

## Ports and terminals

Services and solutions

# Where will our knowledge take you?

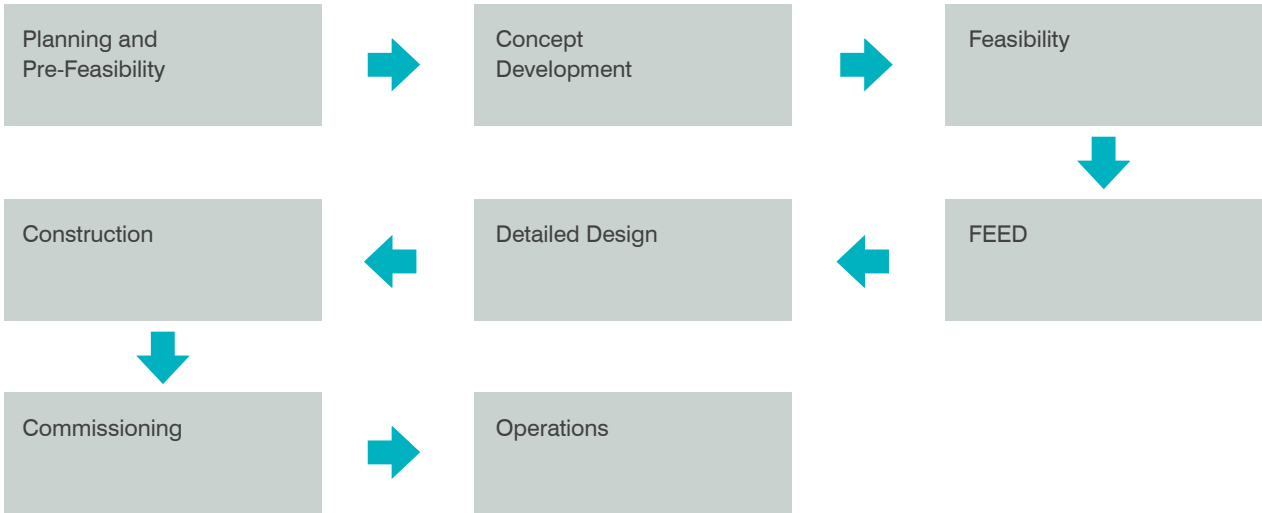
BMT supports clients at each stage of the planning, development and operation of ports, terminals and harbours.

BMT is a leading international multi-disciplinary engineering, science and technology

consultancy offering a broad range of services, particularly in the energy and environment, defence and transport sectors.

From concept to planning, design and construction, right through to operation and maintenance,

BMT's holistic approach combines valuable engineering experience with sustainable environmental management and economic practicality to deliver high-value solutions for clients.



“What we like most about BMT is their deep understanding of our needs, their flexibility, and the high quality of the results they deliver. I look forward to working with BMT again in the near future.”

Department of Business Development,  
Modern Terminals Ltd, Hong Kong

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## Investment and Planning

Well planned, critical infrastructure is essential to economic growth. By providing investment and planning support throughout the initial stages of infrastructure development, we aim to help clients build future growth on strong foundations.



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## 1: Site Selection Study for LNG Facility at Pipavav, India

BMT carried out an in-depth SWOT analysis and cost and feasibility studies at sites in Pipavav, to identify the best location for an LNG import terminal. On completion of the study BMT was subsequently selected for environmental impact assessment and engineering design work.

## 2: Masterplanning Study for Weifang Port, China

When Malaysia-based Sime Darby needed an independent consultant to review the development of Weifang Port in Northern China, they called on BMT's expertise. BMT developed a strategic masterplan, covering the economic, technical and financial aspects of developing the port.

## Market and Economic Assessments

BMT provides financial and economic assessments for investors in shipping, transport and related infrastructure. Our clients can access BMT's in-depth technical and commercial expertise through a range of services that includes port cargo flow forecasting, market reviews and competitive analysis, concept plans, masterplanning and feasibility studies. We also undertake financial reviews and asset pricing, and can provide customers with plans for financing their projects.

In addition, BMT can offer a wide range of other services including strategic economic analysis, tactical management reviews, detailed cost optimisation and quality management studies.

## Hong Kong 2030 Market Assessment

BMT carried out a two-year study to examine the future potential of Hong Kong's port, and develop a strategy for its development up to 2030. The study includes reviews of global markets and competitors, and extensive stakeholder consultation. BMT will undertake long-range throughput forecasts and outline port planning.

## Songon Gas-to-Power Project

BMT conducted supply chain due diligence, contract review, operability assessments and infrastructure design and optimisation studies for the supply of gas from an LNG FSRU to onshore gas turbines, for a gas-to-power project outside Côte d'Ivoire, Africa.

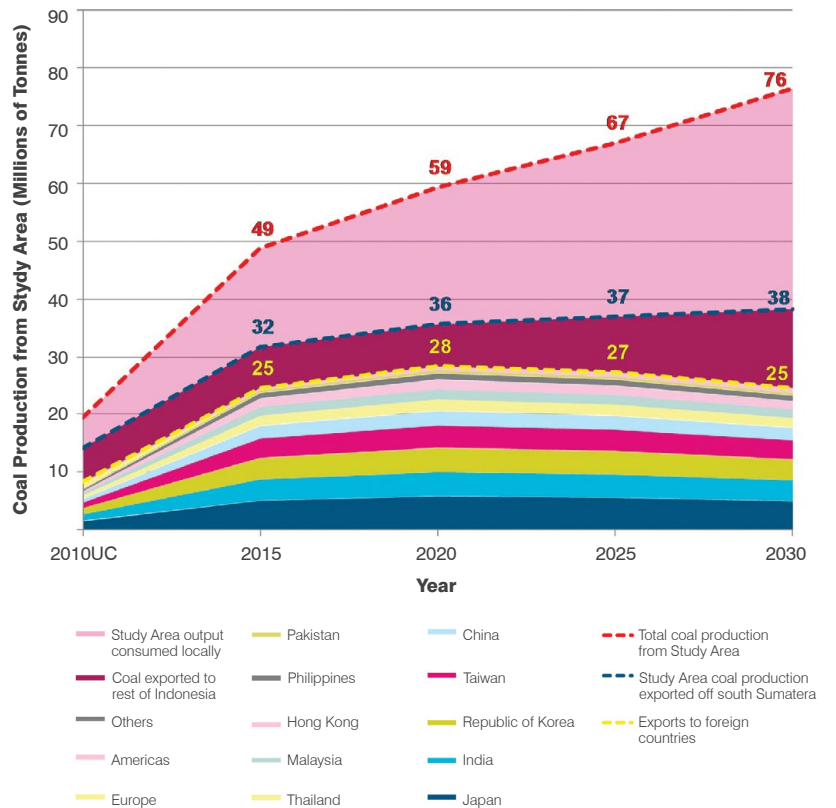
## Marine and Transport Planning

BMT offers an extensive portfolio of planning, design and assessment services for transport projects and supporting infrastructure. Services range from site selection, feasibility studies and concept designs to traffic impact assessments (TIA) and temporary traffic management (TTM) schemes, as well as detailed traffic simulation and network modelling studies. By working closely with economic and environmental specialists, our transport experts provide customers with robust economic assessments for transport and logistics proposals, including green transport solutions.

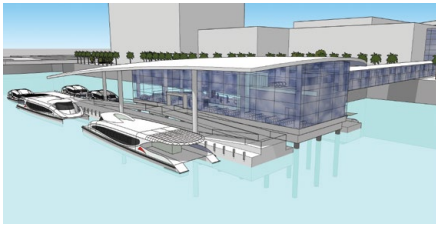
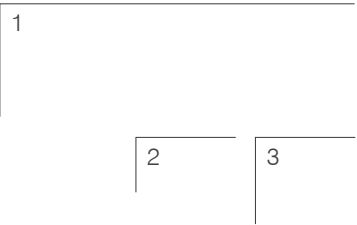
Site selection studies are carried out by BMT staff whose expertise include; geotechnics, marine accessibility, and marine environmental conditions.

## Coal Transport Study, South Sumatra, Indonesia

Indonesian port operator Pelindo II commissioned BMT to develop a transport link from South Sumatra's coal mines to the coast. The BMT solution, backed by extensive environmental, financial and technical analyses, involved transporting the coal downriver by barge to a floating transshipment facility. BMT also developed a phased implementation plan to match infrastructure costs with growth in demand.







## Marine Facilities Masterplanning

BMT prepares long, medium and short-term masterplans for ports and marine terminals. We have extensive experience in conducting feasibility studies for high-profile container, bulk and cruise ports and helping clients to select the most suitable locations for their projects. We provide layouts and plans for both new developments and reconfiguring existing ports.

We also specialise in planning, designing and project managing all capital and maintenance dredging works. This includes obtaining the required approvals and dredging licences. Our experts assist with berthing and downtime assessments, reclamation and ground improvement work, project management of multi-disciplinary maritime development projects and detailed designs for rock armoured breakwaters, groynes and seawalls.

### LNG Marine Terminal Feasibility Study

BMT carried out a feasibility study for a LNG marine terminal. Using its state-of-the-art simulation software, BMT established the Metocean conditions at the site, evaluated manoeuvring and mooring aspects for various jetty configurations (location and orientation) and predicted operational downtime, cargo transfer and storage requirements over a 20-year period.

### 1: Kijing Deepwater Port, Indonesia

Through our long-term engagement with the Client, BMT delivered pre-feasibility and detailed feasibility studies and an outline design of the Kijing greenfield port. BMT provided analyses on market situation, economic viability, port connectivity and issues related to oceanography, marine engineering expertise for design development as well as recommending partnership arrangements for future operations.

### 2: Marine Facilities Masterplanning, Dubai

BMT has developed a Marine Transportation Masterplan that will meet Dubai's public transport needs up to 2030 and provide passengers with seamless travel. The project includes an Integrated Transport Strategy that covers all modes of transport and is consistent with Dubai's future plans. BMT also forecasted marine transport usage and requirements for berthing and other support facilities.

### 3: Oakajee Port Development Feasibility, Australia

BMT has conducted detailed investigations and assessments to ensure an optimum port layout at the Oakajee Port Development in Australia, where geotechnical conditions and exposure to the prevailing swell have created challenges to dredging and breakwater construction. BMT also conducted dredging studies and designed the breakwater, with input from international experts.



“ Using our risk, management and operations expertise, we provide due diligence studies that are robust, structured, and defensible. ”

## Port and Coastal Environmental Assessment

Multi-disciplinary consultancy services and BMT developed software tools are at the heart of BMT's environmental management offering. Our services include impact assessment and mitigation, training, and IT support. From engineering design, economic development and resource optimisation to protection of ecosystems, training, legislation and policy development, we take a balanced approach that adds real value to our clients' projects.

BMT engineers and scientists study baseline water quality conditions, marine ecology, coastal processes and shoreline erosion to offer port planning impact assessments and specialist dredging management. Our modelling and monitoring activities are underpinned by high quality technology and a deep

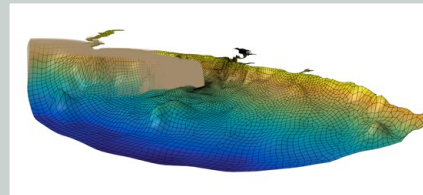
understanding of physical, chemical and biological processes.

Drawing on advanced field measurement and data collection, numerical modelling and analysis, remote sensing capabilities and a detailed understanding of regional environmental processes, BMT can also provide comprehensive meteorological and oceanographic (Metocean) services.

### Environmental Assessment at Port of Townsville, Australia

A multi-disciplinary team from BMT was engaged by the Port of Townsville to assess the likely impacts from port expansion on the sensitive marine environments of Cleveland Bay and adjacent Great Barrier Reef Marine Park. This work is culminating in a detailed Environmental Impact Statement (EIS) to be presented to the Federal and State Governments for assessment.

The project has showcased BMT's ability to effectively integrate marine science and engineering disciplines together to develop a robust understanding of physical, chemical and natural ecosystems so that the impacts of future port expansion can be accurately and confidently predicted. The project included comprehensive oceanographic data collection (waves, tides, currents as well as turbidity, sedimentation and water quality) and detailed numerical modelling of hydrodynamics, sediment plumes from dredging activities, water quality and coastal processes using BMT's software TUFLOW FV.



### Numerical Modelling at Port of Gladstone, Australia

Since the 1970s BMT has been associated with development and management in Port Curtis and the associated Port of Gladstone, which is one of the world's largest export ports. Tasks have included feasibility studies and environmental impact assessments for terminals, navigation channels and infrastructure on behalf of the regulating authorities and private enterprises.

Through use of advanced numerical modelling tools for hydrodynamics and water quality, BMT is aiding in the improvement of environmental practices and management and continues to monitor performance and collect data to support modelling predictions.

## Technical Due Diligence

BMT helps clients identify potential investment risks through technical due diligence and critical assessment of management processes, the supply chain and operational capability. This enables our clients to resolve any issues in advance of financial close, and gain reassurance about the viability of their

project. Using our risk, management and operations expertise, we provide due diligence studies that are robust, structured, and defensible.

### Lender's Technical Adviser, India

BMT provided Lender's Engineer services to Infrastructure Development Finance Company Limited (IDFC), regarding

a loan to AP Moller / Maersk, for the container terminal development at Pipavav. The work included a detailed cost estimate, on-site inspection of container cranes and an assessment of the layout and efficiency of the port. BMT, which has been involved in the project for more than seven years, also advised on the business plan.



### Esperance Port Authority Shiploader Design, Australia

Esperance Port Authority (EPA) Western Australia, selected BMT to conduct a complete independent structural design review of a new iron ore shiploader. The review covered all primary and secondary structures plus all critical mechanical connections affecting the strength and stability of the plant. EPA has since retained BMT to carry out annual structural inspections and to act as a key technical adviser.



# Design and Engineering

From conception to construction, BMT has a wealth of experience in port and terminal architecture. We provide a detailed design service that complies with international codes, project management, design review, and value engineering. Our clients also call on our expertise in preparing contract documents.

## Engineering Design Services for Marine Facilities

BMT has assisted clients in designing successful proposals for developing marine facilities. Our holistic approach to engineering solutions involves specialists around the world, supported by sophisticated design and optimisation tools.

Engineering services include marine structural engineering, pavements, geo-technical engineering, environmental engineering, Metocean studies to support design, material handling systems, buildings, utilities and associated mechanical and electrical systems.

### Engineering Design Services, India

As part of ambitious plans for expansion, Mundra Port appointed BMT to assist with construction of a multi-purpose berth between an existing terminal and T-2 Jetty. BMT carried out detailed engineering and design of all marine structural elements comprising approach trestle, unloading berth, shore protection and services on the berth. The unloading berth was designed for vessels ranging from 10,000 dwt to 60,000 dwt as a free standing structure supported on a vertical steel pile foundation.

### Engineering Consultancy for Four Jetties on Pulau Busing, Singapore

BMT’s design and project management capabilities were called upon for the development of the oil storage terminal on Pulau Busing. Work involved design and construction management of four jetties accommodating vessels from 6,000dwt to 120,000dwt. BMT also developed the tender package to select the marine contractor and sought government approvals.

“ Our holistic approach to engineering solutions involves specialists around the world, supported by sophisticated design and optimisation tools. ”

## Bulk Materials Handling and Consultancy

For many years BMT has been helping clients to optimise the performance of bulk material handling equipment. This includes bucket-wheel excavators, stackers, reclaimers, shiploaders, ship unloaders, conveyors and conveying systems, mills, crushers, screens, draglines and mining shovels. Our experts offer a complete service from initial investigations and design of machinery to project management, specialist electrical services, procurement and technical support.

BMT uses specialist design tools to undertake finite element analysis, computational fluid dynamics, discrete particle modelling, fatigue and conveyor analysis. Our experts provide an efficient and reliable assessment of problems, supported by software specially developed in-house to carry out complex, state-of-the-art analysis for conveyor dynamics. We are involved with both the industrial and commercial aspects of port equipment from shiploaders and unloaders to grab cranes and passenger gangways. From design to advice, BMT offers quality engineering services that benefit day-to-day, short-term and long-term operations.

### Lyttelton Port of Christchurch Coal Handling Review, New Zealand

BMT reviewed the coal handling system and associated plant for Lyttelton Port Company and Solid Energy. The review identified operational inefficiencies in the equipment and the layout of the facility. BMT then recommended improvements to rectify them.



### LNG Re-gasification FEED Study, Melaka, Malaysia

BMT provided Front End Engineering Design (FEED) for an LNG Re-gasification Unit and Island Berth in Sungai Udang, Malaysia. BMT was subsequently appointed engineering consultant for detailed engineering design and technical support during the engineering, procurement, construction, commissioning (EPCC) stages of the Island Berth and facilities.

### Container Crane Life Extension Facility Review, Indonesia

BMT was engaged to provide refurbishment design solutions to extend the life of three 12-year-old Noell container cranes for Jakarta International Container Terminal (JICT) in Indonesia. The scope of the works involved redesigning, reviewing and improving the operation of all the key components.







#### **Bulk Material Handling and Terminal Design Management**

BMT played a central role in the design, construction and commissioning of a new multi-purpose bulk material handling and transit terminal for TOLL Geelong Port. Tasks included preparing the specifications and contract documents, evaluating tenders, verifying the design, supervising construction and commissioning. BMT also addressed environmental regulations, and ensured integration with existing equipment.

## **Project and Construction Management and Commissioning**

### **Project Management Services for Marine Facilities**

BMT regularly provides project management for marine facilities, including some of the world's largest port projects. Our services cover contractor choice, construction methodology, site supervision, programming and planning, contract management, quality control and safety. In addition, we can extend our project management service to cover the full lifecycle of the project from concept to commissioning.

“ We can extend our project management service to cover the full lifecycle of the project from concept to commissioning. ”

### **Development of Vitol Tank Terminals Marine Jetties, Malaysia**

BMT provided project management services covering Front End Engineering & Design (FEED), invitation to bid for reclamation, dredging, ground improvement, and detailed engineering for marine jetties in Malaysia.



### **Container Terminal Project Management**

A BMT team is providing on-site project management services for the new offshore Indra Container Terminal in Mumbai Port. The two-year project comprises quality management, site supervision, assistance with cost control and advice on marine construction.





# Operations

In order to manage and mitigate risks during the operation and maintenance of ports, terminals and harbours, BMT provides a wide range of services that draw on our global expertise.

## Risk Assessment

BMT not only studies the external and internal risk factors of marine facilities but also their consequences. We look at what impact a project’s vulnerability and risk may have on businesses or countries and advise on the most appropriate ways of mitigating that risk. Our experts review navigational issues, search and rescue and the port marine safety code, as well as assessing and auditing safety management systems.

### LNG Navigational Risk Assessment

BMT led a navigational risk assessment of the anticipated increase in LNG tanker traffic in the Bonny Channel, Nigeria. This involved bringing together key stakeholders and applying HAZID risk assessment to vessel traffic scenarios. It identified strategic methods for reducing risk and improving the safety of shipping, as well as \$40M worth of savings, as part of a capital dredge programme.

### Risk Assessment title

BMT is developing a strategy for the UK’s first alongside ship-to-ship transfer of LNG. The facility will be only the second of its kind in the world. BMT’s scope includes a feasibility study and assessment to identify the risks and ensure they are effectively managed. The project requires close operation with regulators, operators and stakeholders.

## Navigation Simulation and Consultancy

From full-scale trials, free running and captive model tests, to mathematical prediction and simulation, BMT has many years’ experience in all aspects of ship manoeuvring.

Our real time ship-handling and manoeuvring simulator, REMBRANDT (real time manoeuvring berthing & training) is used by pilots, ship operators, naval architects and port authorities to enable effective training, and to evaluate harbour layouts at the planning stage.

The system has a wide range of high fidelity ship models which can interact with varied environmental conditions and tugs to produce realistic vessel behaviour.

### Navigation Simulation, Brazil

BMT carried out a feasibility study to determine if the Port of Vitoria could accommodate larger vessels by dredging part of the channel. The study involved using detailed hydrodynamic modelling to produce an accurate set of simulations in line with the terminal’s capabilities. They tested the entry, departure and manoeuvrability of container ships in the range of 4,000 TEUs and above.

### LNG Metocean Forecasting

BMT provides operational forecasting of offshore winds, offshore and near shore waves, currents and water levels in support of operations at the Balhaf LNG export facility in Yemen.

Port operability is optimised by minimising the number of days where operations are halted due to unexpected

“ Our objective is to identify and support the delivery of sustainable and efficient solutions that will work throughout a port or terminal’s lifetime. ”

### Navigation Simulation Training, India

BMT ran a training workshop for pilots at Hazira Port using REMBRANDT navigation simulation software. The workshop, which took place on-site, enabled the pilots to validate their manoeuvres in relation to the operational jetty and gave them an accurate feel of the conditions at the proposed/new jetty.

## Mooring Analysis

Designing and analysing mooring systems is an essential part of port planning. At BMT we have extensive experience in this area and in evaluating the feasibility of ship-to-ship and ship-to-structure operations. Our comprehensive consultancy services range from providing expert advice, to a detailed dynamic mooring analysis using specialist software.

### Mooring Analysis, Singapore

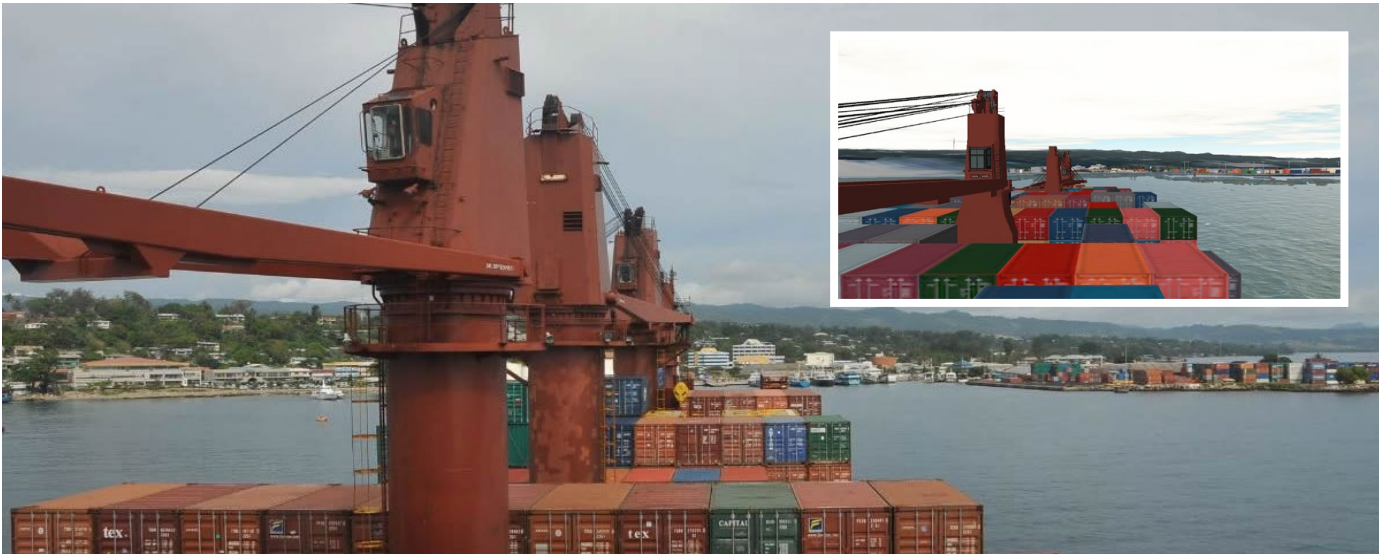
BMT carried out a mooring analysis at the Sembawang shipyard of two berths being used during the conversion of a tanker into a floating storage and offloading unit (FSO) for a major oil company. The analysis was based on appropriate environmental conditions and the shipyard’s proposed mooring arrangement. Using OPTIMOOR software, BMT identified changes needed to ensure the safe mooring of the vessel.

## Port Security

Security is an increasingly important issue and BMT aims to provide the latest thinking and most cost-effective solutions, supported by our worldwide expertise and independent status. Our objective is to identify and support the delivery of sustainable and efficient solutions that will work throughout a port or terminal’s lifetime.

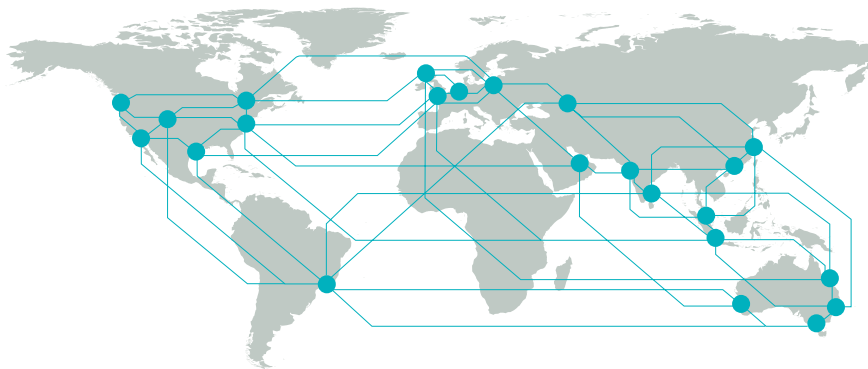
### SUPPORT programme

BMT is part of a Europe-wide project to improve port security and trade flow. The SUPPORT (Security UPgrade for PORTs) programme is studying Europe’s next generation of security legislation and developing more rigorous security processes and procedures to reduce threats from crime and terrorism.





BMT applies engineering, science and technology to help customers design, manage, maintain and improve their assets. Founded on a century's heritage in the marine environment and with a worldwide network of offices, BMT is an independent organisation held in trust for its employees.



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