vulkan Bangladesh has taken a distinctly different path—one that prioritizes engineering depth, system accountability, and lifecycle performance over short-term price competition. Operating as a liaison office of the VULKAN Group, a global engineering company with more than a century of industrial heritage, Vulkan Bangladesh positions itself not as a component seller but as a technical solution partner to the marine, power, and industrial sectors.

This conversation explores how Vulkan Bangladesh navigates price sensitivity, market volatility, evolving customer expectations, and technological transition—while building a defensible competitive position rooted in engineering credibility, reliability, and long-term value creation.

In a market as price-sensitive as Bangladesh, how do you position Vulkan BD's premium solutions to move beyond "commodity selling"? What is your strategy for convincing clients that high-end technical quality is a long-term investment rather than an immediate expense?

In a price-sensitive market like Bangladesh, Vulkan Bangladesh deliberately shifts the discussion from initial purchase price to Total Cost of Ownership (TCO) and long-term system reliability. We move beyond commodity selling by positioning VULKAN not as a component supplier, but as a system solution partner responsible for overall performance.

As illustrated in the Holistic Approach diagram, we integrate engineering, consulting, products, and in-house validation capabilities to deliver optimized solutions rather than isolated parts. Through advanced competencies such as torsional and lateral vibration calculations (TVC/LVC), structure-borne noise analysis (SBN), shock calculations, and 6/12 degrees-of-freedom simulations, we identify and mitigate risks at the design stage.



This proactive approach helps clients avoid costly secondary measures such as structural modifications, excess weight, increased fuel consumption, noise-related compliance issues, and operational downtime.

Additionally, our liaison office model

in Bangladesh allows customers to source directly from the factory, ensuring transparent pricing, authentic OEM solutions, and direct technical coordination—particularly critical for marine and industrial applications where reliability and compliance are non-negotiable.

The current economic climate has placed significant pressure on imports and the luxury sectors. How have you adapted Vulkan's sales forecasting and inventory strategy to maintain growth while ensuring the brand remains exclusive and resilient?

In today's economic climate—marked by import constraints, currency pressure, and cautious investment—Vulkan Bangladesh has adapted by treating sales forecasting and availability as a reliability strategy rather than a volume exercise. It is important to clarify that VULKAN is not a luxury product; it is a premium, engineered reliability solution, selected when uptime, safety, and lifecycle performance are critical.

We have shifted from broad, volume-driven forecasting to a project- and probability-led model, focused on confirmed opportunities across marine, power, and industrial sectors. At the same time, we rebalance our pipeline toward more resilient vessel categories—such as Navy Vessel, cargo ships, regional feeders, and advanced fishing trawlers—where technical performance remains essential.

Supply resilience is supported by VULKAN's global manufacturing network and centralized original spare-parts buffers, including the main warehouse in Herne and other strategic locations worldwide. Complementing this, Vulkan Bangladesh provides on-ground technical expertise for inspections, project assessment, and demand forecasting, enabling accurate planning, reduced downtime risk, and consistent system availability even under challenging import conditions.

Managing a sales team in a specialized sector requires a mix of technical knowledge and aggressive drive. What is your personal blueprint for building a team that can speak the language of "engineers and enthusiasts" while consistently hitting high-revenue targets?

At Vulkan Bangladesh, operating as a liaison office under Vulkan Far East Pte. Ltd., Singapore, we follow VULKAN's blueprint for high-performance sales culture: combine deep technical credibility with disciplined commercial execution. VULKAN develops technical consultants, not conventional salespeople—people who can speak confidently with engineers, shipyards, consultants, and performance-driven end users. This enables early engagement at the design and specification stage, where engineering value is created, and price pressure is lowest. In parallel, we run structured pipelines, clear revenue ownership, and long-term account planning. Continuous technical learning, joint customer visits, and post-installation follow-up ensure performance, trust, and repeat high-value business.

How has the Bangladeshi premium automotive or industrial consumer changed in the last three years? What specific "buying triggers" have you identified that are unique to this local market compared to global trends?

Over the last three years, Bangladesh's premium industrial and marine buyers have evolved—slowly but steadily—from cost-first decisions toward higher-value, technically complex assets. While initial investment sensitivity remains and cheaper options are still sometimes chosen, awareness of Total Cost of Ownership (TCO) is clearly increasing as the financial impact of downtime and rework becomes more visible.

A key local buying trigger—distinct from many global markets—is operational certainty under challenging conditions. Import dependency, tight construction schedules, and high financing costs mean failures are extremely expensive. As a result, customers increasingly prioritize proven reliability and early-stage technical validation.

Additional triggers include policy-driven compliance for classed vessels, growing demand for specialized ship types aligned with the Blue Economy, and rising expectations around comfort, particularly low vibration and noise in passenger and premium segments. Sustainability is also gaining importance, primarily as a requirement for international market access rather than brand positioning.

As new competitors enter the detailing and automotive care space, what is Vulkan BD's specific competitive advantage—its "moat"—that ensures high customer retention and long-term brand loyalty?

Vulkan Bangladesh's competitive moat is not price—it is engineering-led system

responsibility. Under the slogan “we ensure that systems work better,” we deliver tailor-made solutions that improve performance both technically and economically, instead of selling generic products. What competitors cannot easily replicate is our ability to engage early, apply a holistic, system-integration approach, and prevent costly issues before they appear in operation.

Trust is further reinforced by the depth behind the brand: the VULKAN Group has been family-owned since 1889, built on consistent values of quality, product safety, punctual delivery, and continuous improvement. In Bangladesh, this matters because customers want a partner who stays accountable over the lifecycle—not only at the point of sale.

Looking back at your career, what was the most challenging “no” you ever turned into a “yes”? How did that specific deal or experience shape your current leadership philosophy at Vulkan BD?

One of the most challenging “no” we turned into a “yes” came from a client who had standardized on a lower-cost alternative and was unwilling to consider a premium solution. Rather than pushing for an immediate sale, we at Vulkan Bangladesh chose to step back and focus on education and trust—sharing data, application risks, and lifecycle implications without pressure.

Months later, when the client faced repeated operational issues and costly downtime, the conversation reopened—this time through the lens of performance and reliability, not unit price. That experience reinforced a principle we apply in our leadership and sales culture at Vulkan Bangladesh: credibility always precedes conversion.

It shaped our approach to lead with patience, technical integrity, and long-term thinking. Real leadership in sales is not about winning arguments—it is about earning trust early, staying present throughout the customer journey, and being the reliable partner when the moment to decide truly arrives.

With the rise of digital research and social commerce, how is Vulkan BD bridging the gap between online engagement and the final high-touch, offline sales conversion in the showroom or workshop?

Vulkan Bangladesh uses digital channels to educate and qualify—but we deliberately close sales offline through face-to-face, project-based discussions. Our online engagement shares technical insights, references, and the latest documentation (including QR-based version checks), helping engineers and decision-makers shortlist the right direction early.

The conversion happens when we move from online interest to drawing-board consultancy and on-site review—aligning specifications with real operating conditions, identifying risks before installation, and building the trust premium engineering requires. In short, digital creates confidence;

offline meetings in the workshop, shipyard, or project site convert that confidence into the right solution and long-term performance.

Beyond the current portfolio, where do you see the next big revenue driver for Vulkan BD? Whether it is geographic expansion into other cities or moving into new service categories, what is the “Next Big Play” on your radar?

Looking ahead, the next big growth driver for Vulkan Bangladesh is the shift toward eco-friendly, high-efficiency propulsion systems, a direction we expect the Bangladesh market to follow as fuel economics, international regulations, and customer expectations continue to evolve. Our core focus is VULKAN Hybrid Architect, which enables lower emissions, quieter operation, and meaningful fuel savings for workboats, passenger vessels, and future-ready fleets.

In parallel, composite shaft solutions represent a strong opportunity. Compared to conventional steel shafts, VULKAN composite shafts offer significant weight reduction, improved vibration behavior, and greater design flexibility—often reducing bearing requirements and installation effort when combined with our highly flexible couplings.

We also see strong potential in upcoming innovations such as Dynamic E Flow, designed to further support the transition toward intelligent and sustainable drivetrains. In essence, the next big play is to prepare the market today for tomorrow’s standards, positioning VULKAN as the partner that enables Bangladesh’s transition toward cleaner, smarter, and more efficient marine systems.

Feature

TECH TREND DIGITAL TWIN TECHNOLOGY IN MARITIME OPERATIONS: OPTIMISING FLEET PERFORMANCE

In an era where data and digitalisation are reshaping global industries, the maritime sector is undergoing a technological transformation driven by digital twin technology. At its core, a digital twin is a virtual, real-time replica of a physical asset—such as a ship, engine or port infrastructure—powered by continuous data from sensors and advanced analytics. In the maritime context, this technology is rapidly evolving from a futuristic concept into a practical tool that enhances decision-making, efficiency and sustainability across fleet operations, port logistics and vessel maintenance.

WHAT IS A DIGITAL TWIN AND WHY IT MATTERS

A digital twin functions as more than a static model; it is a dynamic system that mirrors the physical counterpart's condition at all times. It integrates real-world sensor data, navigational logs and performance metrics into a coherent digital platform that updates in real time. This synchronization enables operators and managers to monitor vessel health, simulate "what-if" scenarios and make proactive operational decisions with confidence.

Digital twins differ from traditional models because they are connected to actual assets, and evolve as those assets change, giving stakeholders a continuously accurate and actionable digital mirror. The result is improved visibility and responsiveness across all stages of a vessel's lifecycle—from design and construction to operation and maintenance.

ENHANCING MAINTENANCE AND PREDICTIVE ANALYTICS

One of the standout capabilities of digital twin technology is predictive maintenance. Instead of relying on fixed service schedules, fleet managers can monitor real-time data from engines, propulsion systems and structural components to identify early signs of wear or impending failure. This allows maintenance teams to act before issues escalate, reducing unplanned downtime and extending the service life of critical equipment.

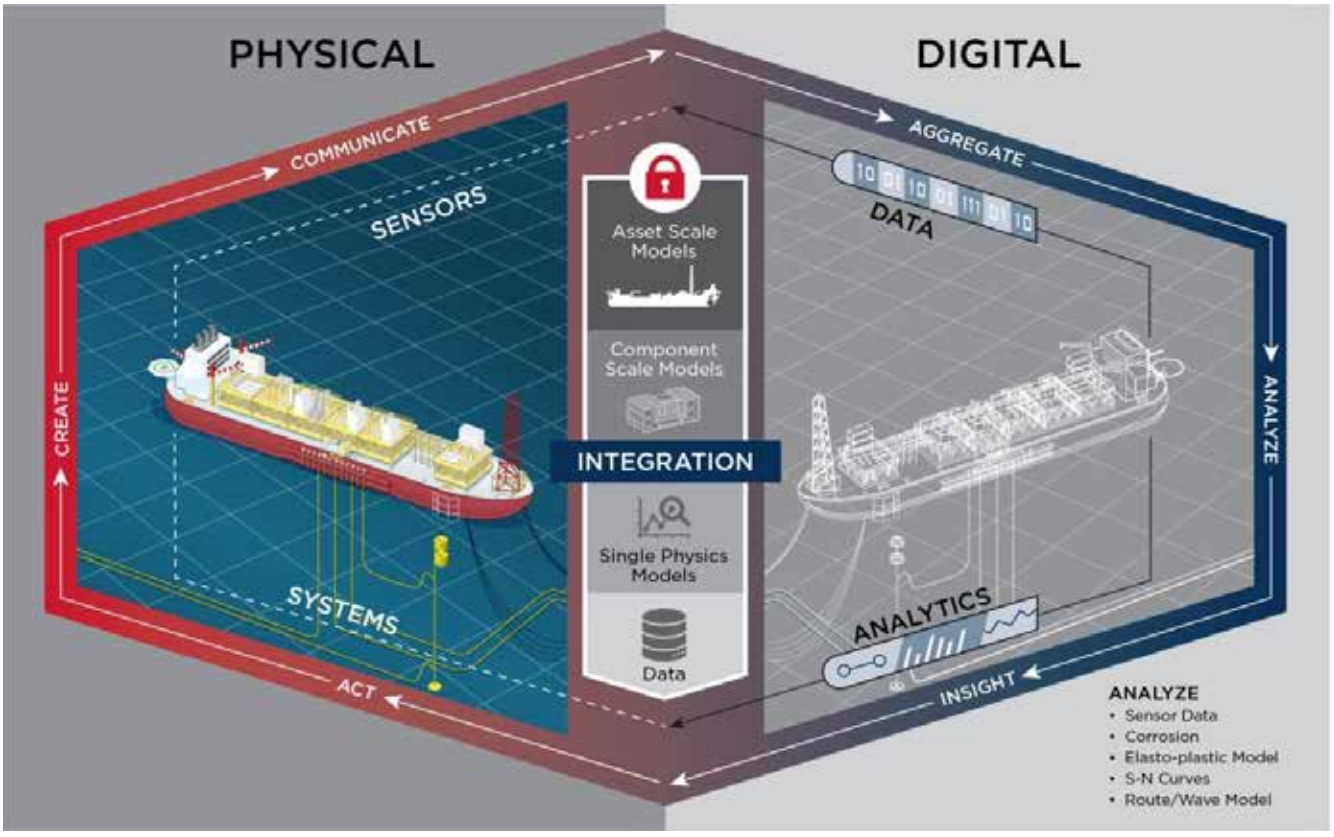
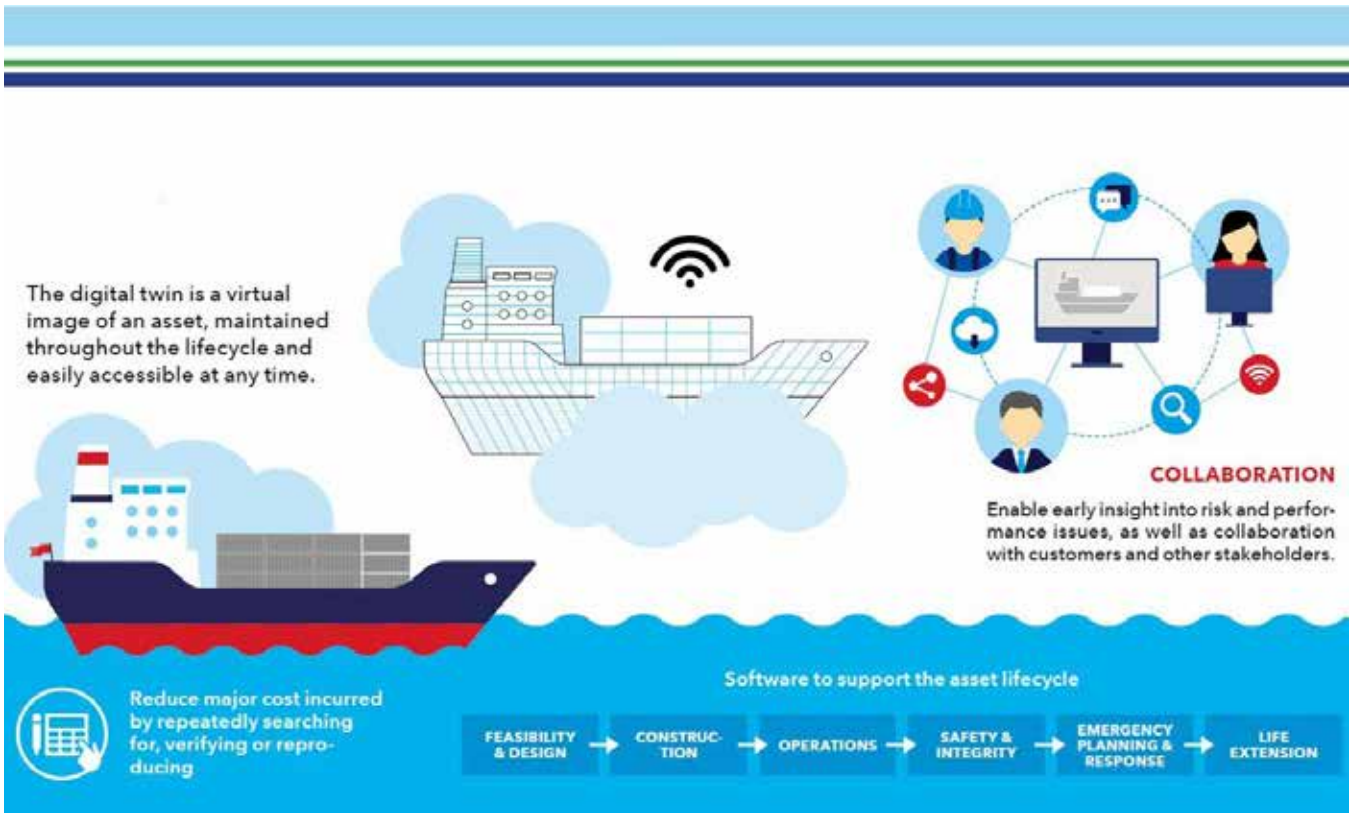


Photo American Bureau of Shipping, LinkedIn



For instance, continuous real-time monitoring can detect subtle anomalies in engine performance or hull integrity, prompting targeted interventions that minimise disruption and reduce lifecycle costs. By analysing trends and patterns over time, digital twins help shift maritime operations from reactive fixes to proactive care.

OPERATIONAL EFFICIENCY AND FUEL OPTIMISATION

Beyond maintenance, digital twins offer significant benefits in fuel and route optimisation—an essential consideration given volatile fuel prices and tighter environmental regulations. By simulating different routes, weather conditions and engine settings, digital twins can identify the most efficient operating profiles for any voyage. This not only lowers fuel consumption but also contributes to reduced emissions, aligning with broader sustainability goals in shipping.

Port operations also benefit from digital twin technology. Virtual models of port infrastructure, including cranes, berths and storage areas, allow operators to experiment with logistics strategies in a risk-free digital environment. This can streamline processes such as berthing sequences, cargo handling and turnaround planning, ultimately reducing congestion and enhancing throughput.

SAFETY, SIMULATION AND STRATEGIC DECISION-MAKING

Digital twins also elevate safety and risk management. By simulating emergency scenarios, such as equipment failures or extreme weather events, operators can test responses and build robust contingency plans without real-world risk. This proactive approach improves crew preparedness and enhances compliance with global safety standards.

Moreover, advanced digital twin models can integrate artificial intelligence and machine learning to predict future scenarios and recommend optimal actions, further strengthening strategic decision-making across fleets and ports.

THE ROAD AHEAD

The adoption of digital twin technology in maritime operations is still evolving, but its impact is clear: better maintenance regimes, heightened operational efficiency, reduced emissions and stronger safety protocols. As sensors and analytics become more sophisticated, the digital twin will continue to unlock new levels of performance and resilience for fleets and ports alike.

In a world where maritime competitiveness increasingly depends on smart, data-driven solutions, digital twins are poised to become a cornerstone of modern fleet management and maritime innovation.

ASIA'S CONTAINER PORT DOMINANCE: NAVIGATING CONGESTION, TECH, AND GEOPOLITICAL TENSIONS

In the heart of global trade, Asia's container ports stand as colossal gateways, handling over 60% of the world's container throughput and fueling the engines of international commerce. From the bustling docks of Shanghai to the strategic hub of Singapore, these ports are not just logistical lifelines but battlegrounds for efficiency, innovation, and power plays. As Bangladesh's Chittagong Port climbs the ranks amid regional growth, the sector grapples with chronic congestion, rapid technological adoption, and escalating geopolitical risks. This feature unpacks how Asia maintains its iron grip on container dominance while steering through turbulent waters, drawing on recent data and scholarly insights to reveal the high-stakes navigation ahead.

THE POWERHOUSES: ASIA'S TOP PORTS AND THEIR METEORIC THROUGHPUT

Asia's ports have shattered records in 2025, with combined throughput surging amid post-pandemic recovery and e-commerce booms. Shanghai, the undisputed king, crossed the 50 million TEU mark by November, ending the year at an estimated 55.06 million TEUs—a 6.9% year-on-year leap. Singapore follows closely with 41.1 million TEUs, leveraging its transshipment prowess to connect East Asia with global routes. Ningbo-Zhoushan and Shenzhen round out the top tier, benefiting from China's export surge despite U.S. tariffs. In Southeast Asia, ports like Port Klang in Malaysia and Vietnam's Cai Mep-Thi Vai are rising stars, driven by nearshoring trends.

Bangladesh's Chittagong Port, handling around 3.5 million TEUs in 2025, plays a pivotal role in South Asia, serving as a key node for garment exports and imports. However, it's overshadowed by giants, with throughput growth hampered by infrastructure limits. Globally, Lloyd's List reports the top 100 ports moved 743.6 million TEUs in 2025, an 8.1% increase, with Asia claiming nine of the top 10 spots.

To illustrate the hierarchy, here's a table of the top 10 Asian container ports by 2025 throughput:(Data compiled from Lloyd's List, UNCTAD, and port authorities; estimates for full-year 2025.)

This dominance stems from massive investments: China's ports alone handled record volumes despite external pressures, underscoring Asia's resilience.

Photo: Ashian Ports

The Congestion Crunch: Bottlenecks in the Supply Chain

Congestion remains a thorn in Asia's side, exacerbated by feeder capacity shortages and yard overflows. In Southeast Asia, tight feeder networks have caused transshipment delays and rolled cargo, spiking yard density. Scholarly studies highlight how port congestion inflates containership freight rates, with Asia's hubs most affected—a 1% congestion rise can hike rates significantly. For instance, a 2025 analysis models congestion's impact on networks, noting Southeast Asian ports' vulnerability due to rapid expansion and environmental pressures.

Technology offers relief: Automation at Singapore's Tuas Port and AI-driven scheduling in Shanghai reduce dwell times by up to 30%. Yet, as a Cardiff University thesis on global congestion notes, Asian ports (38% of studied cases) face unique challenges from typhoons and labor shortages. Bangladesh's Chittagong, plagued by berthing delays, could learn from these, with proposals for digital twins to optimize flows.

A table of congestion impacts in key Asian ports (2025 estimates):

Port	Average Dwell Time (Days)	Congestion Index (Scale 1-10)	Freight Rate Impact (%)	Mitigation Efforts
Shanghai	2.5	7.2	+15%	AI optimization.
Singapore	1.8	6.5	+10%	Full automation at Tuas.
Ningbo	3.0	7.8	+18%	Expanded berths.
Chittagong	4.5	8.1	+20%	Belt and Road up-grades.
Port Klang	2.2	6.0	+12%	Digital tracking.

(Based on JOC and scholarly models; higher index indicates worse congestion.)

Geopolitical Storm Clouds: Tensions Reshaping Trade Routes

Geopolitical frictions are redrawing Asia's maritime map. The Red Sea crisis has disrupted container calls, forcing reroutes around Africa and inflating costs by 20-30%. In the South China Sea, tensions between major powers threaten key chokepoints, potentially collapsing supply chains. Scholarly work simulates waterway closures in Southeast Asia, estimating trade losses up to 10% for affected nations. Geopolitical risks also spill into volatility for shipping and oil markets.

For Bangladesh, Bay of Bengal dynamics—tied to India's Belt and Road counter-initiatives—amplify vulnerabilities, with 90% of trade seaborne. A study on Indo-Pacific strategies warns of fragmented ASEAN unity and non-traditional threats like cyber attacks on ports. Mitigation lies in diversified routes and tech resilience, as ports become "key agents or sitting ducks" in tense environments.

As Asia's ports evolve, balancing dominance with sustainability will define the next decade. For Bangladesh, integrating into this network via upgrades could unlock billions in trade.

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Feature

THE SHIP RECYCLING SLUMP: REVIVING BANGLADESH'S INDUSTRY IN A REGULATED GLOBAL ERA

Bangladesh's shipbreaking yards in Chittagong once buzzed with activity, dismantling hulking vessels and supplying steel to a booming economy. But a confluence of global disruptions, stricter regulations, and environmental scrutiny has triggered a slump, with imports dropping sharply. As the Hong Kong Convention reshapes the industry, this feature explores the decline, its impacts, and pathways to a greener revival—spotlighting scholarly evidence on pollution's toll and strategies for sustainable reform.

The Decline: From Boom to Bust in Ship Recycling Volumes

Bangladesh has long dominated ship recycling, accounting for up to 40% of global volumes by gross tonnage. In 2025, it recycled 2.74 million gross tonnes, retaining its top spot for the seventh year. Yet, the slump is evident: Ship imports fell to 130 in 2024, a 23.5% drop from 170 in 2023, driven by high scrap prices, supply chain issues, and regulatory pressures. Annually, 250-270 ships generate USD 75 million in duties, but volumes have dipped amid COVID aftermath and geopolitical shipping reroutes.

Scholarly reviews trace this to overcapacity and global shifts, with Bangladesh's yards facing competition from India and Pakistan. The industry supplies 60% of local steel raw materials, supporting 200,000 jobs, but the downturn threatens livelihoods.

A table of Bangladesh's ship recycling volumes (2020-2025):

Year	Ships Imported	Gross Tonnage (Million GT)	% Change YoY	Key Factors
2020	~220	2.1	-15%	COVID disruptions.
2021	~240	2.3	+9.5%	Recovery phase.
2022	~260	2.5	+8.7%	Peak amid supply glut.
2023	170	2.2	-12%	Regulatory tightening.
2024	130	1.9	-13.6%	Price hikes, fewer end-of-life ships.
2025	~150 (est.)	2.74	+44% (GT basis)	Partial rebound but volatile.

(Data from UNCTAD, NGO Shipbreaking Platform, and local reports.)

Environmental Toll: Pollution and Ecosystem Damage

The slump masks deeper issues: Shipbreaking's environmental footprint. Yards release toxins like heavy metals, PCBs, and asbestos, contaminating soils, waters, and air in coastal zones. Studies show river discharges near Chittagong exacerbate pollution, harming biodiversity and leading to fish extinctions. A 2025 analysis links activities to "more-than-economic dispossession," where toxins disrupt local commons and health. Welding and sandblasting generate dust that poses long-term risks, with contamination rates in Sitakunda far exceeding safe levels.

Worker safety is dire: Surveys across 18 yards reveal high accident risks, with mitigation proposals urging better PPE and zoning. Global comparisons highlight Bangladesh's pre-2015 unregulated era caused extensive ecosystem loss.

The Regulatory Reckoning: Hong Kong Convention's Ripple Effects

The Hong Kong Convention (HKC), effective June 2025, mandates safe, green recycling—yet Bangladesh missed implementation deadlines, risking yard closures. It aims to curb hazards, but critics argue it falls short, as yards circumvent rules via flags of convenience. Three months in, HKC has improved standards but strained the slump-hit industry with compliance costs. Scholarly evaluations praise its role in elevating Bangladesh's practices, though full adoption lags.

Revival strategies include green upgrades: KSRM Steel's model shows eco-friendly dismantling boosts sustainability. SWOT analyses suggest leveraging strengths like low costs while addressing weaknesses in regulation.

A table contrasting regulations:

Region	Key Regulation	Compliance Rate	Environmental Focus	Impact on Industry
Asia (Bangladesh/ India)	HKC (partial)	60-70%	Hazardous waste mgmt.	Cost increases, slump accentuation.
Europe (e.g., Turkey)	EU Ship Recycling Reg.	90%+	Strict audits, zero discharge.	Higher costs, fewer yards.
Global South (Pakistan)	Basel Convention links	50%	Pollution controls.	Similar slumps, reform push.

(From IMO and scholarly sources.)

With targeted reforms, Bangladesh can revive its yards as green leaders, balancing economy and ecology.

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Feature

REVIVING THE OCEANS: THE RISE OF THE REGENERATIVE BLUE ECONOMY

In the vast expanse of our planet's oceans, a quiet revolution is underway. For decades, we've treated the sea as an endless resource—a dumping ground for pollution, a highway for global trade, and a buffet for overfishing. But as coral reefs bleach, fish populations plummet, and coastal communities struggle, a new vision is emerging: the regenerative blue economy. This isn't just about sustaining what's left; it's about actively healing marine ecosystems while fostering equitable growth. Imagine wind farms that double as oyster reefs, women-led cooperatives turning seaweed into livelihoods, and policies that protect small fishers from industrial giants. As we stand on the brink of irreversible tipping points, the regenerative approach offers a blueprint for prosperity that's as resilient as the tides themselves.

The original push for a "sustainable" blue economy put the ocean on the global map, weaving it into development plans and business strategies. Yet, despite these efforts, degradation persists at alarming rates. Warming waters, plastic pollution, and habitat loss are pushing ecosystems to the edge. But momentum is building. With landmark agreements like the High Seas Treaty entering force in January 2026 and billions pledged at the 2025 UN Ocean Conference, the stage is set for transformation. Drawing from fresh data and on-the-ground stories, this feature dives deep into why regeneration matters—and how it's already reshaping our relationship with the sea.

THE ALARMING PULSE OF OCEAN HEALTH

The ocean covers 71% of Earth, regulates our climate, and supports over 3 billion people for protein and livelihoods. Yet, it's degrading faster than ever. Overfishing remains a scourge: the latest FAO assessment from 2025 reveals that 35.5% of global fish stocks are overexploited, up slightly from previous years, while 64.5% are fished at sustainable levels—but many teeter on the brink. Coastal habitats, nature's carbon vaults, are vanishing. Mangroves, which sequester carbon 10 times faster than terrestrial forests, have declined by 3.4% globally from 1996 to 2020, equating to a loss of 5,245 square kilometers. Seagrasses, vital for marine biodiversity and coastal protection, are disappearing at 110 square kilometers per year since 1980, with 29% of known extents already gone.

These losses aren't abstract—they ripple through economies. Degraded oceans mean fragile supply chains, rising insurance costs from extreme weather, and food insecurity for millions. To visualize the scale, here's a snapshot of key degradation metrics:

Indicator	Current Status	Annual Loss Rate	Source Notes
Overexploited Fish Stocks	35.5% of global stocks	N/A (weighted by production: 22.8% overfished)	FAO 2025 assessment
Mangrove Coverage	3.4% net loss (1996-2020)	0.13% per year (2000-2016)	UNEP-WCMC & Hamilton studies
Seagrass Meadows	29% of known extent lost	110 km²/year since 1980	PNAS global assessment
Coral Reefs at Risk	Up to 90% could be lost by 2050 due to warming	Varies by region	IPCC projections

This table underscores the urgency: without intervention, these trends could erase trillions in economic value and displace coastal communities.

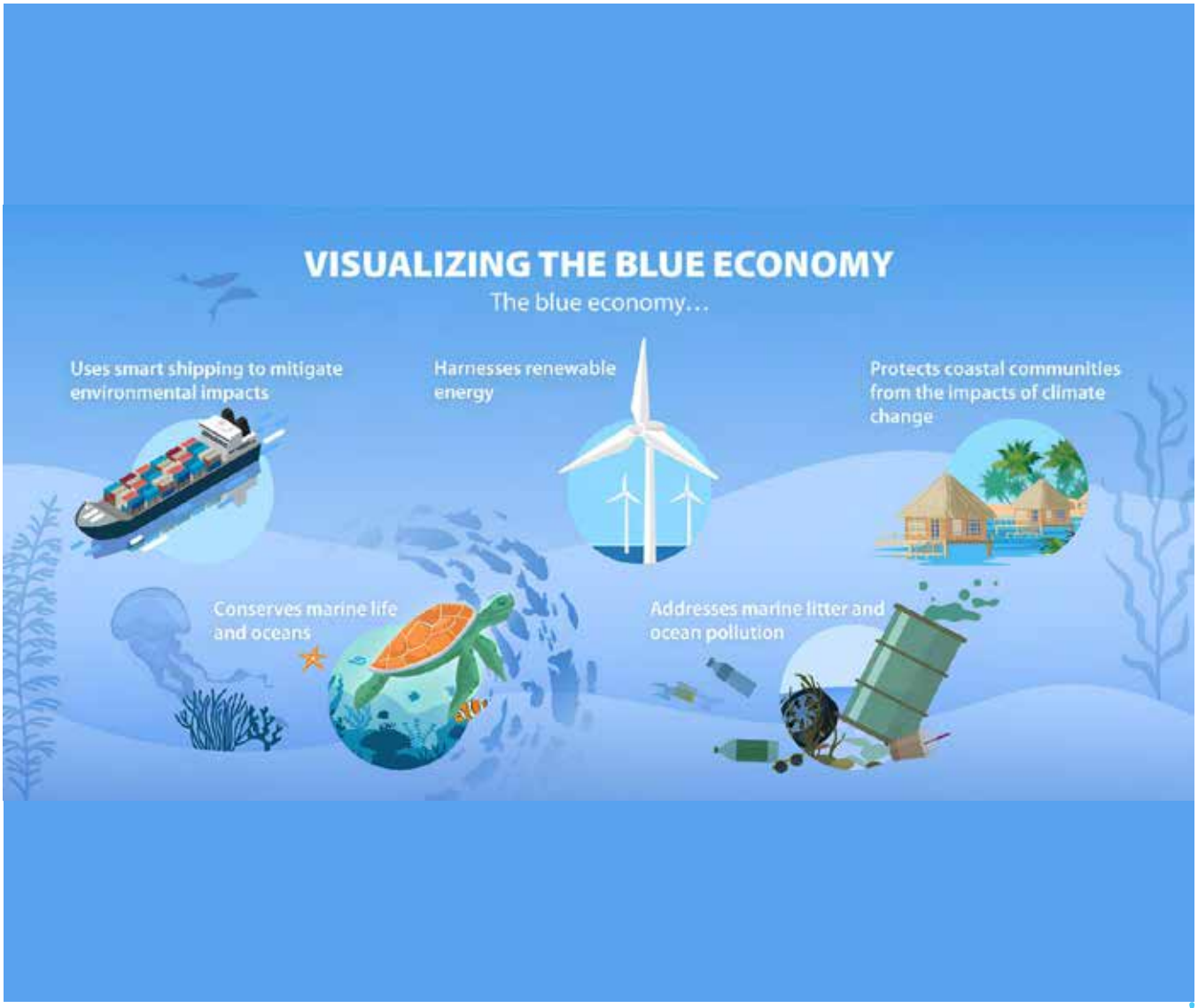
THE ECONOMIC ENGINE OF THE SEAS

Amid the challenges, the blue economy hums with potential. Valued at $2.5 to $6 trillion annually—equivalent to the world's eighth-largest economy—it drives global trade, energy, and tourism. Recent estimates peg it closer to $2.6 trillion, with projections climbing toward $3 trillion by 2030 as sectors like offshore renewables expand. Employment is another bright spot: the ocean economy currently supports over 130 million jobs worldwide, with forecasts predicting growth to 184 million by 2050—a 51 million job increase—if we pivot to sustainability. That's a 1.5% annual growth rate, outpacing many land-based sectors.

Breaking it down by sector reveals where the value lies. The EU Blue Economy Report for 2025 outlines seven core areas, with coastal tourism and maritime transport leading in GDP contribution. Globally, tourism and recreation alone generate hundreds of billions, while emerging fields like marine biotech and renewables promise exponential growth. Here's an approximate global breakdown based on recent analyses:

Sector	Estimated Annual GDP Contribution	Key Growth Drivers	Projected 2030 Value
Coastal Tourism & Recreation	$1-1.5 trillion	Eco-tourism, post-pandemic recovery	Up to $2 trillion
Maritime Transport & Shipping	$500-800 billion	Global trade expansion	$1 trillion+
Fisheries & Aquaculture	$400-600 billion	Sustainable farming innovations	$500-700 billion
Offshore Renewables (Wind, Wave)	$100-200 billion	Net-zero targets	$300-500 billion
Marine Non-Living Resources (Oil, Gas, Minerals)	$300-500 billion	Transition to greens	Declining share
Port Activities & Shipbuilding	$200-300 billion	Infrastructure upgrades	$400 billion
Marine Biotech & Emerging	$50-100 billion	Innovation in pharma, materials	$200 billion+

(Data aggregated from OECD, NOAA, and World Bank reports; figures are estimates as global tracking varies.) This table highlights regeneration's business case: investing in restoration could unlock $10-15 trillion in net benefits by mid-century, creating resilient value chains.



MOMENTUM BUILDS: FROM POLICY TO PRACTICE

The tide turned decisively in 2025. At the UN Ocean Conference in Nice, France, 65 heads of state and 10,000 participants rallied around the Nice Ocean Action Plan—a framework with over 800 commitments and €8.7 billion in pledges for conservation and science.

Record business participation signaled the ocean's shift to the heart of climate agendas. Complementing this, the Biodiversity Beyond National Jurisdiction (BBNJ) Agreement—aka the High Seas Treaty—entered force in January 2026, governing 60% of the world's oceans by promoting marine protected areas and equitable benefit-sharing from genetic resources. Meanwhile, the WTO Fisheries Subsidies Agreement, effective September 2025, bans $22 billion in harmful subsidies annually, curbing overfishing and leveling the playing field for small-scale operators.

These policies aren't just words—they're catalyzing action. Investor interest spans 70+ ocean innovation categories, from carbon-capturing kelp farms to AI-driven pollution trackers. The World Economic Forum's Global Future Council on the Regenerative Blue Economy is at the forefront, uniting experts to translate ambition into blueprints. Meeting in Dubai in October 2025, they emphasized cross-sector collaboration, nature-inclusive design, and de-risking investments for local communities.

STORIES FROM THE FRONTLINES: REGENERATION IN ACTION

Regeneration isn't theoretical—it's happening now. In Chile, Territorial Use Rights for Fisheries (TURFs) empower artisanal fishers to manage coastal zones, leading to rebuilt benthic ecosystems and sustained local economies. After 30 years, studies show higher catch rates in TURFs versus open-access areas, though ongoing monitoring is key to prevent declines.

Across the North Sea, offshore wind farms are morphing into multi-use hubs: RWE's projects integrate oyster reef restoration and aquaculture, boosting biodiversity while generating clean energy and jobs. A recent feasibility study confirms that just 1% of global wind investments could restore millions of hectares of marine life.

In Zanzibar, Tanzania, women-led seaweed cooperatives like the "Mwani Mamas" are restoring lagoon health while creating income streams. With 88% of seaweed farmers being women, these groups harvest sustainably, produce beauty products, and empower communities amid climate challenges. Ghana's 2025 Fisheries Act extended the Inshore Exclusive Zone from 6 to 12 nautical miles, shielding small-scale fishers from industrial trawlers and fostering biodiversity recovery.

Beyond these, innovative projects abound: GreenWave's regenerative ocean farming in the US combines kelp and shellfish to sequester carbon and create jobs. In Europe, EU-funded algae hubs advance sustainable farming, while Mozambique-Tanzania exchanges upskill youth in seaweed cultivation. These examples prove that ecological recovery and prosperity can advance hand-in-hand.

CHARTING THE FUTURE: A CALL TO ACTION

As the Global Future Council convenes, the message is clear: regeneration must scale from pilots to norms. By integrating policy, finance, and community co-design, we can build an ocean economy that's circular, inclusive, and resilient. Governments, businesses, and investors are invited to join—spotlighting initiatives that make regeneration the blue economy's core principle. The ocean isn't just a resource; it's our lifeline. With bold action, we can ensure it thrives for generations, turning degradation into abundance.

Feature

SUSTAINABLE MARITIME FUELS: TRENDS IN LNG AND HYDROGEN ADOPTION FOR GLOBAL TRADE ROUTES

As the global shipping industry navigates the choppy waters of climate imperatives, a profound shift toward low-carbon fuels is underway. Traditional heavy fuel oil (HFO), long the workhorse of maritime propulsion, is giving way to cleaner alternatives like liquefied natural gas (LNG) and hydrogen. Driven by stringent regulations from the International Maritime Organization (IMO) and the European Union's Emissions Trading System (ETS), this transition promises to slash emissions while reshaping trade dynamics. In Asia's bustling corridors—from the Malacca Strait to the Bay of Bengal—these fuels are gaining traction, with forecasts pointing to a 15% surge in green vessel deployments by the end of 2026. Bangladesh, with its strategic ports, emerges as a potential bunkering powerhouse. Drawing on insights from IRENA and BIMCO reports, this feature explores the trends, challenges, and opportunities fueling this green revolution.

REGULATORY CATALYSTS: IMO AND EU ETS PUSHING THE ENVELOPE

The push for sustainable fuels stems from escalating regulatory pressures. The IMO's revised 2023 Greenhouse Gas (GHG) Strategy, updated with net-zero ambitions in 2025, mandates a 20% reduction in shipping emissions by 2030, 70% by 2040, and net-zero by around 2050 compared to 2008 levels. This includes carbon intensity cuts and a proposed Net-Zero Framework with mandatory fuel standards and GHG pricing, set for final adoption in 2026 and implementation from 2028. Delays in voting have raised concerns, potentially stalling clean fuel projects, but the framework emphasizes low-carbon options like LNG and hydrogen-derived fuels.

Complementing this, the EU ETS extended to shipping in 2024, covering CO2 from large vessels, with methane and nitrous oxide added in 2026. By 2026, operators must surrender allowances for 100% of emissions, up from 70% in 2025, leading to surcharges that could add 12% to freight costs. FuelEU Maritime, effective since 2025, further mandates gradual GHG

intensity reductions in marine fuels, promoting renewables and low-carbon alternatives. These rules are accelerating adoption, with non-compliance penalties incentivizing a switch from fossil fuels.

LNG AND HYDROGEN: THE FRONT-RUNNERS IN LOW-CARBON PROPULSION

LNG, a transitional fuel, dominates current trends due to its availability and infrastructure. It reduces GHG emissions by up to 23% on a well-to-wake basis compared to HFO, with even greater cuts in SOx (nearly 100%) and NOx (up to 80%). However, methane slip remains a concern, prompting advances in bio-LNG and e-LNG for deeper decarbonization.

Hydrogen, particularly green variants produced from renewables, offers near-zero emissions—up to 95% GHG reductions when used in fuel cells or as derivatives like ammonia and methanol. IRENA highlights green hydrogen as the backbone for shipping's net-zero pathway, with derivatives like ammonia potentially meeting 95% of energy needs by 2050. Challenges include high costs, low energy density requiring larger storage, and limited infrastructure, but innovations in value chains are bridging gaps.

To compare, here's a table of emission reductions for key fuels (well-to-wake basis, relative to HFO):

Fuel Type	CO2 Reduction (%)	NOx Reduction (%)	SOx Reduction (%)	Methane Slip Risk	Source Notes
LNG (Fossil)	20-23	80-90	~100	High	SEA-LNG, Lloyd's Register
Bio-LNG	80-90	80-90	~100	Medium	IRENA, DNV
Green Hydrogen	95-100	~100	~100	Low	IRENA, CSIS
e-Ammonia (H2-derived)	90-95	~100	~100	Low	UMAS, IRENA
HFO (Traditional)	Baseline (0)	Baseline (0)	Baseline (0)	N/A	General benchmark

ASIA'S TRADE CORRIDORS: HOTSPOTS FOR FUEL ADOPTION

Asia, handling over 40% of global maritime trade, is a focal point for sustainable fuel rollout. Corridors like the South China Sea and Malacca Strait, vital for energy imports, face heightened risks from emissions regulations. LNG bunkering is expanding in Singapore and Japan, while hydrogen pilots emerge in South Korea and China. BIMCO notes biofuels and LNG as interim solutions, with hydrogen gaining for long-haul routes. Costs remain a barrier: LNG is competitive at $500-1,000/ton, but hydrogen could be 2-3 times pricier without subsidies.

A comparative table of fuel costs (2026 estimates, USD per ton, including compliance):

Fuel Type	Base Cost (USD/ton)	With ETS/IMO Levies (USD/ton)	Energy Density (MJ/kg)	Infrastructure Availability	Source Notes
LNG	500-1,000	600-1,200	48-55	High (Asia hubs)	Ship & Bunker, ScienceDirect
Green Hydrogen	2,000-4,000	2,500-5,000	120	Low (Emerging)	IRENA, IEEFA
e-Methanol (H2-derived)	800-1,500	1,000-1,800	19-20	Medium	Sustainable Ships, S&P Global
HFO	400-600	500-800 (with scrubbers)	40-42	Very High	Baseline from various reports

2026 FORECASTS: SURGING GREEN VESSEL DEPLOYMENTS

Forecasts for 2026 predict a 15% rise in green vessel deployments, driven by order books and regulations. BIMCO reports over

500 alternative-fueled container ships on order, representing 53% of newbuilds, with deliveries ramping up. Overall, sustainable fuels could capture 5-10% market share by 2026, up from <2% today, per IRENA and market analyses. The sustainable marine fuels market is projected to hit $19.86 billion in 2025, growing at 52% CAGR.

Market share table (global shipping fuel mix, 2026 forecasts):

Fuel Category	Current Share (2025, %)	Forecast Share (2026, %)	Growth Driver	Source Notes
Traditional Fossils (HFO/ VLSFO)	90-95	85-90	Declining due to regs	BIMCO, IEA
LNG/Bio-LNG	3-5	5-7	Infrastructure expansion	SEA-LNG, Precedence Research
Hydrogen & Derivatives	<1	1-2	Pilot scaling	IRENA, World Economic Forum
Biofuels/Other Renewables	1-2	2-3	Interim solutions	BIMCO, Market Data Forecast

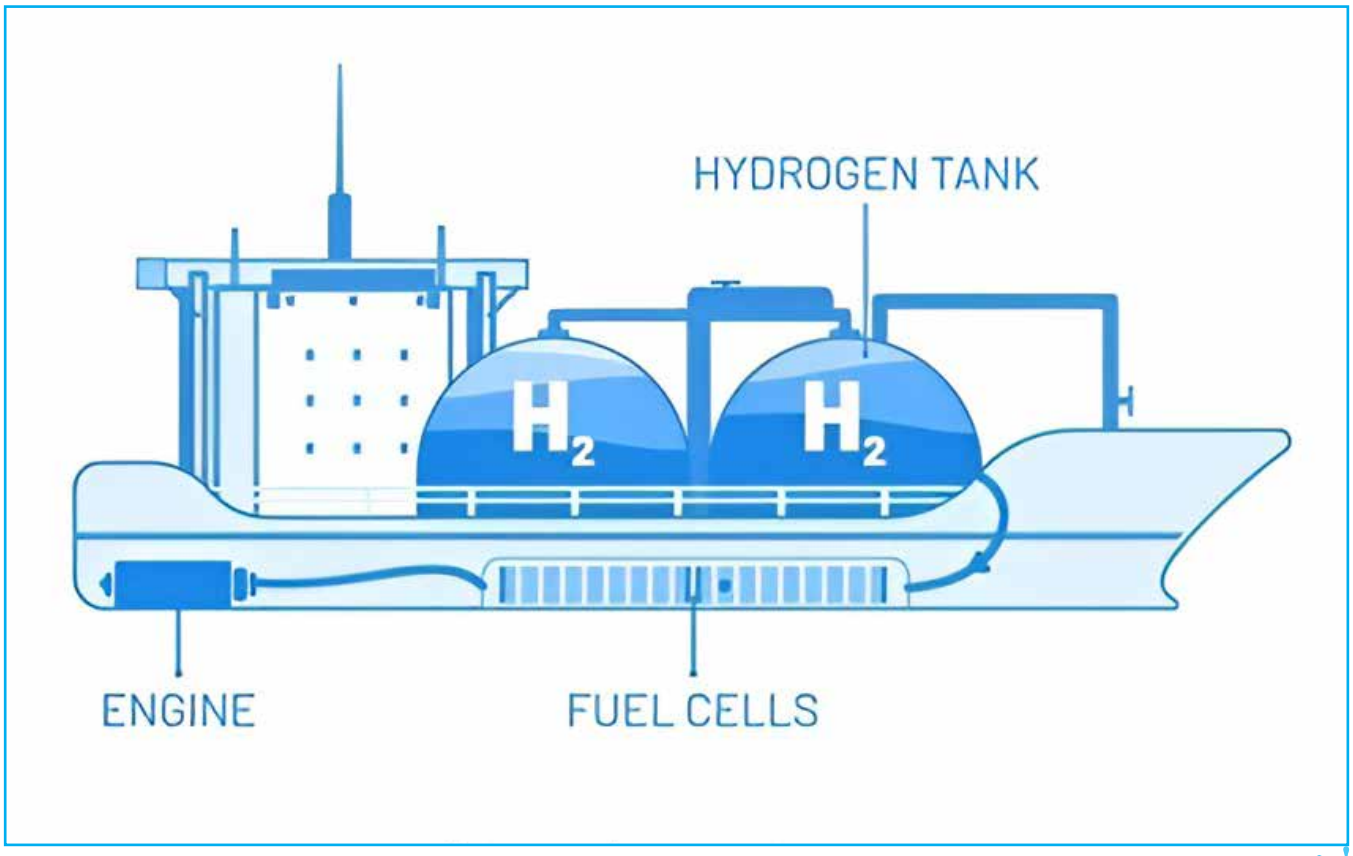
Bangladesh's Emerging Role in Bunkering Hubs

Bangladesh stands poised to capitalize on this shift, with ports like Chittagong and Matarbari eyed for LNG bunkering. Studies highlight potential for FSRU-based facilities, leveraging existing LNG imports to serve regional trade. As a gateway for South Asian routes, it could become a hydrogen hub with investments, aligning with global zero-carbon bunkering trends.

The transition to sustainable fuels is not just environmental—it's economic. By 2026, Asia's corridors could lead the way, with Bangladesh at the helm.

Expanding Bangladesh's Bunkering Case Studies: LNG and Hydrogen in Focus

Building on the potential highlighted in the sustainable maritime fuels landscape, Bangladesh's strategic position in the Bay of Bengal positions it as an emerging player in bunkering for low-carbon fuels. With ports like Chittagong and the developing Matarbari deep-sea facility, the country can leverage its growing LNG import infrastructure and nascent hydrogen explorations



to serve regional and global trade routes. Below, we delve into detailed case studies drawn from recent analyses, focusing on LNG bunkering viability and hydrogen applications in maritime vessels. These examples underscore economic opportunities, environmental benefits, and implementation challenges, supported by data from key reports and studies.

Case Study 1: LNG Bunkering Potential at Chittagong and Matarbari Ports

A comprehensive 2023 study (updated with 2025 insights) on the feasibility of LNG-fueled ship bunkering in Bangladesh evaluates Chittagong and Matarbari as prime sites for establishing dedicated facilities. This analysis, grounded in port capabilities, trade patterns, and regulatory alignments, projects Bangladesh could capture bunkering demand from vessels trading with Emission Control Areas (ECAs) in Europe, North America, and Asia.

- **Project Overview and Sites**: Chittagong Port (coordinates: 22.3091°N, 91.8018°E), Bangladesh's main gateway handling over 3.5 million TEUs annually, supports vessels up to 190m in length and 9.5m draft. It currently lacks dedicated LNG bunkering but benefits from proximity to existing Floating Storage and Regasification Units (FSRUs) like the Moheshkhali terminal. Matarbari Port (21.6914°N, 91.8590°E), under development as a deep-sea hub, accommodates larger ships (up to 338m length, 16m draft, suitable for 10,000 TEU vessels). It integrates with planned LNG terminals, including Summit Group's FSRU project, which faced termination threats in 2025 but was urged for reconsideration to boost capacity. Additional sites like Kuakata and Bhola are eyed for expansion, leveraging offshore gas reserves.

- **Economic Viability**: Bangladesh's exports to ECA zones (e.g., U.S., Germany, UK) totaled $204.65 billion in 2021-2022, with six of the top 10 importers in regulated areas. Direct routes via Matarbari could reduce transshipment via Singapore or Sri Lanka, attracting LNG-fueled vessels. With global LNG-fueled ships at 251 operational and 403 on order (projected bunkering ports rising to 200 by 2024), Bangladesh could generate revenue through competitive pricing. Onshore reserves (high reserves-production ratio) and imports (projected 115 cargoes in 2026, up 5.5% from 2025) ensure supply. A World Bank loan guarantee of $350 million in 2025 eases import costs, supporting bunkering economics.

- **Environmental and Operational Benefits**: LNG cuts emissions by 90% SOx, 80% NOx, 100% particulate matter, and 20% CO2 versus heavy fuel oil (HFO), aligning with IMO 2020 sulfur caps and ECA expansions (e.g., China and South Korea in 2022).

- **Challenges**: No existing bunkering terminals lead to reliance on regional hubs like Cochin (India) or Busan (South Korea). Infrastructure gaps include mooring systems, spill containment, and safety protocols. Trade dependencies on indirect routes and environmental risks (e.g., spillage) pose hurdles. Rising LNG spot prices and domestic gas shortages (driving 2025 imports) could inflate costs.

- **Recommendations and Outlook**: The study urges rapid infrastructure development at both ports to exploit geographical advantages and growing demand. By 2026, with Matarbari operational, Bangladesh could position itself as a cost-effective alternative to Asian giants, potentially handling 15 million mt/year of LNG imports amid 6-7% GDP growth. Integration with offshore gas extraction and FSRU expansions is key for sustainability.

To quantify viability, here's a comparative table of port capabilities for LNG bunkering:

Port	Max Vessel Length (m)	Max Draft (m)	Current LNG Infrastructure	Projected Bunkering Role	Emission Reduction Potential vs. HFO
Chittagong	190	9.5	Proximity to Moheshkhali FSRU	Interim hub for regional vessels	20% CO2, 90% SOx
Matarbari	338	16	Planned LNG terminal, FSRU integration	Deep-sea gateway for ECA trade	Same as above; scalable for larger fleets
Comparative (Singapore)	400+	18+	Established bunkering terminals	Benchmark for competition	N/A (mature market)

(Data adapted from feasibility study and port reports.)

Photo: The Hy-Ekotank concept, launched by TECO 2030 and partners Ektank AB

Case Study 2: Hydrogen-Powered Inland Oil Tankers – A Feasibility Analysis

While ocean-going hydrogen bunkering remains nascent in Bangladesh, a 2023 case study on life cycle analysis of hydrogen-powered marine vessels provides insights through comparisons of inland oil tankers operating on domestic routes. This research evaluates hydrogen fuel systems against conventional diesel, highlighting potential for bunkering in riverine and coastal areas, amid broader discussions on zero-carbon fuels in developing countries.

- **Project Overview**: The study analyzes fuel systems for oil tankers on Bangladesh's inland waterways (e.g., routes along the Meghna and Padma rivers). It compares conventional diesel engines with hydrogen fuel cells and internal combustion engines (ICE), using real-world data from operational tankers. Hydrogen is considered as compressed gaseous or liquid forms, with bunkering simulated via truck-to-ship or small-scale terminals at ports like Mongla or Payra.

- **Economic Viability**: Hydrogen systems show higher upfront costs (2-3 times diesel setups due to storage and fuel cells), but long-term savings from lower maintenance and fuel efficiency. A U.S.-based parallel study notes total cost of ownership (TCO) for hydrogen vessels could double diesel at $10/kg H2 prices, but drops with scaling. In Bangladesh, subsidies and green hydrogen production (e.g., via renewables) could make it viable by 2030, especially with EU ETS influences on exports.

- **Environmental Benefits**: Hydrogen achieves near-zero emissions (95-100% GHG reduction vs. diesel), with zero SOx/NOx/PM. The analysis quantifies life-cycle emissions: diesel tankers emit ~1,200 kg CO2 per trip, while green hydrogen cuts this by 90%+. This aligns with IMO net-zero goals and could extend to coastal bunkering.

- **Challenges**: Limited infrastructure—no dedicated hydrogen bunkering exists, with risks in storage (low energy density requiring larger tanks) and safety (flammability). Feasibility is lower for long-haul due to refueling needs; inland routes are more practical. High production costs ($2,000-4,000/ton) and supply chain gaps hinder adoption.

- **Recommendations and Outlook**: Scale pilots on inland vessels before ocean expansion, integrating with ports like Chittagong for hybrid LNG-hydrogen hubs. World Bank reports suggest developing countries like Bangladesh prioritize ammonia (hydrogen-derived) for bunkering, with investments in $1.4-1.9 trillion global needs. By 2026, with rising green vessel deployments, Bangladesh could pilot hydrogen bunkering at Matarbari.

Comparative table of fuel systems for Bangladesh inland tankers:

Fuel System	Upfront Cost Multiplier (vs. Diesel)	GHG Reduction (%)	Bunkering Feasibility	Operational Challenges
Conventional Diesel	1x	Baseline (0)	High (existing)	High emissions, fuel volatility
Hydrogen Fuel Cell	2-3x	95-100	Medium (pilots needed)	Storage volume, safety
Hydrogen ICE	1.5-2x	80-90	Low (emerging)	Efficiency losses, infrastructure

(Data from life-cycle analysis.)

These case studies illustrate Bangladesh's pathway to sustainable bunkering, blending immediate LNG opportunities with long-term hydrogen potential. Investments in infrastructure and policy alignment could yield billions in trade benefits while advancing decarbonization.

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Shaping sustainable international hydrogen value chains - IRENA (2024) - https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2024/Sep/IRENA_Shaping_sustainable_hydrogen_value_chains_2024.pdf

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IMO approves net-zero regulations for global shipping - IMO (2025) - https://www.imo.org/en/mediacentre/pressbriefings/pages/imo-approves-netzero-regulations.aspx

Reducing emissions from the shipping sector - EU Climate Action - https://climate.ec.europa.eu/eu-action/transport-decarbonisation/reducing-emissions-shipping-sector_en

INSIGHT: A Comparative Analysis of Alternative Fuels for Sustainable Maritime Shipping - Ship & Bunker (2025) - https://shipandbunker.com/news/world/527976-insight-a-comparative-analysis-of-alternative-fuels-for-sustainable-maritime-shipping

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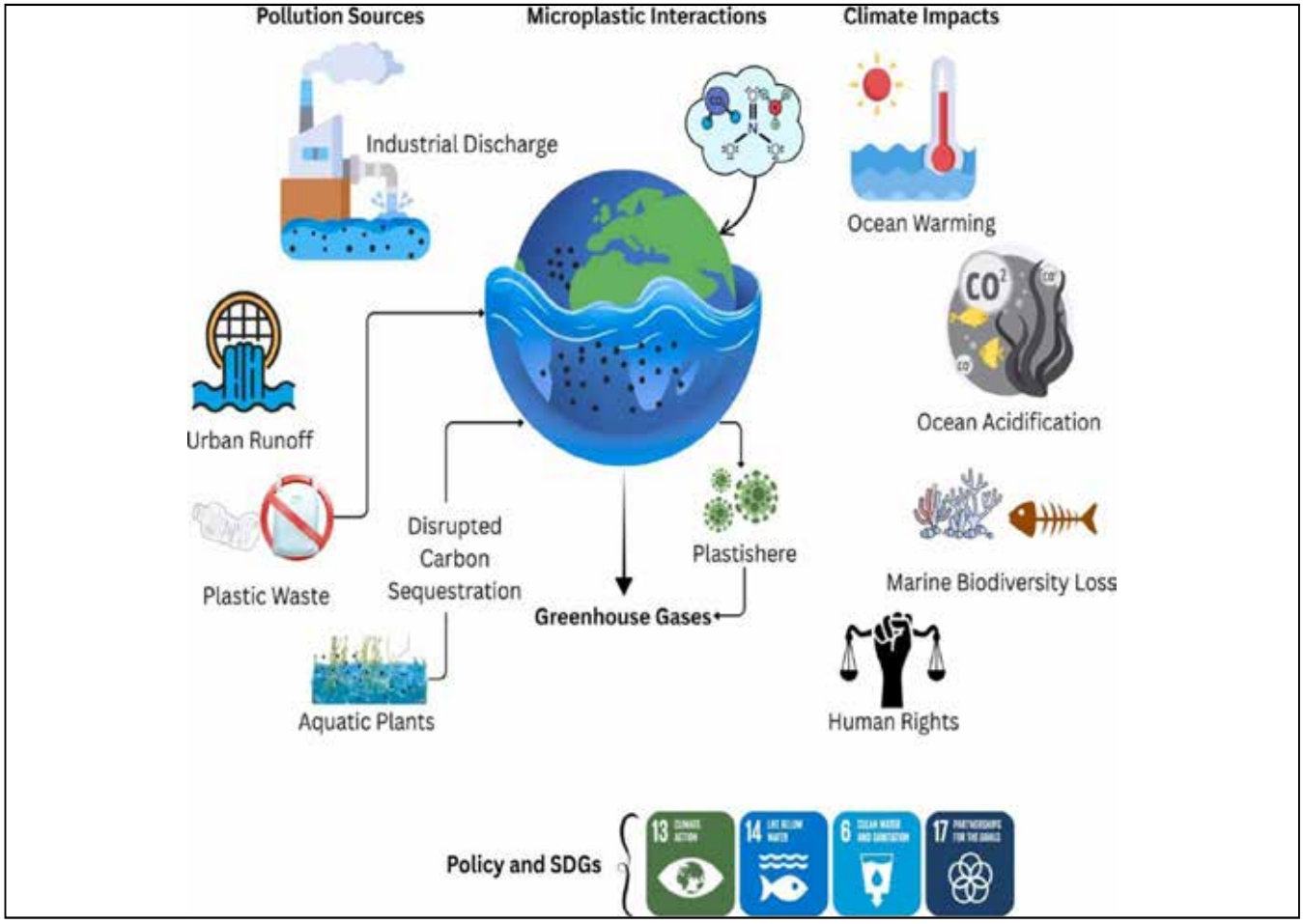
THE HIDDEN THREAT: MICROPLASTICS AND THEIR ROLE IN EXACERBATING CLIMATE CHANGE

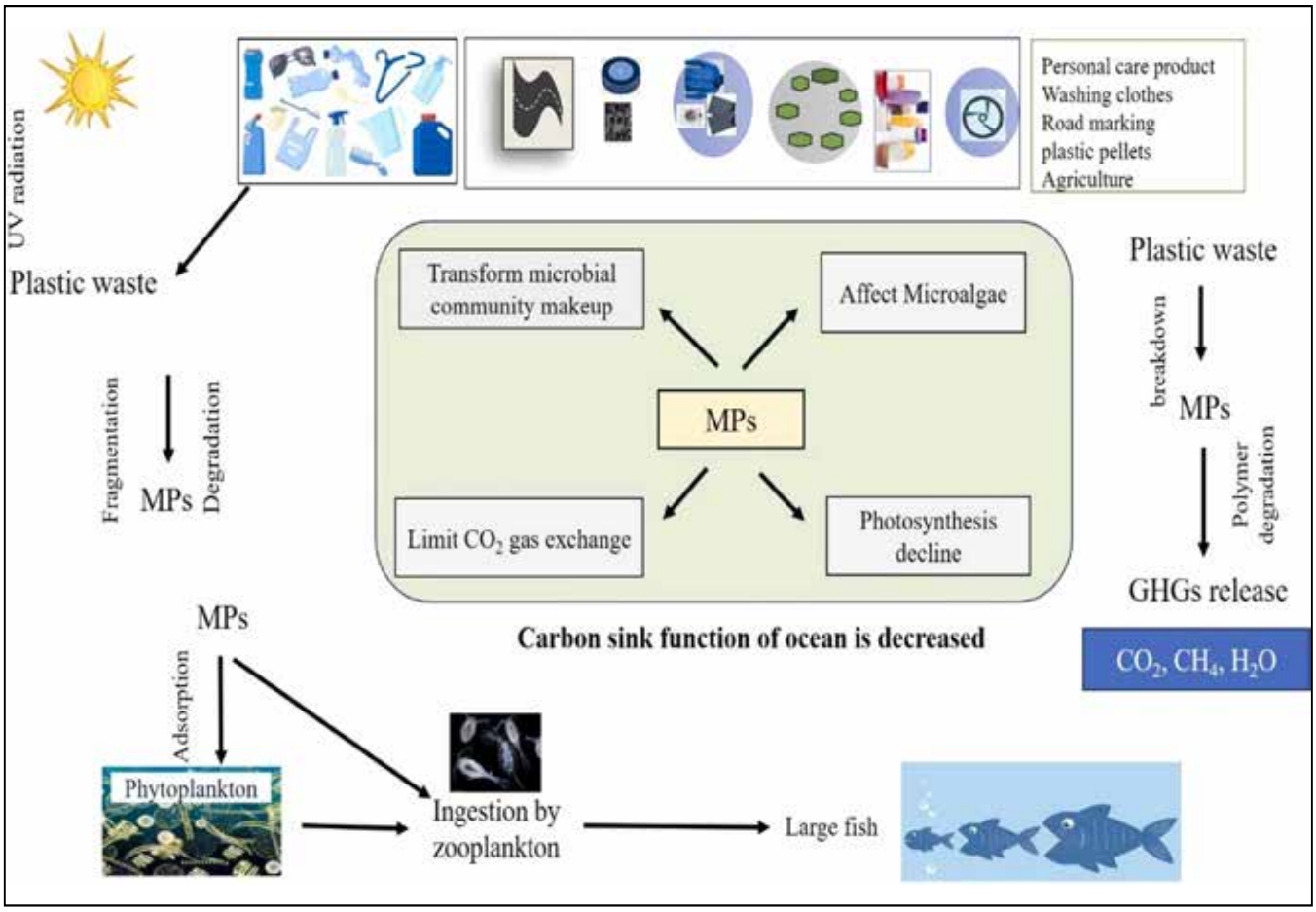
Microplastics (MPs)—tiny plastic particles less than 5 mm in size—represent a pervasive environmental pollutant that intersects with climate change in profound and underappreciated ways. While plastic pollution and climate disruption are often addressed separately, emerging evidence reveals their intricate connections. MPs disrupt marine carbon sequestration, foster microbial communities that emit greenhouse gases (GHGs), and contribute to ocean warming and acidification. This special report synthesizes key insights from recent research, highlighting MPs' impacts on biogeochemical cycles, ocean health, and global sustainability efforts. It underscores the need for integrated strategies to mitigate these intertwined crises, aligning with the United Nations Sustainable Development Goals (SDGs) and human rights frameworks. At approximately 1500 words, this report calls for urgent action to curb MP pollution and safeguard planetary resilience.

INTRODUCTION: THE INTERSECTING CRISES OF PLASTIC POLLUTION AND CLIMATE CHANGE

Plastics have revolutionized modern life, from packaging and healthcare to agriculture and sanitation. However, their lifecycle—from production to disposal—imposes severe environmental costs. Annually, 4.8 to 12.7 million tonnes of mismanaged plastic waste enter ecosystems, with projections suggesting up to 270 million tonnes by 2060. MPs, derived from primary sources (e.g., microbeads in cosmetics) or secondary breakdown of larger plastics, pose unique risks due to their persistence and mobility.

Despite growing awareness of MP pollution, its linkages to climate change remain underexplored. MPs influence oceanic carbon pumps, alter microbial dynamics in the "plastisphere," and directly emit GHGs during degradation. In marine





environments, they disrupt phytoplankton and zooplankton, key players in carbon cycling, potentially accelerating global warming. Moreover, MPs exacerbate ocean acidification by leaching dissolved organic carbon (DOC) and fostering GHG-producing biofilms. This report examines these mechanisms, drawing on ecological, social, and policy perspectives to advocate for holistic solutions. As illustrated in conceptual frameworks (e.g., sources and pathways of MPs, akin to Fig. 1 in foundational studies), addressing MPs requires viewing them not just as pollutants but as amplifiers of climate instability.

SOURCES AND PATHWAYS OF MICROPLASTICS: A GLOBAL MENACE

MPs originate from diverse anthropogenic activities, infiltrating ecosystems through interconnected pathways. Primary MPs are intentionally manufactured for products like personal care items, while secondary MPs result from the fragmentation of larger plastics via UV radiation, wind, and mechanical abrasion. Common sources include synthetic textiles (e.g., polyester fibers from laundry), road markings, tire wear, and single-use items like plastic bags and bottles. Industrial effluents, agricultural mulches, and wastewater from households and hospitals further contribute, with MPs often evading treatment plants and accumulating in sludge or escaping into rivers and oceans.

Geographical and environmental factors amplify MP distribution: winds, tides, cyclones, and hydrodynamic conditions transport particles across vast distances. Land-based sources account for 75-90% of oceanic plastic debris, with marine activities (e.g., fishing gear) contributing the rest. In aquatic systems, MPs form fibers, flakes, pellets, and fragments, with fibers predominant in regions like Vietnam's rivers and beaches. Once in the environment, MPs adsorb toxins such as polychlorinated biphenyls (PCBs), heavy metals, and pesticides, enhancing their ecological threat. As depicted in interconnected source-pathway diagrams (similar to Fig. 2), MPs move from terrestrial to marine realms, underscoring the challenge of containment. This widespread infiltration sets the stage for MPs' disruptive effects on ocean systems and climate regulation.

IMPACTS ON MARINE ECOSYSTEMS: DISRUPTING CARBON CYCLES AND OXYGEN LEVELS

Oceans cover over 70% of Earth's surface, acting as the planet's largest carbon sink and oxygen producer, absorbing 25-30% of anthropogenic CO2. MPs compromise this role by interfering with the biological carbon pump—a process where phytoplankton photosynthesize CO2 into biomass, which zooplankton consume and transfer to deeper waters upon death. High MP concentrations reduce light penetration, inhibiting

phytoplankton growth and photosynthetic efficiency. Studies show polystyrene MPs decrease photosynthesis in species like Phaeodactylum tricornutum, while broader contamination lowers algal biomass.

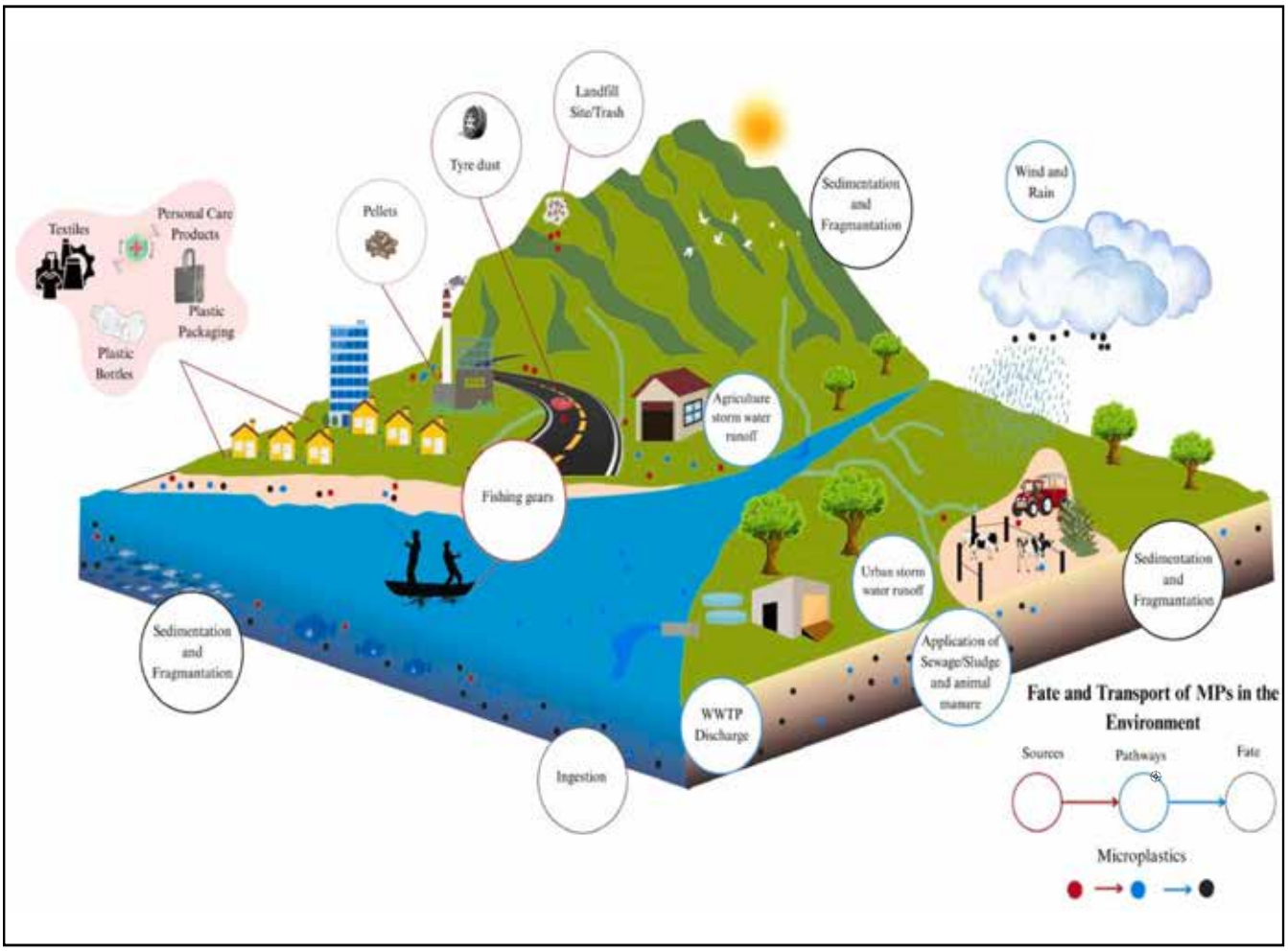
Zooplankton, vital herbivores at the food web's base, ingest MPs mistaking them for food, leading to reduced feeding, growth, and reproduction. This diminishes grazing on phytoplankton, potentially triggering algal blooms and accelerating ocean deoxygenation. MPs also alter fecal pellet sinking rates, restricting carbon sequestration—research estimates up to 27% loss in the ocean's carbon storage capacity due to MP-oil agglomerates. In simulated environments, MPs raise sand temperatures by 0.017°C per 1% volume, affecting temperature-sensitive species like marine turtles and inducing trophic cascades.

The plastisphere—microbial biofilms on MP surfaces—adds complexity. These communities, richer than surrounding waters, cycle nutrients like nitrogen and phosphorus but also emit GHGs (CO_2, CH_4, N_2O) during degradation. In freshwater and estuarine sediments, MPs like PVC and polyethylene boost N_2O production by shifting microbial compositions. Oceanic MPs leach DOC via photodegradation, lowering pH and enhancing acidification. Combined with atmospheric CO_2 absorption, this threatens calcifying organisms (e.g., corals, shellfish) and disrupts food chains, from microbes to apex predators like sharks.

CONTRIBUTION TO OCEAN WARMING, ACIDIFICATION, AND CLIMATE FEEDBACK LOOPS

MPs indirectly fuel climate change by emitting GHGs throughout their lifecycle. Degradation releases CO_2, methane, and ethylene, while incineration adds to atmospheric CO_2. Dark-colored MPs absorb solar radiation, potentially warming surface waters and altering thermal stratification. In polar regions, MPs in snow and ice reduce albedo, accelerating melting and releasing stored particles into soils, disrupting carbon cycles.

Ocean acidification, driven by CO_2 dissolution, is worsened by MPs: they lower pH, deplete calcium carbonate, and promote harmful microbial shifts. Studies link MP exposure to weakened immune responses in marine species and coral skeleton erosion. MPs also hinder blue carbon ecosystems (BCEs) like mangroves and seagrasses, which sequester carbon and buffer climate impacts. In mangroves, MPs block sunlight, entangle roots, and reduce nutrient uptake, compromising photosynthesis and resilience.



Atmospheric MPs act as cloud-condensation nuclei, influencing precipitation and radiative forcing. Agricultural plastics (12.5 million tonnes globally in 2019) alter soil properties, affecting freshwater flows and biodiversity under extreme weather. Table 1 from relevant research summarizes GHG emissions from MP degradation across ecosystems, showing promotions in N_2O and CO_2 in freshwater, sediments, and oceans. These feedbacks could amplify global warming, with MPs potentially altering Earth's albedo and oceanic heat absorption.

MICROPLASTICS IN THE CONTEXT OF UN SDGS AND HUMAN RIGHTS

MP pollution undermines multiple SDGs, as visualized in impact frameworks (e.g., Fig. 3). SDG 2 (Zero Hunger) is threatened by soil and food chain contamination, reducing agricultural productivity. SDG 3 (Good Health) faces risks from MPs in human tissues (e.g., blood, placentas), potentially causing respiratory and endocrine issues. SDG 6 (Clean Water) is compromised by water source pollution and sewage blockages, while SDG 12 (Responsible Consumption) demands reduced plastic use and better waste management.

SDG 13 (Climate Action) is directly affected: MPs impair carbon sinks, exacerbating warming. SDGs 14 and 15 (Life Below Water and on Land) suffer from biodiversity loss in marine and terrestrial habitats. From a human rights lens, MPs violate the right to health and a clean environment, as recognized by UN agreements. The UN Special Rapporteur on toxics notes plastics' lifecycle impacts toxify the planet, demanding rights-based policies. The ongoing Global Plastic Treaty negotiations (culminating in 2025) must adopt a full lifecycle approach to address these violations.

RESEARCH GAPS, CHALLENGES, AND MITIGATION STRATEGIES

Despite advances in MP detection and removal, gaps persist in understanding their climate linkages. Research often isolates plastic pollution from climate change, overlooking synergies. Methodological shortcomings hinder quantifying MPs' contributions to warming and acidification, necessitating integrated studies on microbial dynamics, carbon pump disruptions, and long-term feedbacks.

Key challenges include MPs' persistence, global transport, and amplification under warming scenarios (e.g., permafrost thaw releasing stored MPs). Mitigation requires stricter regulations banning single-use plastics, promoting biodegradables, and advancing circular economies. AI and machine learning can enhance MP tracing and removal. Public education campaigns should foster reusable practices, while international alliances (e.g., Ocean Acidification Alliance, Blue Carbon Partnership) build awareness.

Fig. 4 outlines strategies: from reducing production to improving wastewater treatment and enforcing treaties. The Paris Agreement's oversight of ocean acidification highlights policy gaps; future frameworks must integrate MPs. Rodent and fish models can link MPs to health effects, informing

evidence-based actions.

TOWARD INTEGRATED ACTION FOR A SUSTAINABLE FUTURE

MPs are not mere pollutants but active contributors to climate destabilization, disrupting carbon cycles, emitting GHGs, and eroding ocean health. Their accumulation threatens SDGs and human rights, demanding a paradigm shift from siloed to holistic approaches. By curbing plastic production, enhancing recycling, and fostering global collaboration, we can mitigate these risks. Urgent research and policy integration are essential to protect marine ecosystems and ensure planetary resilience. Failure to act risks amplifying climate feedbacks, underscoring the imperative: address MPs today to secure tomorrow's climate.

Company Profile

TWIN RHVAC SYSTEMS

ENGINEERING COMFORT ACROSS LAND AND SEA

When TWIN RHVAC Systems began its journey in 2000, it operated from a modest office, supplying and servicing unitary air-conditioning systems for homes, offices, hospitals, schools, and small factories. More than two decades later, the company stands as one of Bangladesh's most experienced HVAC-R solution providers—equally at home in residential spaces, large commercial installations, industrial facilities, and complex marine environments

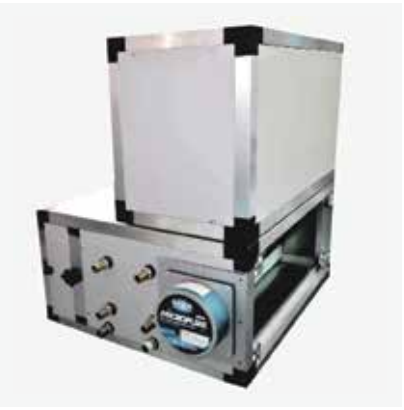
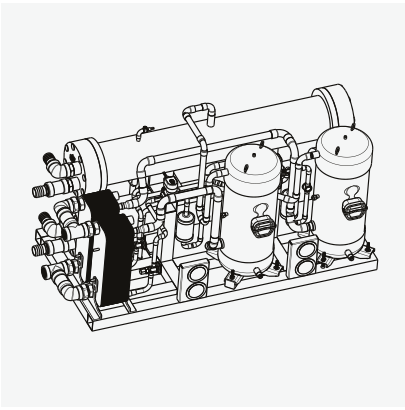


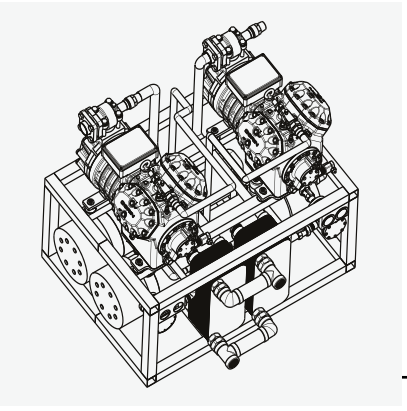



TWIN-RHVAC-SYSTEM-PROFILE

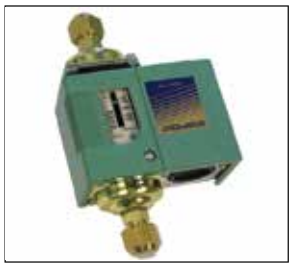
FROM HUMBLE BEGINNINGS TO SPECIALIZED EXCELLENCE

The early 2000s were defined by steady learning and hands-on service. By 2004, TWIN RHVAC had established a product demonstration center, helping customers






understand systems before investing—an early signal of the company's customer-first philosophy. Expansion followed quickly. In 2005, the company entered the light commercial air-conditioning market, delivering ducted split, packaged, and floor-mounted systems for hospitals, auditoriums, data rooms, and large marketplaces.

A defining milestone arrived in 2010, when TWIN RHVAC ventured into **marine air-conditioning**, executing HVAC work on a CATAMARAN cruise ship built for Chittagong Boat Club Limited. This project marked the beginning of a long-standing association with Western Marine Shipyard Ltd., positioning the company as a trusted partner for shipbuilders requiring precision HVAC, ventilation, and exhaust systems.

A TRUSTED NAME IN MARINE HVAC

Between 2012 and 2015, TWIN RHVAC delivered HVAC solutions for an extraordinary range of vessels—oil tankers, RO-RO ferries, tugboats, fishing trawlers, passenger vessels, cargo ships, and even a converted hospital vessel for FRIENDSHIP NGO. The company's marine expertise deepened further with customized HVAC retrofits for Bangladesh Navy vessels, including Castle Class Corvettes and fast attack gunboats.

In 2019 and 2020, the successful installation and commissioning of customized marine chiller systems for pilot boats and heavy-duty speed boats built for the Payra Port










Authority reaffirmed TWIN RHVAC's technical credibility in high-performance marine environments.

INTEGRATED HVAC-R SOLUTIONS

Today, TWIN RHVAC Systems delivers end-to-end solutions across **air-conditioning, refrigeration, ventilation, and heating systems**. Services begin with detailed cooling load calculations and system design, followed by careful product selection, installation, commissioning, and long-term after-sales support.

The company works with internationally renowned brands sourced from Europe, America, Japan, Thailand, and China. Its portfolio includes advanced marine chillers, direct expansion systems, data center InRow cooling, industrial refrigeration, blast freezers, cold rooms, and customized cold storage solutions. By integrating world-class components with local engineering expertise, TWIN RHVAC ensures reliability in demanding operating conditions.

BEYOND COOLING: VENTILATION, SANITATION, AND HEATING

TWIN RHVAC's expertise extends well beyond air-conditioning. The company designs and installs **commercial, industrial, and marine ventilation systems**, including solutions for underground parking, hospitals, clean rooms, commercial kitchens, production floors, warehouses, and ship engine rooms. It also provides sanitation and disinfection services using HVAC-based technologies and central heating solutions for ice-class vessels and specialized commercial needs.

LEADERSHIP AND VISION

At the core of the company is a philosophy of continuous improvement. As CEO Mohammad Forhad Hossain notes, TWIN RHVAC has evolved alongside rapid changes in HVAC-R technology, embracing environmentally responsible and future-ready solutions. The company positions itself not just as a service provider, but as a long-term technology partner prepared to meet emerging challenges.

A DIVERSE AND TRUSTED CLIENT BASE

TWIN RHVAC Systems has delivered projects for hospitals, corporate offices, industrial plants, hotels, diagnostic centers, military facilities, shipyards, and government institutions. This diverse portfolio reflects a rare ability to operate seamlessly across sectors—on land and at sea.

VULKAN NAVAL TECHNOLOGY

ENGINEERING SILENCE, RESILIENCE, AND PERFORMANCE FOR MODERN NAVIES

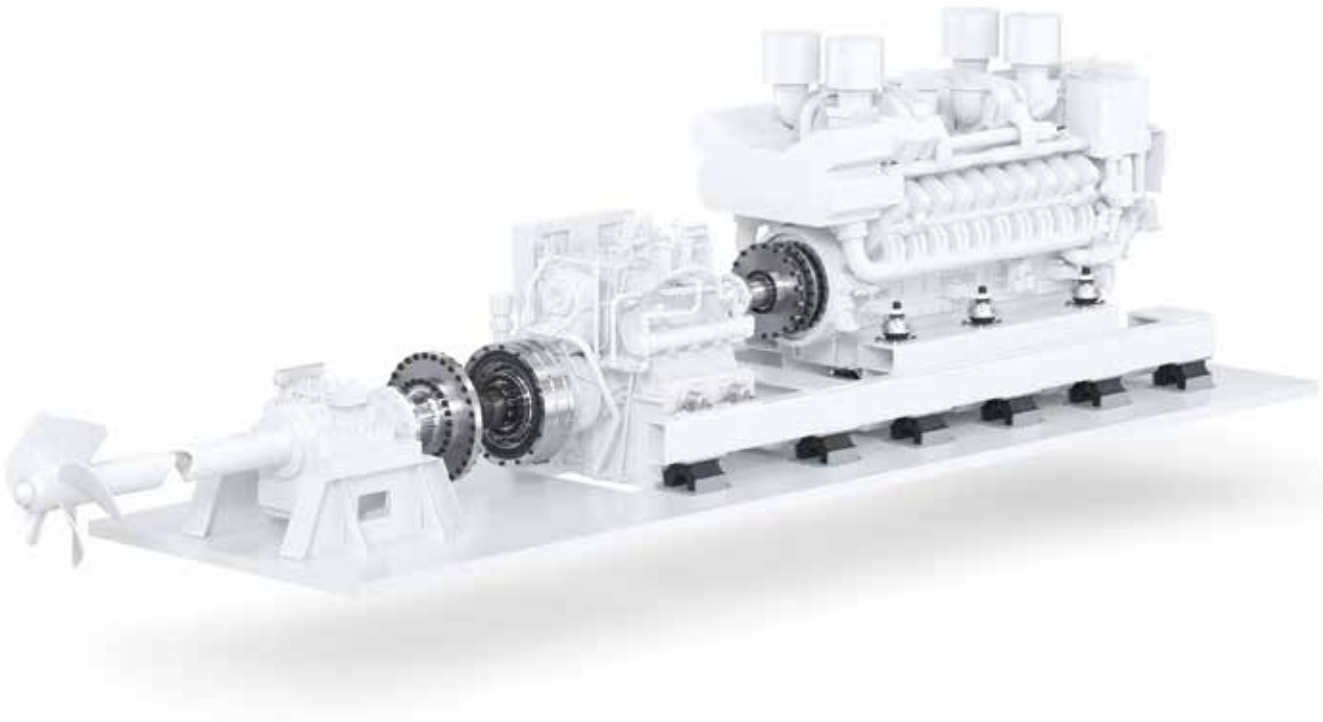
In an era where naval superiority is defined as much by what cannot be heard as by what can be seen, VULKAN's Naval Technology portfolio positions itself as a quiet force behind modern fleets. More than a collection of mounts and couplings, VULKAN presents a **holistic engineering ecosystem** designed to meet the intertwined demands of shock resistance, vibro-acoustic control, and propulsion reliability under extreme operational conditions.

A HOLISTIC PHILOSOPHY ROOTED IN ENGINEERING DEPTH

Founded in 1889 and still family-owned, the VULKAN Group brings over a century of mechanical engineering expertise into today's naval domain. What sets the company apart is not merely product breadth, but its clearly articulated **Holistic Approach**—a philosophy combining engineering excellence, product optimization, and project coordination. This approach recognizes that naval propulsion systems are no longer isolated mechanical assemblies, but deeply interconnected systems where mounts, couplings, foundations, and hull dynamics must perform as one.

DESIGNED FOR EVERY NAVAL PLATFORM

VULKAN's solutions are engineered to serve the full spectrum



of naval vessels—from patrol boats and mine hunters to frigates, submarines, and aircraft carrier support platforms. Across these platforms, the technical challenges remain consistent: extreme shock loads, strict acoustic limits, and the need for uninterrupted torque transmission across complex propulsion architectures.

The portfolio supports all major naval propulsion concepts, including **CODAD, CODOG, CODAG, CODELAG, hybrid, and fully electric configurations**, ensuring compatibility with both legacy and next-generation fleet designs.

MOUNTING AND COUPLING SYSTEMS: THE CORE OF PERFORMANCE

At the heart of VULKAN Naval Technology lies its integration of **resilient mounts and flexible couplings**. These are not generic vibration isolators; they are precision-engineered components tuned through advanced simulations—ranging from 6 to 18 degrees of freedom and full structural modeling.

In double elastic mounted systems, VULKAN employs resilient mounts beneath engines, gearboxes, and baseframes, dramatically reducing structure-borne noise while maintaining displacement control during shock events. Acoustically optimized couplings downstream of gearboxes further suppress vibration transfer, delivering tangible reductions in both onboard noise and underwater radiated noise (URN).

ELECTRIC PROPULSION AND HYBRID READINESS

As navies increasingly adopt **electric and hybrid propulsion** for stealth and operational flexibility, VULKAN demonstrates clear technical leadership in E-Drive systems. Electric propulsion introduces unique vibration signatures and torque dynamics—challenges that VULKAN addresses through tailored mount stiffness, displacement compensation, and time-domain shock simulations.

Special attention is given to **hollow shaft electric motor systems**, where spatial constraints, radial displacement, and shock requirements converge. Early-stage coordination between VULKAN engineers and motor manufacturers enables optimized mount positioning and improved system resilience, a level of integration rarely achieved through component-only suppliers.

SHOCK QUALIFICATION BEYOND COMPLIANCE

VULKAN sets an industry benchmark in **full-system shock analysis**, particularly for scenarios involving underwater

explosions (UNDEX). Using detailed force–deflection characterization and time-domain transient simulations, VULKAN evaluates everything from mount displacement and residual acceleration to peak stresses in metallic and elastomeric components.

High-deflection shock mounts play a critical role here. By absorbing rapid hull displacements and releasing energy gradually, these mounts dramatically reduce acceleration levels transmitted to equipment. The result is not only survivability under shock, but also exceptional acoustic isolation—making these solutions equally attractive for research vessels and low-noise platforms.

ACOUSTIC SIGNATURE CONTROL AS A STRATEGIC ASSET

The catalogue makes clear that acoustic performance is not treated as a secondary benefit. VULKAN addresses **airborne noise (ABN), structure-borne noise (SBN), and underwater radiated noise (URN)** as interdependent design parameters. Through noise budgets, transfer function analysis, and impedance modeling, the company ensures that vibration isolation does not compromise mechanical integrity or mission readiness.

This capability is reinforced by VULKAN's proprietary acoustic toolboxes and in-house measurement facilities, where mounts and couplings are characterized under realistic operating conditions using globally unique test rigsre.

TESTING, VALIDATION, AND THROUGH-LIFE SUPPORT

Few suppliers can match VULKAN's testing infrastructure. With torque testing up to 5,000,000 Nm, advanced acoustic benches, and full-scale shock and fatigue testing, products are validated well beyond theoretical compliance. On-site measurement services further extend this capability into operational vessels, supporting troubleshooting, validation, and lifecycle optimization worldwide.

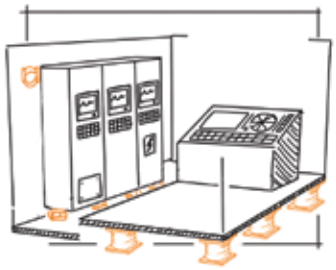
VERDICT

VULKAN Naval Technology is not a single product—it is a **systems-level solution** engineered for navies that demand stealth, resilience, and reliability in equal measure. By integrating shock physics, vibro-acoustics, and propulsion engineering into a unified design philosophy, VULKAN delivers solutions that do more than meet specifications—they shape how modern naval vessels perform, survive, and remain undetected.

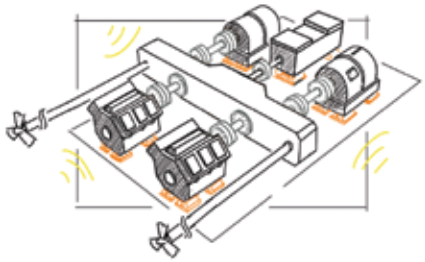
For shipyards, naval architects, and defense integrators seeking long-term technical partners rather than component vendors, VULKAN sets a compelling benchmark in naval engineering excellence.

Product Review

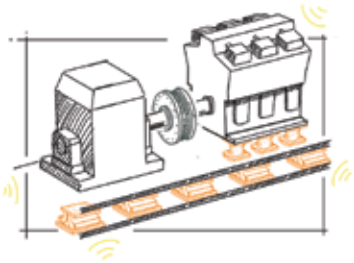
VULKAN NAVY MOUNTS



Multi Purpose Floating Floor (MPFF)



Drive train



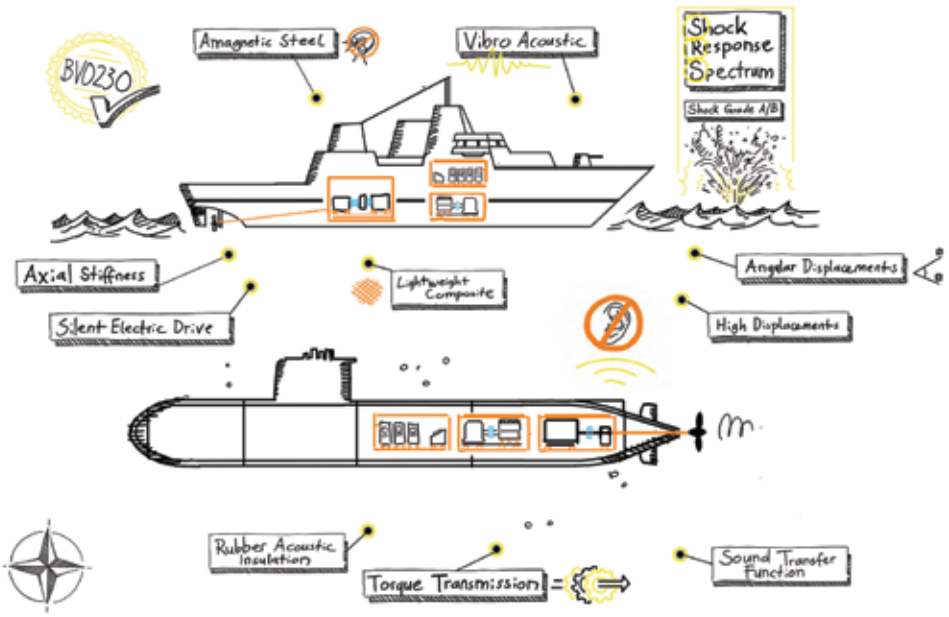
Gensets

WHERE SHOCK CONTROL MEETS ACOUSTIC INTELLIGENCE

In modern marine and naval vessels, comfort, survivability, and acoustic discretion are no longer optional—they are engineering imperatives. VULKAN's **Navy Mounts portfolio** positions itself precisely at this intersection, offering a sophisticated response to the dual challenge of **shock resistance** and **noise isolation** in demanding maritime environments

.ENGINEERED FOR THE REALITIES OF THE SEA

Unlike conventional resilient mounts that focus primarily on vibration damping, VULKAN Navy Mounts are engineered with a broader operational context in mind. Naval and commercial vessels operate under continuous mechanical stress, exposure to shock loads, and increasingly strict regulations on **Structure Borne Noise (SBN)** and **Underwater Radiated Noise (URN)**. VULKAN addresses these constraints not as afterthoughts, but at the **design stage**, using predictive vibro-acoustic modelling to ensure compliance before installation even begins



A PORTFOLIO DESIGNED FOR PRECISION

What distinguishes the Navy Mounts range is its **application-specific diversity**:

- **PU-MaX** High Deflection Mounts These are tailored for small auxiliary rotating equipment, delivering excellent isolation against structure-borne noise while maintaining shock resilience. Their ability to support non-rotating equipment makes them particularly versatile in space-constrained engine rooms.

- **HD Series** High Deflection Mounts, with significantly higher load ranges, are clearly aimed at heavy rotating machinery. These mounts excel where both shock absorption and acoustic isolation must coexist without compromise—an essential requirement in naval propulsion and generator systems.

- **Wire Rope Mounts** focus on pure shock isolation, deliberately minimizing acoustic priorities. This makes them a pragmatic solution for non-rotating equipment exposed to high shock loads, especially in mission-critical zones where mechanical survival outweighs comfort considerations.
- **T Series Resilient Mounts** serve a different but equally important role. Developed for propulsion engines and generator sets, they combine vibration isolation with seaway stability and integrated displacement limiters. While they do not provide shock isolation, their performance consistency across rough operating conditions makes them a reliable choice for long-duration deployments.

BEYOND COMPONENTS: A SYSTEMS APPROACH

Perhaps the most compelling aspect of VULKAN's Navy Mounts is that they are not marketed as isolated components, but as part of a **holistic drivetrain and mounting strategy**. VULKAN's expertise lies in combining mounts with drivetrain elements to achieve measurable reductions in onboard noise and underwater acoustic signatures. This system-level thinking is increasingly vital as naval platforms face growing scrutiny over stealth, crew comfort, and environmental impact.

VERDICT

VULKAN Navy Mounts stand out not for novelty, but for **engineering maturity**. They reflect a deep understanding of how shock, vibration, and acoustics interact in real-world marine conditions. For shipbuilders, naval architects, and operators seeking compliant, future-ready solutions—whether for propulsion engines, generators, pumps, compressors, or refrigeration systems—this portfolio offers flexibility without sacrificing performance.

In an industry where silence can be strategic and resilience can be lifesaving, VULKAN's Navy Mounts deliver exactly what modern vessels demand: **control, predictability, and confidence at sea**.

BLUE ECONOMY: CHARTING BANGLADESH'S MARITIME RENAISSANCE IN THE BAY OF BENGAL

As the sun rises over the vast expanse of the Bay of Bengal, casting a golden hue on the churning waves, fishermen from Cox's Bazar set out in their weathered boats, casting nets into waters that hold the promise of abundance—and peril. For generations, these coastal communities have relied on the sea for sustenance, but today, the Bay represents something far grander: a gateway to economic transformation. As a maritime expert with decades of experience navigating the intricacies of South Asia's coastal dynamics, I've witnessed how Bangladesh, once constrained by territorial disputes, now stands poised to unlock the Blue Economy's potential. This sustainable harnessing of ocean resources could propel the nation from a lower-middle-income status toward its Vision 2041 goals, adding tens of billions to GDP while safeguarding

fragile ecosystems. Yet, this journey is fraught with challenges, from climate-fueled cyclones to overexploitation, demanding bold policies and regional collaboration.

The Bay of Bengal, a semi-enclosed sea spanning 2.2 million square kilometers and shared by Bangladesh, India, Myanmar, Sri Lanka, and others, is one of the world's most biodiverse marine regions. For Bangladesh, the resolution of maritime boundary disputes in 2012 (with Myanmar) and 2014 (with India) via international tribunals expanded its Exclusive Economic Zone (EEZ) to 118,813 square kilometers—roughly the size of Greece. This victory not only affirmed sovereign rights over living and non-living resources but also opened doors to untapped wealth beneath the waves. Marine resources already underpin livelihoods for over 30 million coastal residents, contributing to food security and poverty alleviation. Fisheries alone provide 52% of the animal protein in Bangladeshi diets, with annual marine captures reaching about 0.70 million metric tons out of an estimated 8 million tons available in the Bay. However, this is just a fraction of the potential; experts estimate that with modern techniques, output could double, injecting $2-3 billion annually into the economy.

Beyond fish, the Bay harbors gas hydrates—frozen methane deposits—potentially rivaling onshore reserves of 26 trillion cubic feet (TCF), with discoveries like Magnama holding 3.5 TCF. Seabed minerals such as zircon and rutile dot coastal belts, while renewable energies like offshore wind (with speeds up to 10 m/s) and tidal power could meet 20% of coastal energy needs by 2030, reducing reliance on imports. This aligns with global trends: the ocean economy worldwide is valued at $6 trillion, but in South Asia, it's underdeveloped, offering Bangladesh a chance to lead through sustainable practices under SDG-14 (Life Below Water). The EEZ, part of the Bay of Bengal Large Marine Ecosystem (BOBLME), produces over 7% of global fisheries catches, yet faces threats like mangrove loss exceeding 20% since the 1980s due to aquaculture expansion and pollution.

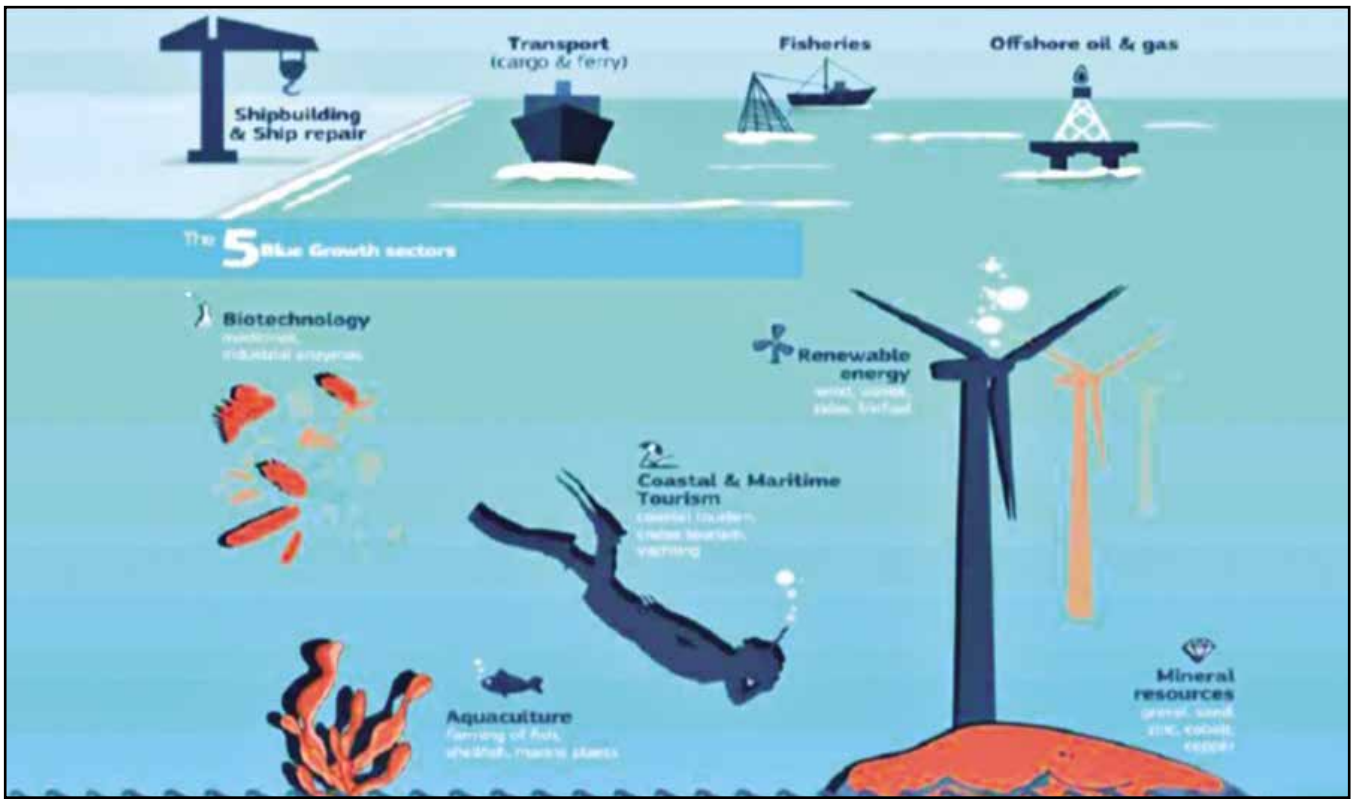
Yet, the narrative isn't solely one of opportunity. Recent surveys reveal an alarming 80% drop in fish stocks over seven years due to overfishing and pollution, underscoring the need for balanced growth. Plastic waste, comprising 60% of beach litter, chokes marine life, while climate change threatens a 1-meter sea-level rise by 2100, potentially eroding 10% of coastal GDP. As I reflect on my fieldwork in the Sundarbans mangroves—a natural buffer against cyclones—the urgency is clear: the Blue Economy must integrate environmental stewardship to avoid ecological collapse.

KEY SECTORS: ENGINES OF MARITIME GROWTH

Diving deeper, several sectors stand out as pillars of Bangladesh's Blue Economy, each with unique prospects and hurdles.

FISHERIES AND AQUACULTURE: FROM NETS TO PROSPERITY

Fisheries form the backbone, employing over 17 million people and contributing 3.6% to GDP, with marine fisheries alone



generating $585 million in 2019. The iconic Hilsa shad adds 1% to GDP, with successful management tripling exports to $50 million in recent years. The sector supports hundreds of thousands of jobs but faces overfishing, with 40% of surveyed stocks depleted, pollution-induced habitat degradation, and saltwater intrusion into coastal aquaculture ponds. Yet, reliance on artisanal methods limits deep-sea exploitation; only 10% of the EEZ has been surveyed. Transitioning to modern vessels and integrating aquaculture could boost output by 50-100%, yielding $1.5-3 billion in economic value, with projections reaching $8-10 billion by 2030 and 2.1 million jobs. Seaweed farming, a nascent area, holds export potential amid rising global demand, though Bangladesh trails India. Coastal aquaculture, producing 0.4 million metric tons annually, could grow 30% with sustainable practices, adding $0.8 billion. Challenges include illegal, unreported, and unregulated (IUU) fishing, which depletes stocks, and shrimp farming's impact on salinity and mangroves. Mitigation strategies, like quotas and monitoring via research vessels such as RV Meen Sandhani, are essential. The Swatch-of-No-Ground Marine Protected Area harbors endangered species, emphasizing the need for more MPAs.

Sector	Current Output (Million Metric Tons/Year)	Potential Growth (%)	Economic Value (USD Billion)
Marine Fisheries	0.66-0.70	50-100	1.5-3
Coastal Aquaculture	0.4	30	0.8

OFFSHORE ENERGY: POWERING THE FUTURE

The Bay's energy prospects are transformative. Offshore gas fields hold untapped reserves comparable to India's Krishna Godavari Basin (100 TCF), with 26 wells drilled to date across 26 offshore blocks (11 shallow, 15 deep-sea). Gas hydrates could add trillions of cubic feet, while renewable sources like wind and tidal energy suit the Bay's strong currents and winds, potentially meeting 30% of the country's energy demands by 2040 and reducing fossil fuel imports.

By 2030, these could power 20% of coastal grids, supporting energy security amid depleting onshore resources, with projections for 30% of coastal energy demand and 300,000 jobs. Blue energy via osmosis and biomass adds layers, but exploration lags due to technological deficits. Mineral sands reserves of 5.847 million tons, rich in copper, nickel, and cobalt, could support electronics and renewable energy storage, valued at $210 billion in deep waters.

SHIPPING AND PORTS: HUBS OF CONNECTIVITY

With 90% of external trade seaborne, ports like Chittagong handle the bulk, contributing over 90% of foreign trade and $500 million from aquaculture exports. New deep-sea facilities at Payra and Matarbari could elevate Bangladesh as a transshipment hub for South Asia, with Matarbari aiming for 0.8 million TEU capacity by 2023, expanding to 2.5 million tonnes by 2041.

This could generate 500,000 jobs and handle 100 million tons yearly, retaining freight domestically. Shipbuilding, a $2 billion industry, and recycling offer further gains, but dredging and tech upgrades are critical. Maritime trade handles over 90% of exports, underscoring ports' strategic role.

TOURISM BOOM: WAVES OF OPPORTUNITY

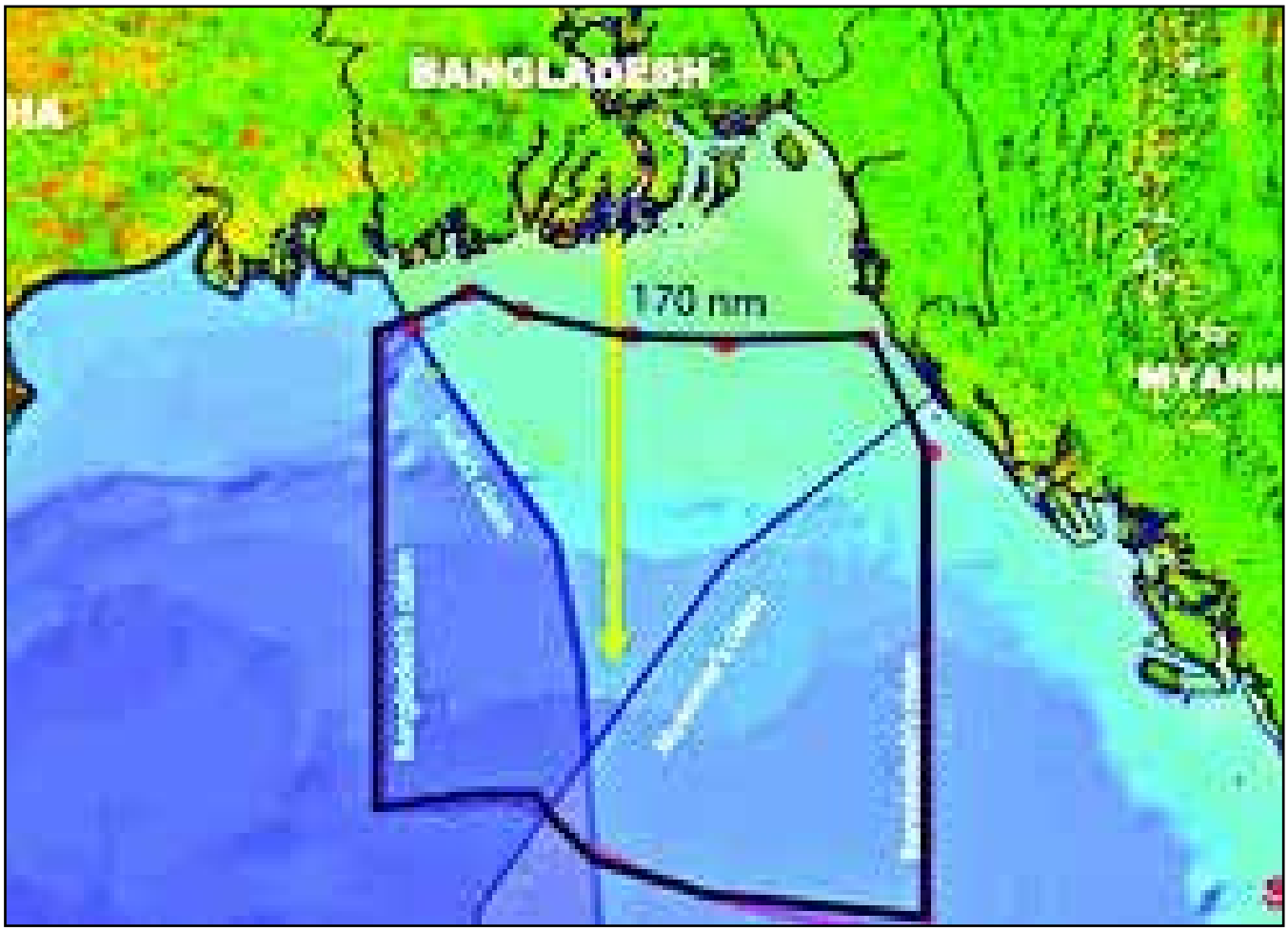
Cox's Bazar, the world's longest natural beach at 120 km, attracts 81% of international tourists, with eco-tourism on St. Martin's Island and Kuakata's unique views poised to generate $1 billion annually. Coastal and marine tourism contributes $6.2 billion (3% of GDP) but is underutilized; the National Tourism Master Plan (2023-2047) identifies 255 locations, focusing on low-impact resorts.

Sustainable options like marine safaris and coral conservation could boost revenue to $1.5 billion by 2030 with 500,000 jobs, while protecting biodiversity. However, infrastructure for water sports and cruises remains underdeveloped.

ECONOMIC IMPACT PROJECTIONS

Currently, the Blue Economy contributes 1-3% to Bangladesh's GDP ($6.2 billion in 2018), but with policy support, it could reach 5-10% by 2030, adding $20-30 billion across sectors. This dwarfs agriculture's 13% share and complements ready-made garments (84% of exports). Job creation could hit 2-5 million, lifting coastal communities. Projections estimate fisheries and aquaculture at $8-10 billion by 2030, marine renewables at 30% of coastal energy with 300,000 jobs, and tourism at $1.5 billion.

[chart: Projected GDP Contribution]



GDP Sector Comparison	Current Share (%)	Blue Economy Potential (%)	Job Creation (Millions)
Agriculture	13	N/A	N/A
RMG Exports	84	N/A	N/A
Blue Economy Total	1-3	5-10	2-5

REGIONAL CONTEXT IN SOUTH ASIA

In South Asia, the Bay's littoral states boast a combined GDP of $2.7 trillion, with the regional Blue Economy potentially reaching $100 billion by 2030 through integration. Bangladesh's central position could make it a hub, fostering maritime diplomacy for resource sharing via BIMSTEC, enabling joint patrols against IUU fishing and shared early-warning systems for cyclones, despite competition from India's Sagarmala and Sri Lanka's ports.

NAVIGATING CHALLENGES: RISKS AND RESILIENCE

Overexploitation risks a 30% fish stock decline without quotas, while maritime pollution—1,200 tons of plastic daily—threatens fisheries and tourism. Skill gaps persist, with only 2% of the workforce trained; 100,000 mariners needed. Regulatory fragmentation across 29 ministries hampers progress. Climate change exacerbates vulnerabilities, with cyclones and sea-level rise posing empirical challenges, potentially flooding two-

thirds of the country below 15 feet.

Challenge	Impact Level	Mitigation Strategy
Overfishing	High	Quotas, monitoring
Climate Change	High	Mangroves, resilient ports
Tech Deficit	Medium	Research vessels, training

POLICY ROADMAP

The government's Blue Economy Cell under the Ministry of Disaster Management and Relief coordinates efforts, with the Seventh Five-Year Plan outlining 12 actions. The Bangladesh Delta Plan 2100 emphasizes integrated water management. Investments of $5 billion needed for ports and energy by 2030, via PPPs with Japan and China. Marine Spatial Planning (MSP) could zone the EEZ for multi-use, drawing from Norway's model where ocean economy hits $200 billion. Training via BSMRMU aims for 50,000 skilled workers. Case studies inspire: Vietnam's aquaculture tech boosted Blue GDP by 10%; Bangladesh's Hilsa management offers local success. An integrated roadmap aligns with SDGs, emphasizing governance, innovation, and BIMSTEC cooperation.

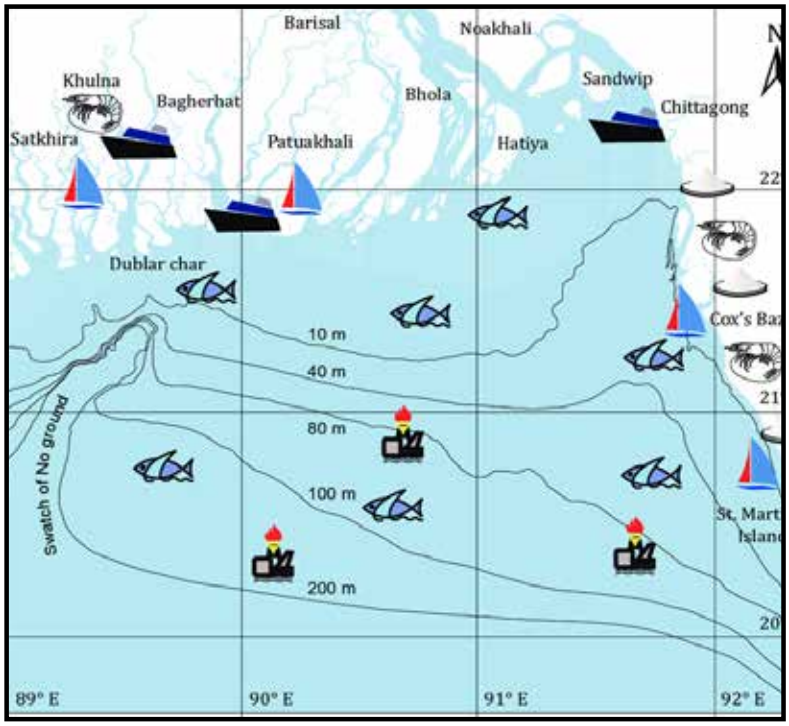
FUTURE VISION: 2030 AND BEYOND

Looking ahead to 2030 and beyond, Bangladesh's Blue Economy is poised to evolve into a cornerstone of national development, transforming the Bay of Bengal from an underutilized frontier into a hub of sustainable prosperity. Drawing from strategic analyses in recent reports, such as the 2025 GSC Advanced Research and Reviews article, an integrated roadmap envisions harmonizing short-term economic gains with long-term environmental stewardship. This approach aligns closely with Bangladesh's national priorities, including the UN Sustainable Development Goals (SDGs), particularly SDG-14 on ocean conservation, and emphasizes robust governance frameworks, scientific innovation, and strategic investments to foster ecological sustainability and inclusive growth.

By 2030, key milestones could include the commencement of gas hydrate extraction around 2028, tapping into trillions of cubic feet of methane reserves to bolster energy security and reduce dependence on fossil fuel imports. Offshore wind farms, leveraging the Bay's consistent winds of up to 10 m/s, are projected to become operational as early as 2027, contributing to renewable energy targets and powering up to 30% of coastal grids. These developments, combined with advancements in marine biotechnology and renewable energy sectors, could diversify the economy beyond traditional fisheries and shipping, positioning Bangladesh to capture a share of the global ocean economy—valued at $1.5 trillion annually today and expected to double to $3 trillion by 2030.

Regional cooperation will be pivotal, with strengthened pacts through frameworks like BIMSTEC facilitating joint initiatives on transboundary resource management, such as shared fisheries quotas and pollution control. This collaboration could secure supply chains for marine trade, mitigate climate risks like cyclones and sea-level rise, and enhance maritime diplomacy among Bay of Bengal littoral states. Domestically, these efforts integrate seamlessly with Bangladesh's Vision 2041, the ambitious national plan to achieve upper-middle-income status by 2041 through inclusive growth and poverty reduction. Projections suggest that a fully realized Blue Economy could generate $20-30 billion in annual revenue, create 2-5 million jobs, and directly benefit over 20 million coastal dwellers by improving livelihoods, food security, and resilience to environmental challenges.

However, realizing this vision demands overcoming barriers like institutional fragmentation and limited access to finance and technology. By prioritizing water governance, marine protected areas, and cross-sectoral policies, Bangladesh can build a resilient maritime future—one where economic expansion coexists with biodiversity preservation, ensuring the Bay remains a source of abundance for generations to come. As outlined in the World Bank's 2018 pathway report, this transition requires collaborative partnerships, from government agencies to international bodies like the EU and Duke University's Nicholas Institute, to turn aspirational goals into tangible outcomes.



FROM SHORE TO SEA: EMPOWERING THE NEXT GENERATION OF MARITIME WOMEN

The maritime industry has historically been male-dominated, but tides are changing. Across ports, shipping companies, and ocean science institutions, women are increasingly stepping into leadership roles, technical positions, and research careers, breaking stereotypes and paving the way for the next generation. Central to this transformation are education, scholarships, and training programs that equip young women with the skills, confidence, and opportunities to thrive at sea and ashore.

EDUCATION AS A LAUNCHPAD

Formal education remains the foundation for maritime careers. Institutions like the World Maritime University (WMU) in Sweden and regional maritime academies now actively recruit women, offering courses in nautical science, maritime logistics, marine engineering, and oceanography. Many programs include hands-on simulations, internships with shipping companies, and exposure to port operations—ensuring that students gain practical skills as well as theoretical knowledge.

Scholarship initiatives such as the IMO-WMU Women in Maritime Scholarship Programme aim to reduce barriers for women from developing countries, enabling them to pursue higher education in maritime disciplines. These opportunities not only empower individual women but also contribute to more diverse and inclusive industry leadership globally.

TRAINING AND MENTORSHIP PROGRAMS

Beyond formal education, training programs and mentorship networks play a crucial role. Organizations like the Mission to Seafarers, Women in Shipping & Trade (WISTA), and local maritime NGOs provide mentorship, workshops, and leadership training specifically for women. These programs offer guidance on career pathways, safety at sea, professional networking, and navigating the unique challenges women face

in a traditionally male-dominated field.

Practical, on-the-job training also prepares women for operational roles. From shipboard engineering internships to maritime logistics simulations, these programs build technical competence and confidence, making young women ready to take on responsibilities from deck officer positions to port management roles.

INSPIRING ROLE MODELS

Highlighting female role models is key to encouraging young women to enter maritime careers. Figures such as Captain Inga Gröning, one of the first female ship captains in Europe, and Dr. Deborah Lee, a marine scientist leading ocean conservation projects, demonstrate that women can thrive at the highest levels of maritime professions. Local initiatives also showcase women leading coastal shipping, port operations, and maritime research, proving that the industry's opportunities are no longer restricted by gender.

SHAPING THE FUTURE OF MARITIME

Empowering women in maritime is more than a matter of equity—it strengthens the industry. Studies show that diverse teams improve problem-solving, innovation, and operational efficiency, critical factors in an industry navigating global challenges like climate change, port congestion, and digital transformation.

By investing in education, scholarships, training, and mentorship, the maritime sector is cultivating a generation of women ready to lead, innovate, and inspire, ensuring that the oceans are navigated by talent as diverse as the waters themselves.

HARBOURS OF HAPPINESS: HOW MARITIME RECREATION CENTRES ENRICH LIFE AT SEA AND ASHORE

The sea may be vast and challenging, but modern maritime life is increasingly supported by networks of dedicated **Maritime Recreation Centres** — spaces ashore where seafarers, port workers and coastal communities can rest, connect and rejuvenate between voyages. Beyond being places to relax, these centres are vital for wellbeing, camaraderie and cultural exchange in one of the world's oldest yet most demanding industries.

From the bustling ports of northern Europe to new wellness hubs in Asia, these centres demonstrate how holistic support ashore can make life at sea safer, healthier and more fulfilling.

A HOME PORT AWAY FROM HOME

For many seafarers, shore leave is a rare chance to unplug from months at sea. Recreation centres provide amenities that bridge the isolation of maritime life and the comfort of home. These range from **lounges and internet access** to **social activities**, counselling, fitness opportunities, and spiritual support — all contributing to improved mental and emotional resilience.

DUCKDALBEN INTERNATIONAL SEAMEN'S CLUB — HAMBURG, GERMANY

One of the most renowned seafarers' centres in the world is the **Duckdalben International Seamen's Club**, located in the Port of Hamburg. Founded in 1986, it has grown into a bustling hub offering seafarers a warm welcome far from home. The club provides free Wi-Fi, lounges, recreational games like table tennis and billiards, a library, and even services like telephone access and clothing donations. Over the years, more than a million guests from over 100 countries have visited, making it one of the most visited and celebrated seafarers' centres globally.

Duckdalben's inclusive atmosphere and practical support — including transport into the city and spaces for relaxation and reflection — have earned it accolades such as being named **"Seafarers' Centre of the Year."**

LIVERPOOL SEAFARERS CENTRE — UNITED KINGDOM

In the UK, the **Liverpool Seafarers Centre** is another prime example of a vibrant maritime recreation hub. With roots stretching back to the 19th century, this centre has continued to evolve its support for seafarers visiting Merseyside ports. Run by a coalition of maritime welfare organisations, it provides social spaces, transportation services, and pastoral care that help combat loneliness and support crew wellbeing. In addition to relaxation facilities, the centre runs shuttle services to bring seafarers into the city for leisure and shopping, reinforcing the connection between life at port and life ashore.

NEW HORIZONS: SEAFARER WELLNESS AND DIGITAL CONNECTIVITY

The concept of recreation is also expanding into wellness and digital spaces. In Sri Lanka, **The Palace — Seafarer Wellness Centre** opened in 2025 as a dedicated hub addressing the physical and mental wellbeing of maritime workers, offering activities and community support designed for crews arriving in port.

Meanwhile, organisations like **The Mission to Seafarers** are pioneering digital support: their *Happy at Sea* app functions as a **digital seafarers' centre**, providing online access to welfare services, wellbeing resources, and port-specific information across more than 200 ports worldwide.

MORE THAN RECREATION

What distinguishes these centres is their holistic approach: these are not just social clubs, but **wellbeing hubs** that recognise seafarers as individuals with emotional, social and cultural needs. By offering spaces to rest, play, connect with family, access support and experience local culture, maritime recreation centres help reduce the stress and isolation that come with long voyages.

As the shipping industry evolves, these centres are likely to grow in importance — adding new facilities, digital services and partnerships that support both seafarers and the wider maritime community. Whether through a warm meal in Hamburg or a mental-health resource on an app, they remind us that even in a global industry driven by steel and engines, human connection still matters most.

Laughter

Why did the sailor bring a pencil to the sea?
To draw his anchor points!

What do you call a pirate who skips class?
Captain Hooky.

Why don't ships ever get lost?
Because they always follow their current path.

What kind of music do sailors listen to?
Anything that's a little more "sea-rythmical"!

Why did the boat blush?
Because it saw the ocean's bottom.

How do pirates prefer to communicate?
Aye to aye!

Why was the ship so good at school?
It knew how to navigate its way through problems.

What's a sailor's favorite type of candy?
Star-bursts (from the constellations at sea).

Why did the ocean break up with the pond?
It found someone a little deeper.

How do ships say goodbye?
See you laters!

Why are pirates great at math?
They know how to multiply the booty.

What did the ocean say to the beach?
Nothing, it just waved.

Why do seagulls fly over the sea?
Because if they flew over the bay, they'd be bagels!

What's a sailor's favorite game?
Battleship, of course!

Why did the captain go to therapy?
He had too many deep-seated issues.

How does a ship flirt?
By dropping anchor lines.

Why did the fish avoid the computer?
It was afraid of the net.

How do boats greet each other?
With a wave.

Why did the ship apply for a loan?
It needed some liquid assets.

What's a pirate's favorite letter?
Most people say "R", but his first love is the C.

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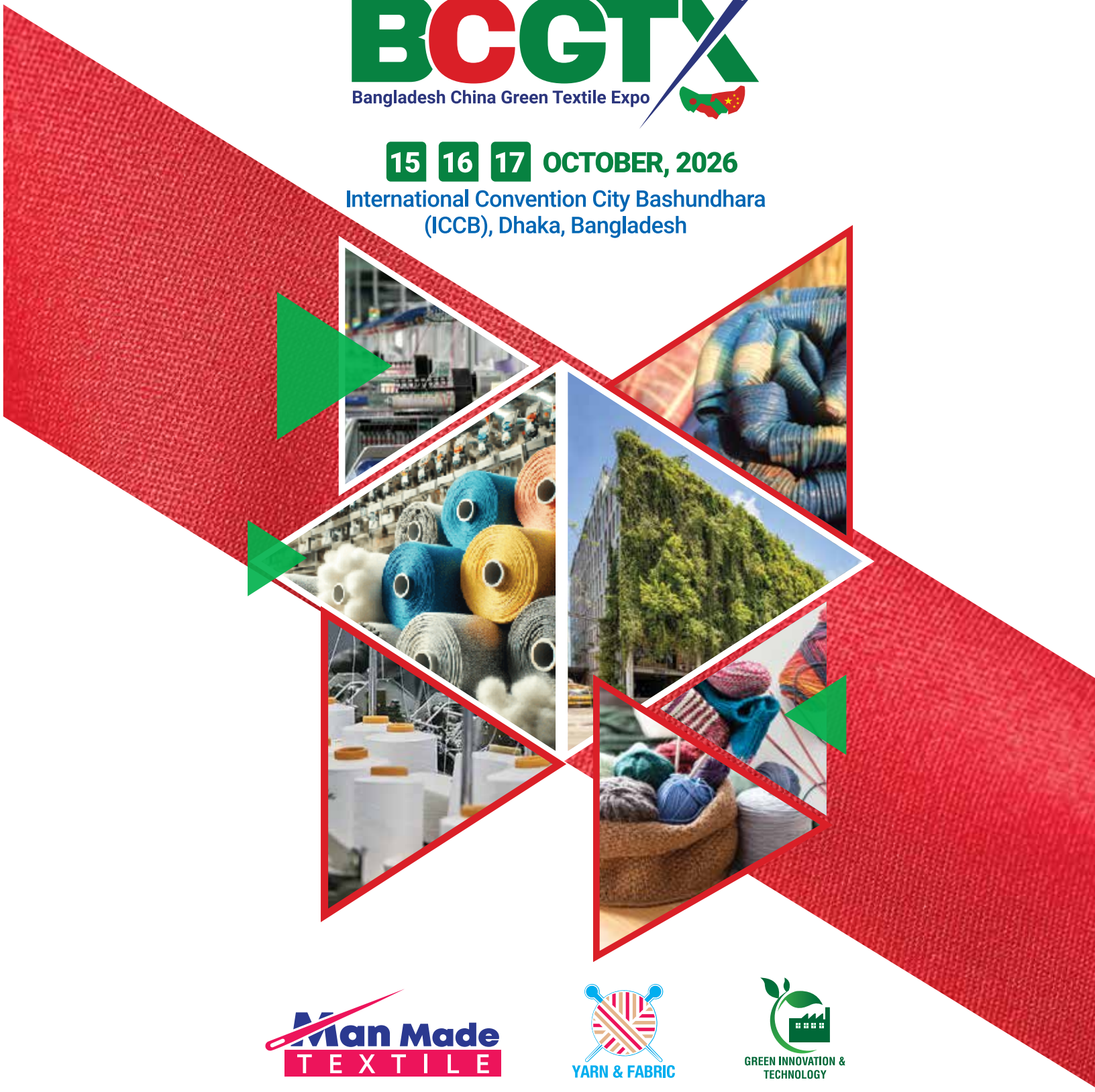

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