



# Coastal Development



## BUILDING AND INFRASTRUCTURE

### **UNDERSTANDING**

*your operational objectives*

### **TACKLING**

*your complex challenges*

### **DELIVERING**

*your global success stories*

# COASTAL DEVELOPMENT

Coastal regions and deltas are home to a significant percentage of the world's population and economy, yet rising sea levels threaten their viability. Establishing effective solutions for coastal development and land reclamation involves rigorous investigation, the accurate processing and interpretation of acquired data and an inherent knowledge of how to design for the future. Fugro provides this insight, together with a global geoconsultancy team that provides data acquisition and interpretation, development advice and risk management.

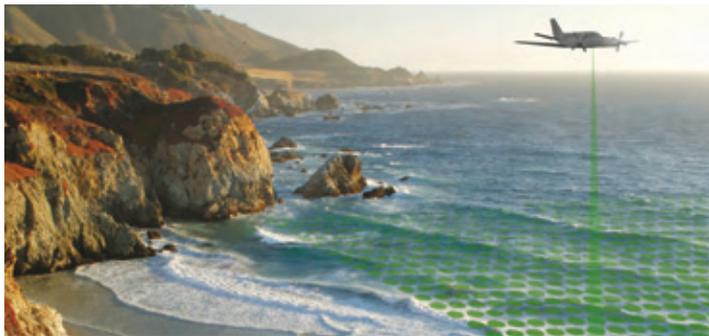


## Our Expertise

Fugro has half a century of marine environmental and geotechnical engineering experience, and developed many of the exploration techniques used within the industry today. Together with unparalleled onshore and nearshore survey expertise, we support the construction and development of ports and harbors, overwater bridges, subsea tunnels, highways, coastal facilities, land reclamation and sea defenses. We operate responsibly in sensitive areas and efficiently in hostile and technically challenging environments. We provide crucial information for coastal zone management (with a focus on coastal erosion and potential loss of habitat); risk prevention advice when dealing with pollution and other natural events; and planning and management support for any development activity in the coastal zone.

## The Benefits of Working with Fugro

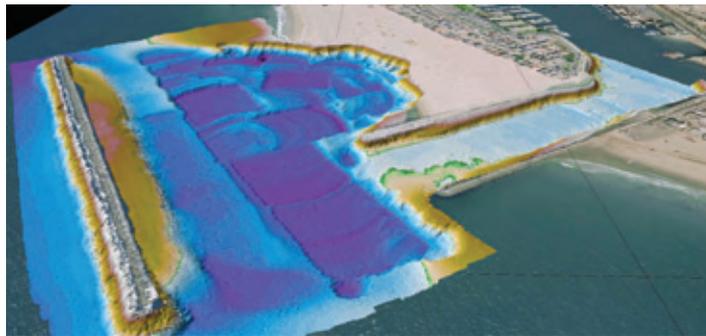
Fugro differs from most survey companies and geotechnical consultants in two distinct ways. Firstly, we own and operate our own vessels, survey systems, positioning systems, geotechnical equipment and pile installation equipment. Hence, whether working as the principal contractor, sub-contractor or as part of a joint venture, our ability to mobilize well-equipped teams of experts at short notice is unrivalled. Secondly, our extensive expertise in onshore and nearshore surveys, foundation engineering design, metocean sciences, satellite positioning and marine construction means that we are able to provide all the physical and environmental knowledge required to inform the design, development and management of assets and operations.



## Survey, Engineering & Construction Support

Many of the world's largest port developments, major bridges and tunnels have been built using Fugro's site exploration, engineering and marine survey services. Our specialist nearshore site investigation teams have played a key role in the feasibility, design and construction stages of major projects, often in challenging environments, including areas of high seismic risk.

- Desk-based assessments (geological, geotechnical and UXO)
- Probabilistic seismic hazard studies and tsunami risk assessments
- Geoconsultancy services and geotechnical engineering
- Sedimentation studies and offshore-to-nearshore wave translations
- Real-time metocean measurement and monitoring
- Hindcast/forecast metocean modeling
- Airborne and satellite-based mapping of coastal topography, structures and habitats using bathymetric and topographic LIDAR and multi- or hyperspectral imagery sensors
- Integrated vessel-based bathymetry surveys and laser scanning sensors (BOAT-MAP)
- Sonar echo-sounding sensor for detailed bathymetric charting
- Onshore, transition and shallow marine geophysical investigation of geology, geohazards, UXO and engineering parameters
- Environmental surveys and studies (EIA, baseline, benthic zone)
- Onshore and offshore geotechnical site investigations
- Laboratory services
- Development of onshore support infrastructure
- Specialist construction services and pile installation for berths, jetties, terminals and mooring-related structures
- Trenched pipeline installation and placement of rock armor
- Integrated positioning systems for barges, tugs, cable-laying vessels and trenchers



## Condition Monitoring & Evaluation

Fugro provides developers, contractors, government agencies and port authorities with detailed surveys of ports and harbors to assess the condition of navigation channels, structures and adjacent shoreline. We gather and present data for harbormasters and pilots to ensure safe and efficient navigation, and for dredging companies to carry out targeted excavation.

- Geo- and structural monitoring
- Satellite (InSAR) surveys to detect, map and monitor ground and structure motion
- Environmental and metocean monitoring
- Real time marine and inland water quality monitoring systems
- Airborne environmental and habitat mapping
- Airborne mapping and terrestrial surveys
- Geophysical and non-destructive assessment of coastal structures
- Onshore and marine topographic elevation surveys
- Hydrographic surveys
- Sub-bottom profiling for dredging applications





**Fugro NV**

Veurse Achterweg 10  
2264 SG, Leidschendam  
The Netherlands

More information available at [WWW.FUGRO.COM](http://WWW.FUGRO.COM)

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