

Coastal and metocean specialist studies

Coastal and river basin development

Coasts and river basins are under pressure not only from pollution, overpopulation and traffic congestion, but also from the forces of nature. Numerous catastrophic events have occurred in recent years, including hurricanes Katrina (2004) and Sandy (2012) in USA, the tsunamis in Indonesia (2004) and Japan (2012), severe floods in Thailand (2011) and UK (2012 and 2013-2014). The sustainable development of coasts and river basins will be one of the major challenges for the future.

An integrated approach to water systems

The complexity of natural processes in coastal and riverine environment often requires an integrated approach to find the most adequate solution without adverse impact. Our added value is formed by our integrated approach in all dimensions.

We are committed to delivering advice of outstanding quality, enabling sound and innovative solutions and designs. We use hydraulic and morphological expertise to develop sustainable solutions, providing perspectives for safety, ecology, nature and economic development, whilst minimizing overall costs and mitigating potential negative impacts of the designs.

A thorough understanding of natural (hydraulic and morphological) processes on the coasts and in the rivers is of indispensable value to assess the vulnerability of the adjacent areas. This is vital for preparing adequate protective measures and to support sustainable development

Sand Engine, the Netherlands – a revolutionary concept for coastal protection, based on Building with Nature principles





Sharq Crossing, Doha, Qatar – Joint venture TEC as subconsultant for Santiago Calatrava - Hydrodynamic modelling for determination of design conditions, operational conditions and impact assessment as part of iconic design

North Sea – Continental shelf – MIKE21 hydrodynamic modelling

Royal HaskoningDHV has worldwide experience in studies of complex hydraulic and morphological processes in rivers and coastal waters. We advise our clients on issues related to flood hazard and flood protection, coastal, port and other waterside development, coastal and river erosion, land reclamation and climate proofing. We provide the designers with the hydraulic design conditions, and help them to optimize the hydraulic works. Our Nature Driven Design philosophy can only be implemented when the natural processes and the natural dynamics are fully understood.

Areas of expertise

In the field of hydraulic and morphological studies we provide the following categories of services:

- Flow studies: movement of water under influence of tides, winds and river flows.
- Wave studies: wave growth at open sea, propagation from open sea towards the shore, penetration into the port basins
- Morphological studies: interaction between water movement and bed sediments causing transport of sediments and erosion and accretion processes
- Environmental studies: interaction between water movements, algae growth, nutrients, pollution.

Metocean studies

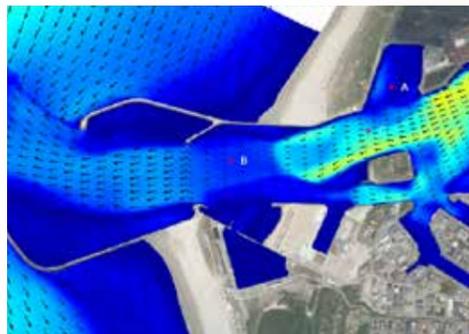
All developments along the coast and in ports are strongly dependent on the wind, wave and current conditions offshore, in the open sea. The offshore conditions are determined using data from a variety of sources, both public and commercial, like NOAA, ECMFW, UK Meteorological Office, BMT ARGOS, supplemented by remote sensing measurements. Our experts use advanced numerical models to simulate currents, tides, storm surges and waves to determine offshore current climate conditions and the extreme conditions occurring during hurricanes and heavy storms.

Coastal studies

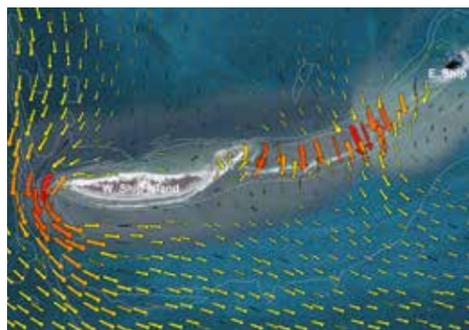
Tidal currents and breaking waves cause sediment movement in the littoral zone, which can either erode or accrete the coast. These processes can be enhanced by man-made structures: breakwaters, jetties, large land reclamations. Undesired developments like excessive erosion might lead to loss of valuable land and increase the vulnerability to coastal flooding. A new trend in coastal engineering is to utilize forces of nature in combination with soft solutions (e.g. nourishments) to achieve a sustainable coastal environment. Our experts provide outstanding solutions to coastal problems, utilizing their profound knowledge of physical processes in the coastal zone, supported by a wide range of most modern tools like 2D and 3D modelling of currents, waves, sediment transport and morphology.

Modelling

With an ever-expanding portfolio of diverse coastal, river and port related problems, Royal HaskoningDHV invests in state-of-the-art modelling software. Our models simulate physical processes in rivers, estuaries and seas and thus accurately predict water flow (e.g. currents and waves), and associated morphological and water quality phenomena (e.g. coastal development, bed scour, channel sedimentation, spreading of pollution, morphological development of the river bed).



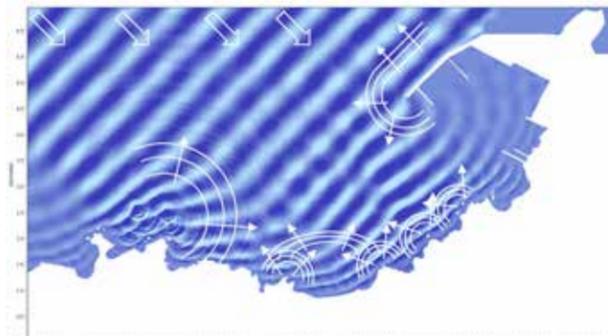
Port of IJmuiden, Netherlands – Delft3D hydrodynamic modelling



Mississippi Barrier Islands, USA – Delft3D hydrodynamic and morphological modelling



Porto Santo, Portugal – Coastal Development Plan



La Coruña, Spain – MIKE 21 Boussinesq wave penetration modelling



Sousse, Tunisia – Coastal Erosion Protection



Mississippi Barrier Islands, USA - Morphological Impact Assessment of restoration works

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Studies are performed with commercial software and in-house developed software and tools. Our in-house developed pre- and post-processing tools (in ArcGIS and MATLAB) allow for high quality modelling results and visualizations. Commercial software is obtained from high ranking institutions in the world such as DHI (MIKE21 and LITPACK suites), Deltares (Delft3D, Pharos, Sobek), Delft University of Technology (SWAN), HR Wallingford UK and many more. We are sponsors and partners in the new developments of freely available open source software such as the OpenEarth Tools, SWASH, Dflow and XBeach. Royal HaskoningDHV has the capability to select an appropriate and integrated suite of models depending on the type and complexity of physical processes.

Royal HaskoningDHV is a leading independent, international engineering consultancy service provider. Our 7,000 professionals provide world class solutions worldwide from our 100 offices in 35 countries in the fields of aviation, buildings, industry, energy and mining; infrastructure, maritime and waterways, planning and strategy, rivers, deltas and coasts; transport and asset management and water technology. We work in partnership with our clients and partners to find innovative and sustainable solutions to today's world challenges.

The Netherlands
Odelinde Nieuwenhuis MSc
Director Advisory Group Hydraulics & Morphology
the Netherlands
T: +31 (0) 88 348 3319
M: +31 (0) 6 15 83 99 76
E: odelinde.nieuwenhuis@rhdhv.com

United Kingdom
Dr Keming Hu
Manager of Numerical Modelling United Kingdom
T: +44 (0) 1444 476 638
M: +44 (0) 7824 896316
E. keming.hu@rhdhv.com

royalhaskoningdhv.com