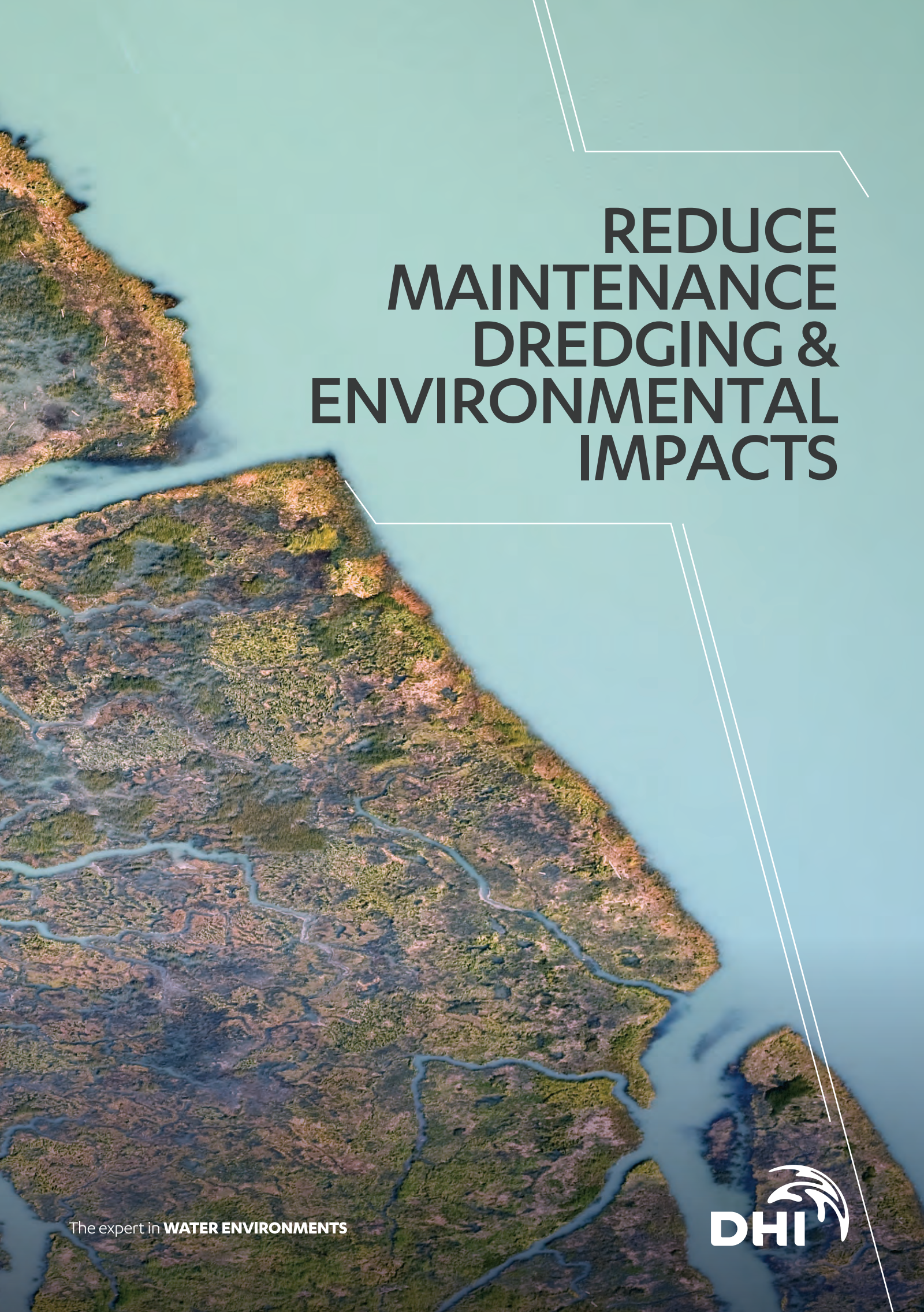


REDUCE MAINTENANCE DREDGING & ENVIRONMENTAL IMPACTS

The expert in **WATER ENVIRONMENTS**

DHI

Maintenance dredging is the most common method of managing channel siltation. Requiring highly specialised equipment and labour, dredging is often a costly maintenance option. Maintenance dredging can have significant ecological impacts on the surrounding marine environment and often requires complex, multidisciplinary, costly and time-consuming environmental approvals to ensure that risks to the marine biota are minimised.

Eliminating or reducing maintenance dredging can thus have significant cost benefits for port operators as well as imparting positive impacts on the surrounding marine ecosystem.

PROACTIVE APPROACH TO REDUCE PORT SEDIMENTATION

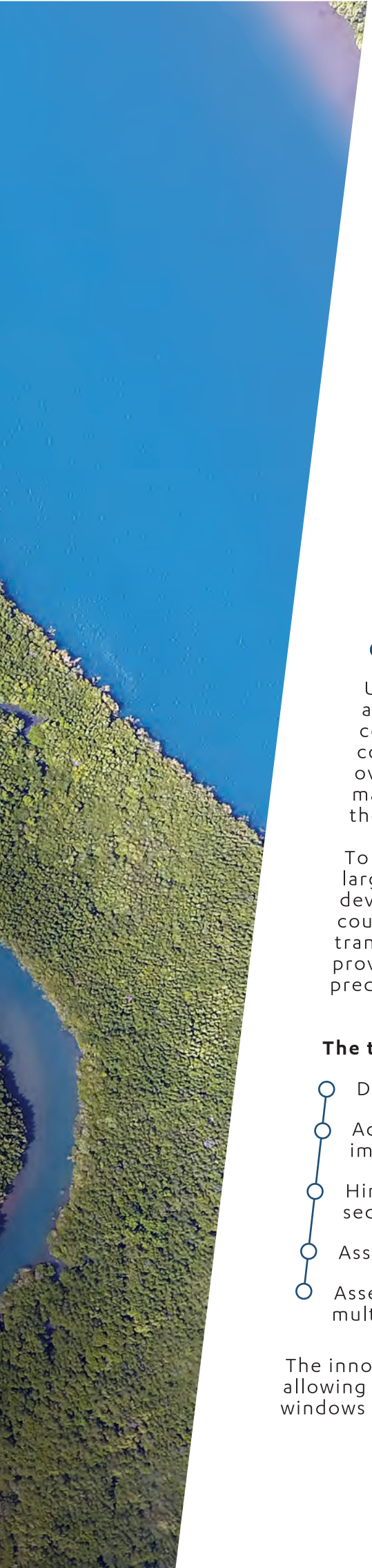
DHI, a non-profit Research and Technology Institute, have developed a number of methods to proactively reduce channel sedimentation in ports, working with the natural hydrodynamic processes to reduce siltation in a long-term, sustainable manner. Through a suite of highly integrated, high precision numerical models, DHI specialists study the integrated wave, hydrodynamic and sedimentation patterns. Cost-effective and sustainable sediment management options are then identified in the context of the local ecosystem.

OPTIMISE PORT INLETS TO IMPROVE NATURAL BYPASSING

The flow of sediment into ports and harbours is widely governed by the location, geometry and orientation of the inlet. Carefully designing inlets so as to avoid areas of long-term sediment build up can lead to significant reductions in channel siltation and associated dredging and bypassing requirements. DHI's integrated solution encompasses a coupled hydrodynamic-wave-sedimentation model which can accurately predict the long-term sedimentation and littoral drift patterns around port inlets to create long-term sedimentation maps of the most complex sites.

SUPPORT DESIGN OF AGITATION DREDGING TO REDUCE SEDIMENTATION

Agitation dredging consists of stirring sediment into suspension and allowing the natural oceanographic processes to remove the sediment from the harbour. Well-designed agitation dredging programs can be highly effective in high energy environments, with little adverse impacts to the marine environment. With accurate forecasting of weather conditions and precise calculations of sediment transport dynamics, DHI has designed highly successful agitation dredging campaigns using a combination of low-tech machinery and target use of propeller wash. The removal efficiency of past projects has been as high as 60% and resulted in significant reductions in dredging campaign.



REDUCE DREDGING VOLUMES

DHI's specialise in accurately calculating dredge volumes required to meet increasing vessel size and draft requirements. Our state of the art technology (NCOS by DHI) calculates under keel clearance with unprecedented accuracy by utilising a probabilistic implementation of the physics underlying full bridge simulators. This radically reduces unnecessary conservatism typically built into empirical methods, maximising channel capacity, minimising dredge volumes and potentially generating huge cost savings to our port clients.

REAL-TIME OPTIMISATION OF DREDGING OPERATIONS

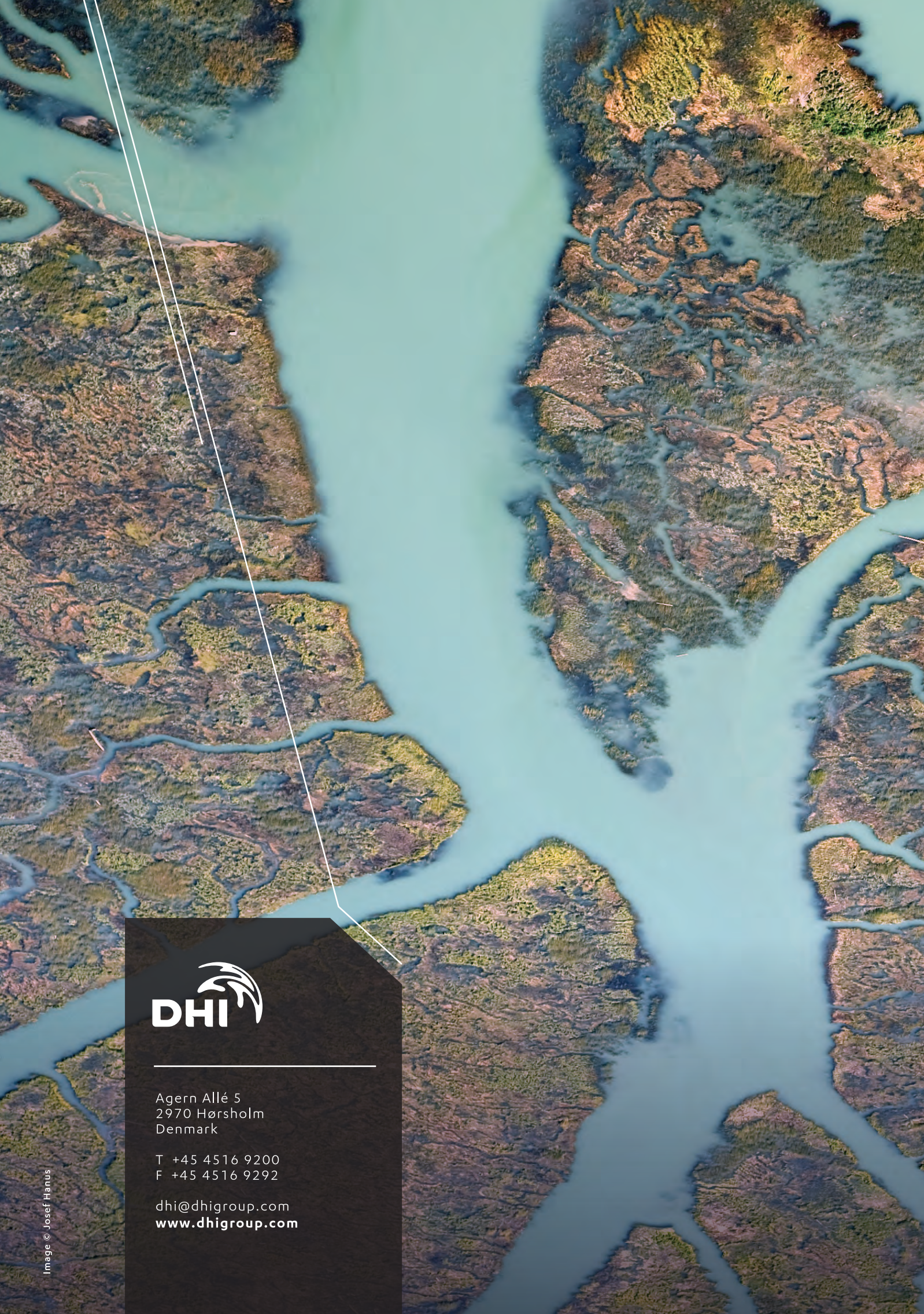
Using a real-time forecasting system for dynamically adapting dredging campaigns to fit environmental conditions can assist in reducing the level of unnecessary conservatism in operating threshold limits and reducing the overall cost of the operations. With the considerable cost of many e dredging operations, such savings can easily be in the millions of dollars.

To facilitate the Wheatstone dredging campaign, one of the largest dredging programs in Western Australia, DHI developed an extensive integrated modelling platform coupling detailed hydrodynamics, waves and sediment transport models with a web-based decision support system providing an in-depth overview of dredging works and predicting/recording risks of Trigger Level exceedances.

The tool enabled:

- Daily scheduling of dredging activities,
- Accurate 7-day forecasting of weather conditions and associated impacts from contractor-provided look-ahead schedule
- Hindcasting weather conditions and net suspended/deposited sedimentation from achieved operations for forensic investigations
- Assessment of multiple candidate look-ahead dredging scenarios
- Assessment of individual and cumulative impacts from multiple contractors

The innovative dredge management system was a key tool in allowing minimised dredge standby/downtime, maximised dredging windows and minimal environmental impacts.



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