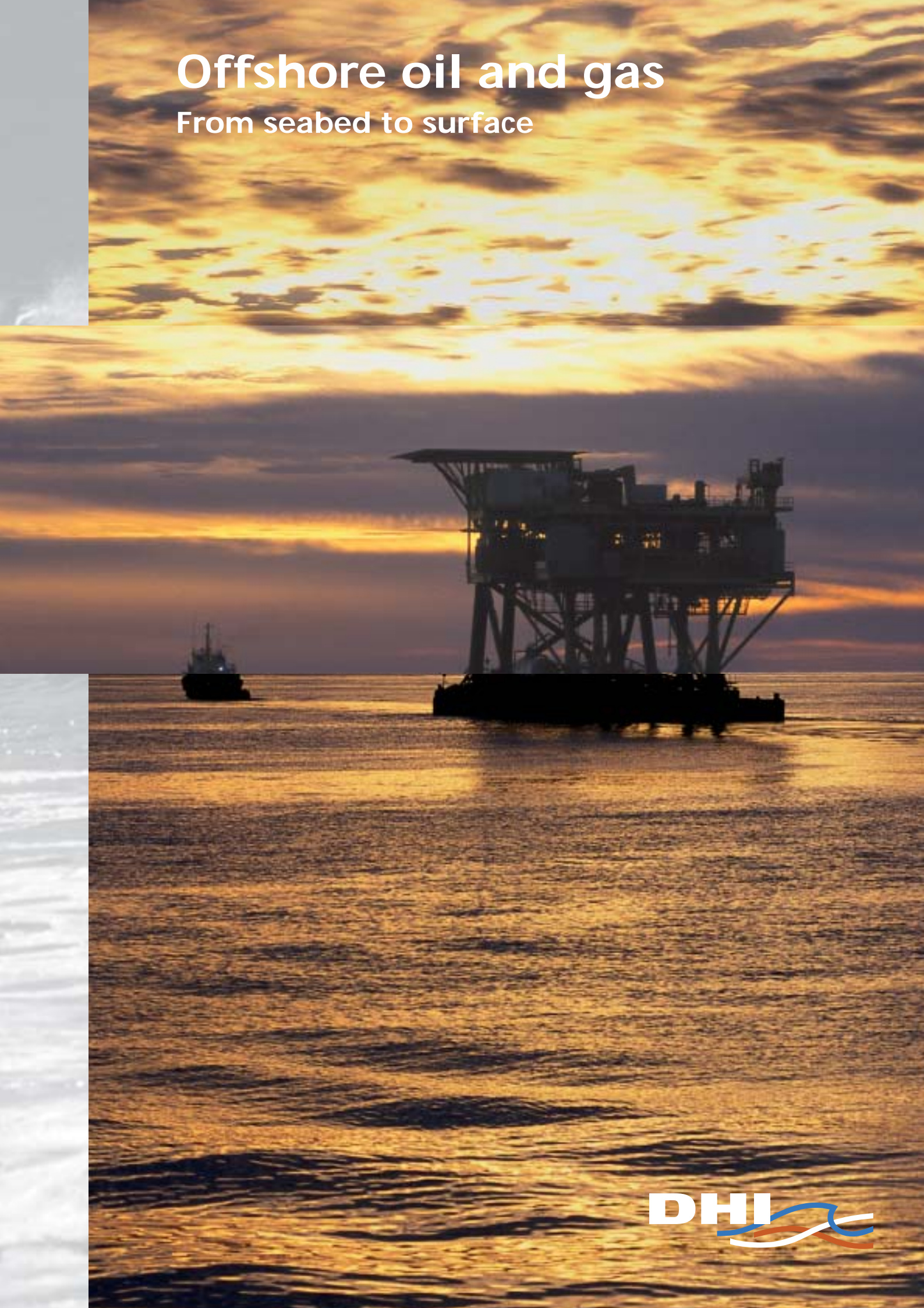


Offshore oil and gas

From seabed to surface





Offshore oil and gas -



Offshore oil and gas is often found in areas exposed to harsh environmental conditions, which greatly influence the exploration and development of the reserves.

Not only must the structures be able to cope with the prevailing conditions - they must also be able to face extreme conditions with ample safety reserve. The influence of the activities on the ambient environment is another major factor - particularly as development often takes place in environmentally sensitive areas.

Offshore activities involve many challenges and professional disciplines.

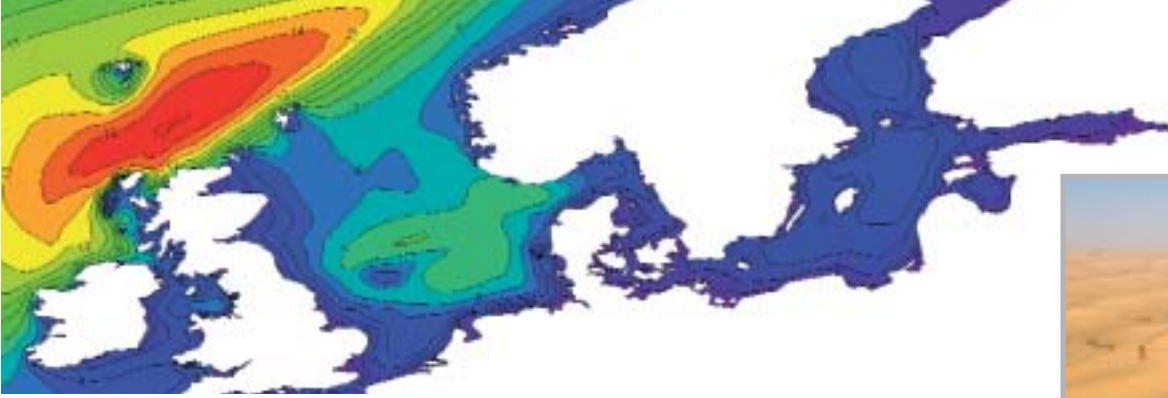
DHI is a key provider of data and knowledge on environmental issues ranging from environmental loads to oil spills and handling of chemicals.

Our solutions are based on more than forty years of experience within the field as data providers, technology developers and consultants worldwide.

At DHI we take pride in providing high quality and sustainable solutions in close collaboration with our clients.

DHI is an independent, international consulting and research organisation represented in all regions of the world. Our objectives are to advance technological development and competence in the fields of water, environment and health. We provide a wide range of solutions within consultancy, policy services and leading edge technologies.

DHI works with governmental agencies and authorities, universities, contractors, consultants and a wide range of industries. We are more than 900 employees working worldwide.



exposed to the elements,

Metocean services

Offshore structures must be designed to cope with the elements with sufficient safety reserves. Hence, a thorough understanding of the metocean conditions and structural interaction is imperative when planning, designing and operating offshore facilities.

DHI's metocean services are based on a combination of field measurements, data analysis and advanced numerical models developed and consolidated over many years. Data from other sources such as satellites can also be incorporated to further enhance quality and resolution.

Our solutions are based on a combination of unique numerical modelling, physical model tests and field data – and a thorough understanding of hydrodynamics.

- Wave/current-structure interaction
- Metocean data – hindcast, nowcast and forecast
- Shallow and deep water physical model testing
- Numerical modelling
- Scour protection optimisation
- Load and response calculations
- Pipeline and riser, including VIV analysis and model testing
- Survey and monitoring

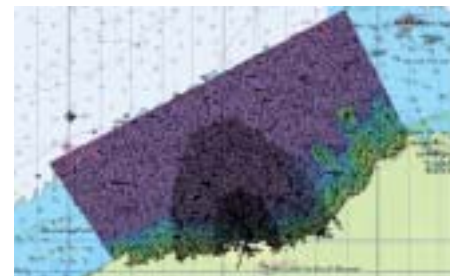
Seabed and coastline

Offshore structure foundations and pipelines are often exposed to an active morphological environment. We provide a wide range of services addressing issues such as:

- Long term stability of the seabed
- Choice of location of structures
- Alignment and burial depth of pipelines
- Scour protection and evaluation
- Long term stability of the coast and the nearshore zone for landfall location selection

In shallow waters pipelines are often trenched to achieve added stability and protection. The backfilling capacity for open trenches is an important aspect of the design process and is typically addressed by:

- Hydrographic surveys and monitoring
- Numerical modelling of sediment transport and seabed morphology under the influence of waves, currents, tides and surges
- Numerical modelling of backfilling
- Numerical modelling of littoral transport as well as shoreline and coastal profile development
- Movable bed physical testing of scour and scour protection





environment and chemicals

Environmental impact assessment

DHI provides the full range of analyses related to risk and impact assessments regarding offshore activities.

- Baseline description of the environment before installation
- Identification of potential impact
- Assessment of impact on water quality, wild life, tourism and other factors
- Spill scenarios and sediment transport

Chemicals

Documentation of ecotoxicological properties of chemicals used in the offshore industry is often mandatory. Documentation includes investigations of biodegradability in seawater and toxic effects on marine algae and crustaceans. In some cases fish studies or sediment reworker tests are required. Our laboratories perform these tests in compliance with the OECD Principles of Good Laboratory Practice (GLP). The laboratory is also accredited by DANAK in accordance with ISO 17025.



Safe and proper handling of chemicals is paramount. DHI offers support on chemical management and assists in setting up and implementing strategies, including material safety data sheets and workplace instructions. Our staff comprises experts in chemical legislation as well as specific offshore legislation and guidelines. DHI also helps setting up training programmes on safe chemical handling for workers thereby reducing the risk of injuries.

Oil spill

Oil spills pose serious threats to the marine environment and place great demands on the national authorities responsible for the response and clean-up operations. For a quick response and as a support during the clean-up an accurate assessment of the spreading of the oil spill and of its impact on flora, fauna and selected species or habitats is of high importance.

Depending on factors such as type of oil and metocean conditions the oil spill modelling tool predicts the spreading and weathering processes, evaporation, oxidation, biodegradation and emulsification. The outcome of this modelling tool can be further evaluated with respect to the environmental impact. The oil spill modelling tool can also form the core in an operational forecast system for oil spill contingency planning.

Biodiversity studies

DHI has worldwide experience with surveys and research of benthic and pelagic offshore ecosystems. Our laboratories offer a whole range of benthic sediment, macroflora and fauna investigations required in relation to monitoring of offshore activities.

We carry out detailed surveys of sensitive areas and species and identify zones of impacts using advanced statistical analyses. Surveys of higher trophic levels include:

- Bird migration by radar
- Seabird distribution
- Cetacean bioacoustics
- Cetacean surveys
- Fish
- Seismic survey MMO services
- Coral reef surveys
- Seagrass surveys
- Mangrove surveys
- Macro menthos surveys



Decommissioning

As fields cease to produce, decommissioning becomes important, not least with respect to the impact on the surroundings, but also with regard to a sustainable way of dismantling and disposing of facilities.

DHI's services comprise:

- Sampling, analysis and evaluation of ambient sediments, cuttings and seabed life
- Setting and detailing of relevant scenarios for removal or in place disposal
- Leaching of contaminants from residuals left in place
- Modelling of impacts of waves and currents on both stability and spreading of contamination
- Assessment of the present and future environmental impact, including ecotoxicological effects





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Water • structure • seabed

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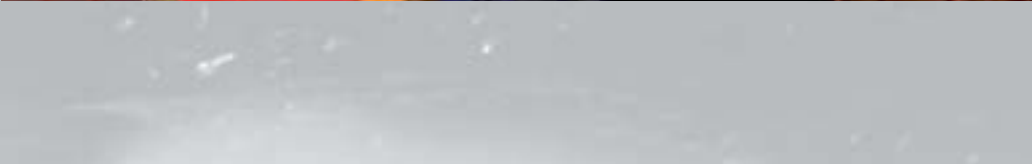
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Browse LNG Development, Australia. Modelling for environmental approvals. Woodside Energy Ltd (via SKM/ERM).

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