

# breakwaters, dredging & reclamation



**ROYAL HASKONING**

thinking in  
all dimensions

# breakwaters, dredging & reclamation



*Flushing Port, The Netherlands; Tripoli Breakwater redesign, Libya; Clacton Breakwater, UK.  
Main image front cover: Hidd Port Development, Bahrain*

## protection from sea & swell

Ideally a marine facility is located where a headland or offshore island provides protection from sea and swell. However, this is not always possible and artificial protection is needed through the use of breakwaters. Such structures, whilst fundamental to the safe operation of the facility, are costly and in themselves non-revenue earning. So cost effective solutions are needed, with construction being phased in line with the overall development requirements.

Royal Haskoning, through Posford Haskoning Ltd., and Haskoning Nederland B.V., takes these considerations

seriously when creating breakwaters. Our expertise includes feasibility studies, preliminary and final designs, project management and supervision of the construction. A long record of designing and creating breakwaters around the world, and of repairing and maintaining existing structures, means we bring substantial practical experience to each new challenge.

Breakwater solutions adopted include conventional rubble mound with rock or concrete armour units; dynamic berm structures; full depth caissons and mounded caissons; piled wavescreens and similar structures.



*Clockwise from above: Palm Island Development, Dubai; Ennore Port Development, India; Norfolk beach nourishment UK.*

## creating new space under & above water

Dredging is used for the creation of new channels, or to deepen existing ones, as well as port basins, turning circles and trenches for tunnels and pipelines. The planning and design of such works is based on location-specific conditions, such as soil, rock, depth, wind, waves, currents and the logistics of mobilisation and labour.

The dredged material can often be used for reclamation purposes, or more suitable material can be dredged from an offshore supply area. Maritime related reclamation often takes place in areas with poor ground conditions using

essential ground improvement measures. Our team takes great care to minimise the cost of such improvements.

Whether your situation calls for a breakwater, dredging or reclamation, an initial site visit is usually undertaken where we gain an understanding of the results you are seeking.

The Royal Haskoning team brings you substantial knowledge and experience through each stage of subsequent projects.

Royal Haskoning is an independent, worldwide operating consultancy that has its origins in a firm established in 1881 in the Netherlands. The consultancy now has a staff of 3,000 who together combine a wide range of knowledge and experience. Rooted in a technical background, our consultancy services focus on the broad field of the interaction between people and their environment, in the fields of spatial development, infrastructure & transport, architecture & building, mechanical & electrical services, environment, water, coastal & rivers and maritime. We are committed to working enthusiastically with our clients to achieve sustainable solutions in an increasingly complex society. The expertise and experience of our professionals in a variety of disciplines allow us to

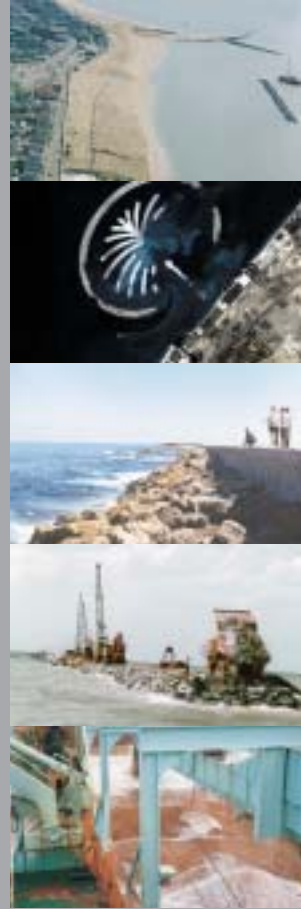
consider all technical, logistical, architectural, legal, organisational, social, environmental and economic aspects of your project, in order to develop sustainable and practical solutions. Royal Haskoning has subsidiaries and partners throughout the world.

Through our branch and project offices in Europe and overseas, we have access to all major international markets. This way, Royal Haskoning offers multidisciplinary and integrated services locally, based on experience built globally. With our personal service in consultancy, we contribute effectively to the successful planning, design, implementation, commissioning and operation of your projects and programmes and enhance our clients' work with added value.

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ACE The Association of Consulting Engineers  
 BCCB British Consultants & Construction Bureau  
 PIANC International Navigation Association  
 ICHCA International Cargo Handling Co-ordination Association  
 CIRIA Construction Industry Research Information Association British Section  
 ICID International Commission on Irrigation and Drainage  
 IEMA Institute of Environmental and Management Assessment  
 FIDIC International Federation of Consulting Engineers

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# thinking in all dimensions

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