ENGINEERING & CONSTRUCTION

Boskalis is a global expert in sustainable and the cost-competitive execution of artificial islands.

With many years of experience in land reclamation and in managing complex projects, Boskalis is able to handle the entire process of island creation, from the feasibility study to completion.

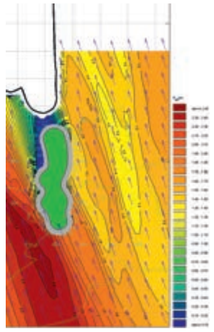
From an early stage, engineering works are developed alongside operational plans. Our in-house experts are from a broad range of disciplines that span the capabilities necessary for island design and construction, including:

- Shore protection works
- Geotechnics
- Soil improvement and remediation
- Environment
- Engineering management

They have a vast bank of knowledge, combining insight about the design process with a thorough understanding of the practicalities of major construction works. They also work closely with several esteemed institutes, which specialize in model testing.

Through sophisticated monitoring programs any island projects consider preservation and even the strengthening of environmental assets, but without compromising the economic benefits.

Our multidisciplinary portfolio, along with a versatile fleet of over 1,100 ships and auxiliary equipment, enables us to engineer and construct optimized, sustainable artificial islands world-wide.



Royal Boskalis Westminster N.V.
Rosmolenweg 20
PO Box 43
3350 AA Papendrecht
The Netherlands

royal@boskalis.com
T +31 78 6969000
F +31 78 6969555

www.boskalis.com

Boskalis
Dredging & Marine Experts

SOLUTIONS BROCHURE

MAN-MADE ISLANDS

STRATEGIC SOLUTIONS

Man-made islands are an answer to the growing problem of land shortage in many areas around the world. They represent a feasible and effective option for expansion and can also provide unique opportunities for ecological habitat and nature development, generating added value solutions for many projects.

Artificial islands can accommodate several types of structures and serve many different purposes:
- Infrastructure (ports and airports)
- Industrial areas
- Energy exploration activities (oil & gas, tidal, wind)
- Real estate
- Waste handling facilities
- Environmental enrichment
- Recreational areas

This demand for new land is reflected in Boskalis' key business activities, whereby we assist customers in developing a broad range of projects.
Long-term growth in the energy and port market segments is the result of global trends such as:
- Growth in world population
- Expansion of global trade
- Increasing energy consumption

Many unique island projects are already present in more than 30 countries. And in the future man-made islands are expected to become an even more common site around the world.

OUR KNOW-HOW

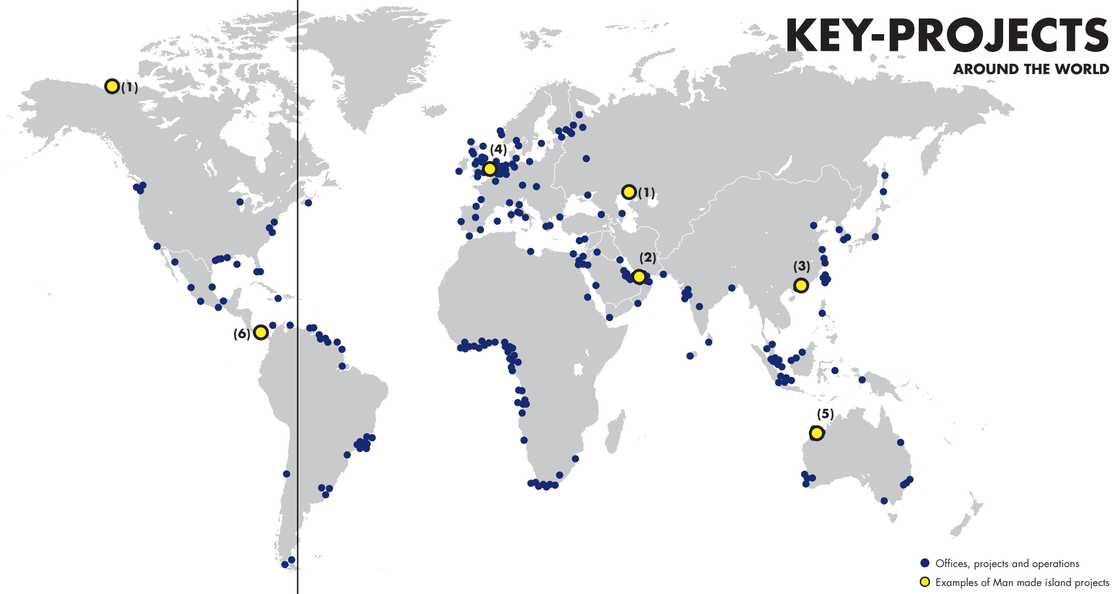
Initially, the development of man-made islands arose from the need for drilling wells for oil and gas production offshore. Boskalis played a pioneering role in the early days and this has continued. More than 40 years ago, a prolonged local presence and active involvement in ice research, meant that Boskalis became an expert in the design and construction of artificial islands in the challenging conditions of the Canadian Arctic using specialised dredging techniques.

Since then, Boskalis has followed the market trends and increasing demands, developing its fleet and technology accordingly. A multitude of islands of varied sizes, shapes and functions have been built by Boskalis worldwide.

Together with its in-house engineering consultancy "Hydronamic", Boskalis is able to provide tailor-made, quality-driven engineering advice, often creating unforeseen opportunities for clients.

Boskalis has the tools, means and resources to create any type of island, for every different use, everywhere.

KEY-PROJECTS
AROUND THE WORLD



1970s
Boskalis pioneers island construction in the Arctic (36 islands in the Beaufort Sea alone).

1980s
Construction of Zubaya and Halat Hail islands, the first ever built in the Gulf region.

1990s
Technological developments facilitate higher vessel capacity and large-scale projects leading to lower unit costs.

2000
Number, size and variety of projects increases. Islands are built as recreational areas or purely for environmental enrichment purposes.

2010
"Building with nature" philosophy: Islands can create opportunities for nature and, where possible, natural processes are utilized while developing the infrastructure.

(1) ARCTIC
Oil and Gas exploration in extreme conditions

- Drilling equipment protected from immense forces from polar ice floes
- Construction in short summer seasons
- Careful planning of supply routes and logistics
- Making use of in-house experience: Similar challenges were faced 30 years later for the construction of drilling islands in the North Caspian Sea.

(2) MIDDLE EAST
Long established presence with several island projects developed for different purposes

ZUBAYA ISLAND, UAE
- Water levels too shallow for floating drilling rigs but too deep for land based equipment
- Deep water access channels dredged for transportation of the drilling plant
- Use of dredged material to reclaim drilling pads.

KHALIFA PORT, UAE
- Built in two artificial islands 4.6km offshore near the most extensive coral reef in the Gulf
- Early involvement of Boskalis environment and engineering teams, which were on-site from the tender to the execution phase
- Extensive protective measures included a 6-km long "environmental breakwater" to protect the coral reef, both during construction and operational phases.

(3) SOUTH-EAST ASIA
Large-scale projects in densely populated areas

CHEK LAP KOK AIRPORT, HONG KONG
- Creation of a 1,248 ha island
- 250 Mm^3 dredged in 3 years
- Largest single dredging job at the time.

(4) EUROPE
Eco-engineering aims to limit environmental impact and to create added value opportunities for ecological development

BIRD ISLAND – PORT 2000, FRANCE
- Compensation measures: Built as a bird habitat for the port extension of Le Havre, France
- Strict design requirements to ensure the site met the needs of the various bird populations (extremely complex geometry to accommodate different species and their breeding habits)

IJSSELOOG, THE NETHERLANDS
- A kilometer-diameter repository in an artificial island built to contain contaminated bed material from the Ketel Lake
- Compensation measures: the newly created island and adjacent wetland habitats will continue to be developed as a recreational area and nature reserve

(5) AUSTRALIA
The Gorgon Project – Unique Physical and Environmental Challenges

ENVIRONMENTAL ENGINEERING EXCELLENCE AWARD 2012

- Dredging and construction works for a marine offloading facility near a Class A Nature Reserve of international significance
- Beneficial use of dredged material for island reclamation and bund construction
- Rock supply over a 1,500 km distance
- Very strict environmental and quarantine procedures
- 11 demobilizations and remobilizations due to cyclones

(6) AMERICA
Punta Pacifica – The first residential artificial island in the Americas
- Urban residential development in the congested city center of Panama City
- Sand body compacted to enhance density and provide seismic resistance