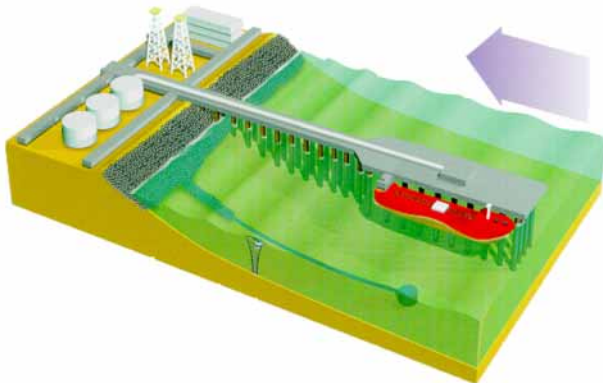


# Coastal Facilities Support



## Benefits from meteorological & oceanographic (metocean) studies include:

- **Construction cost savings by optimising jetty and breakwater design**
- **Enhancing operating safety and efficiency of the import/export jetty**
- **Downtime assessments for construction and operational support**
- **Minimising marine environmental standards compliance costs**
- **Efficiency of an industrial plant affected by the characteristics of influent air or water**

Winds, waves, currents and water levels (metocean) are all important processes in relation to the design and operation of coastal facilities. This is relevant to the energy industry and particularly LNG terminals, fabrication yards and water cooled power stations. For non-energy related projects, near-shore metocean processes can impact significantly on coastal defence, coastal zone management, port developments and wastewater disposal schemes.

Key metocean information requirements at the design stage of any coastal facility include:

- Normal and near-shore wave conditions - important for jetty and breakwater design
- Assessment of long period (swell) wave energy - for vessel response during berthing
- Wind, wave, current and water level statistics - for design and operational planning
- Current circulation - for the assessment of water cooling processes, dredging and berthing design
- Ambient seawater temperature - required for assessment of water cooling processes within the energy and desalination industry
- Assessment of sediment transport - for dredging requirements and scour
- Meteorological conditions - for structural design and pollution dispersion

Fugro has a broad range of capabilities and services to meet the requirements for metocean support at specific stages in the development and subsequent operation of coastal facilities, tailored to meet clients' budgets and requirements. Having measured environmental conditions, derived design criteria and provided real-time operational data collection and forecasting for many of the world's LNG terminals, civil ports and harbours.

## Feasibility Support

Metocean criteria studies are conducted to assess existing data and provide information to determine the viability of any coastal development. During this phase preliminary design statistics are required that may highlight additional data requirements.

## Site Investigations

Oceanographic and meteorological data collection programs may be undertaken to provide a baseline of data to support the derivation of design extremes and operating statistics. Typically 12 months studies are required to provide data for appraisal of the full range of annual conditions where strong seasonal differences are evident.



## Design Support

Detailed analysis of site-specific measured data, appropriate historical measurements and model hindcast metocean data are required to derive design extremes and operating statistics to support the design, construction and operation of a coastal facility. The design support can include rigorous interpretation of the available metocean data to identify and quantify the key metocean processes that influence the development site.

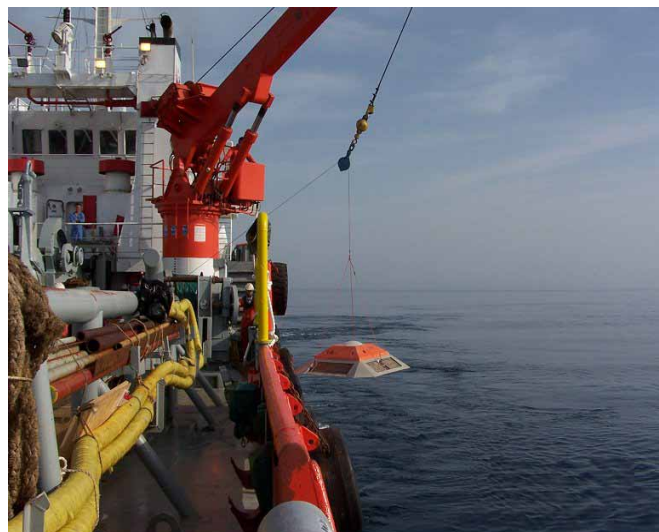
## Construction & Operational Support

A coastal facility is highly reliant on suitable weather and oceanographic conditions that can result in downtime for specific construction and operational activities.

Fugro offers consultancy, weather forecasting and real-time monitoring services that can be used to assess likely downtime or to monitor and predict the conditions that are of concern.

These include:

- Downtime assessment to simulate the environmental limitations of vessel docking, loading/unloading and departure on the operation of the import/export terminal.
- Design, installation and maintenance of integrated, real-time metocean and environmental monitoring systems, providing the client with essential information regarding vital aspects of the operation.
- Management of data from real-time monitoring systems to monitor the real impact on operations and allow design extremes and operational statistics to be revised if required for project expansion.
- Site-specific weather forecasts and 5 to 10 day forecast outlooks to support day-to-day operations, provided and disseminated directly or via the real-time data display system.



The basis for all the work conducted by Fugro is to allow the client to enhance safety, minimise environmental impact and reduce costs during design and operation.

### Track Record

Fugro has worked on a number of coastal facilities around the world. These include:

- **Camisea Gas Project** - Peru LNG - Metocean Study
- **Shell** – Qatar – Pearl GTL Study
- **Sonangol** – Lobito Oil Terminal & Port development – Metocean Measurements
- **Ras-Laffan** LNG Terminal – Real-time displays of wind, waves, currents and water level at the port/berthing location may be provided at the Harbour Masters Office and data transmitted to the approaching vessels
- **Statoil** – Snohvit LNG plant - Environmental Monitoring System
- **Phillips Petroleum** - Baja LNG Terminal Study
- **Shell** - India LNG Terminal – Metocean study
- **Arco Indonesia Inc** - Indonesia LNG Study
- **Shell** - Sakhalin LNG Study
- **Total SA** - Yemen LNG Study
- **Shell** - Oman LNG Studies

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