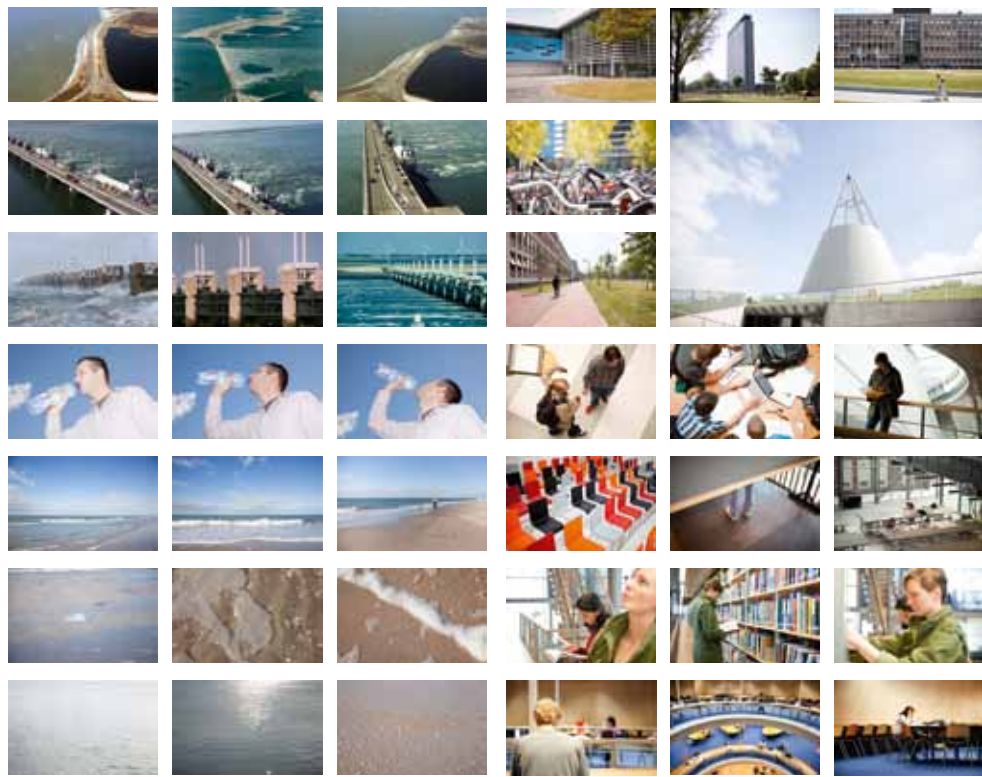




DELFT
WATER
DELTA
TECHNOLOGY

WELCOME





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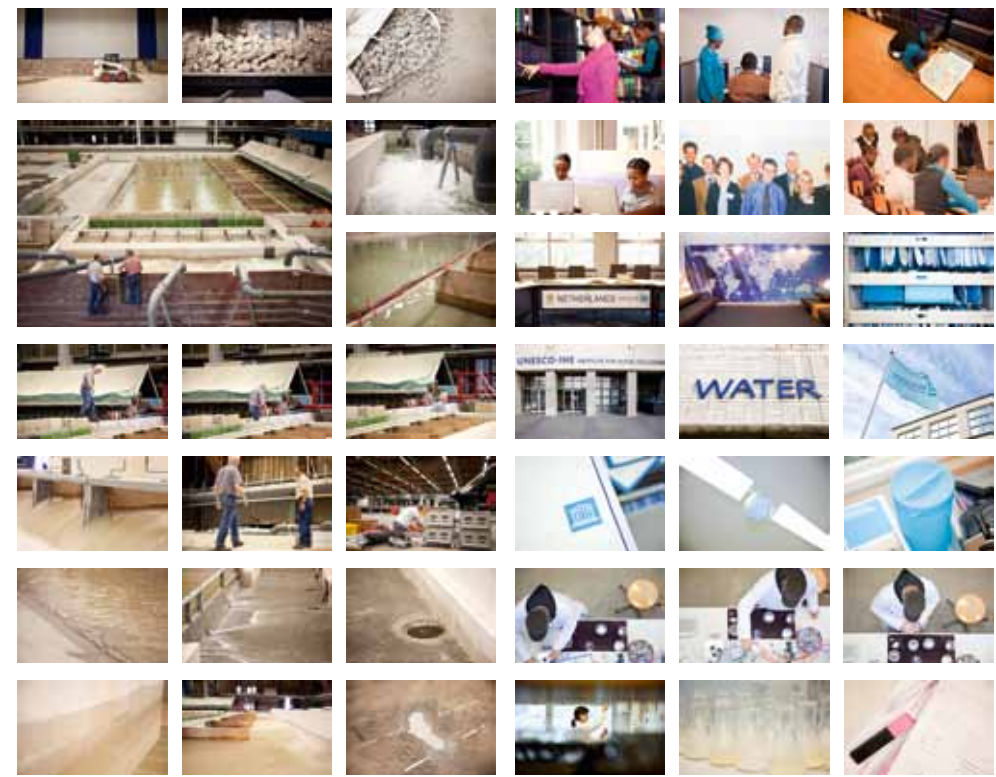
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*Delft is a lively
community and,
what's more, it
has a beautiful
historic city
centre with
something to
astonish you at
every turn.*

DELFT
WORKING
LIVING
ENJOYING

History is abundant in Delft's charming centre, where the Golden Age of the 17th century is beautifully preserved. Standing proudly along Delft's ancient canals are grand buildings which portray the city's rich history. Attractive modern-day architecture complements the historic backdrop. Scattered around the winding streets are quaint shops, offering goods ranging from the famous Delftware to contemporary design. The restaurants and cafés in Delft cater for every taste, from lavish feasts to trendy dining. Perhaps you would like to taste the history of the Prinsenhof or, on the contrary, study the contemporary art displayed in one of Delft's many galleries? Perhaps you fancy a stroll along the ancient canals, or a breath of fresh air in the Delftse Hout recreational area? Delft offers all of these pastimes.

'Delft, a strong brand'

Harry Baayen, CEO Deltares, on Delft's strong reputation in Delta Technology.

QUALITY OF LIFE

Life in Delft means much more than simply enjoying a world-famous historical city centre; it also means being able to live in the modern districts in and around Delft. Districts which offer proximity to the facilities offered by a large city, but with wide open spaces and the beauty of nature.

Positioned between the international city of The Hague and the world port of Rotterdam, Delft lies in the economic hub of the Netherlands. The Green Heart of Holland, with meadows, streams, woodlands and picturesque villages, forms the nucleus of this highly developed urban conurbation with more than seven million residents. Delft is in the very centre of the Green Heart and on its doorstep has a superb recreational area, the Delftse Hout.

NETWORKS

The proximity of Schiphol International Airport, Rotterdam Airport and International rail connections provide Delft with an excellent accessibility to the rest of the world. Further worldwide links are created through the countless networks and alliances between residents, institutions and businesses.

The eighth wonder of the world

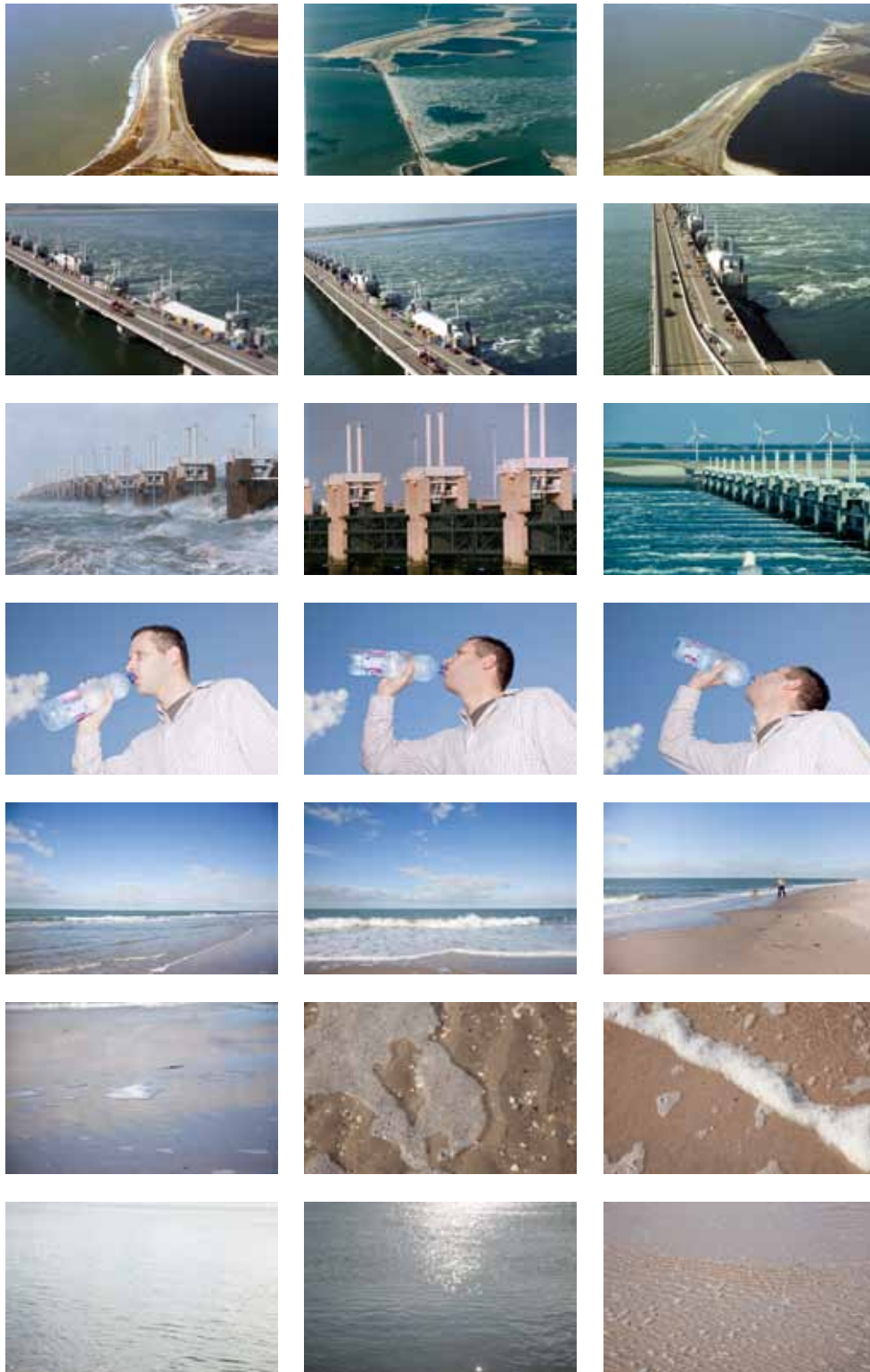
On the morning of 1 February 1953, the Netherlands awoke to a shock. A storm surge had flooded large areas of the Dutch provinces Zeeland, South Holland and West Brabant. More than 1,800 people lost their lives and tens of thousands lost their hearths and homes. "Never again", was the cry following the disaster. Less than three weeks later, the Delta Committee started work on a Delta Plan. For almost 50 years, the Netherlands worked on the construction of the Delta Works, a project of dams, sluices, locks, dikes and storm surge barriers to protect the Southwest of the Netherlands. At that time the thinking process behind hydraulic engineering underwent radical change. Not only was safety made the highest priority, but the environment and spatial planning came to play a significant role. Based on new technologies, the most complex water defences in the world were to be developed, the focal points being the nine-kilometre-long sealable storm-surge barrier in the Eastern Scheldt and the movable Maeslant Barrier near to Rotterdam. The development and construction of the 'eighth wonder of the world' are testimony to the reputation of the Netherlands as a trend-setter in coastal engineering.

DELFT LIES AT THE CENTRE OF THE BEATING HEART OF THE NETHERLANDS



*Part of the Science Port Holland Science Park





The Netherlands and Water

ENVIRONMENT SAFETY COOPERATION

Delft and water are intertwined. There is ample evidence of this relationship, from the centuries-old canals in the inner city of Delft to new technologies for water purification, from the development of the Delta Works to the innovative use of micro-organisms in dike reinforcement.

WATER AND DELTA TECHNOLOGY

Worldwide an increasing number of people are settling in economically attractive deltas, coastal areas and river basins. These low-lying areas offer opportunities, but are also vulnerable. Integrated solutions are required. When water and the subsurface are critical factors, the debate will be about more than just technological issues. For example, we take spatial planning, nature and legal and economic processes into account. Issues must be approached from various angles. Delta technology applies the relevant knowledge in integrated ways to enable safe and sustainable living in delta areas. Water technology focusses on innovative techniques and approaches for the public water supply and wastewater treatment.

INTEGRATED

The Delft research institutes work closely with one another to ensure that these integrated solutions can be offered throughout the world. Not only do they work together, but they also forge close ties with other organisations in the Netherlands. Under the name Delft Blue Technology, the municipality of Delft and the Delfland Water Board have offered up the area they control to research institutes in Delft as a site for experiments, pilot projects and showcases. Delft's research institutes are also playing an important role in the Dutch Delta Design 2012 initiative. Under this initiative, dozens of companies and institutes are combining their strengths to further reinforce the role of the Netherlands as a knowledge hub for water and delta technology.

Polder model

The 'polder model' is a term that describes the way in which Dutch people arrive at a solution through cooperation and discussion. This close cooperation originated many years ago, when the Dutch people were forced to work together when building dikes and when impoldering and reclaiming land. The first 'Water Boards' were formed in the Middle Ages, the idea being to share the costs of the fight against the water. The history of the Higher Water Board Delfland - the water board responsible for the municipality of Delft - dates back to the 13th century. Despite this long history, Delfland is a very modernistic company. The water board works closely with the research institutes based in and around Delft. Delfland is also one of the originators of the Delft Blue Technology initiative, where the area controlled by the Higher Water Board and the municipality of Delft serves as a site for experiments and a showcase for water and delta technology.

EDUCATION RESEARCH DEVELOPMENT

With Delft University of Technology (TU Delft) and UNESCO-IHE, Delft is home to two authoritative institutes for education, research and the development of knowledge in the field of water and delta technology. Delft's leading position in technical and creative education is further reinforced by branches of the INHolland University of professional education and The Hague University.

THE TU DELFT

The TU Delft has a long history of scientific research in the field of water. The Civil and Hydraulic Engineering faculty (which later became Civil Technology) was the birthplace of the Zuiderzee Works and the Delta Works. At the Water Research Centre Delft, the TU Delft has combined all forms of research involving water. At this research centre, five faculties are working together on international research in safety, construction at sea and the provision of drinking water.

Building with Nature

Using the power of nature is the basic premise behind the Dutch innovation programme 'Building with Nature'. Optimal use of the opportunities offered by nature is the thinking behind the sustainable establishment of coastal, delta and river areas. From 'doing less badly' (the limitation of the negative effects) to 'doing well'. One of the first projects being performed under the innovation programme is the reinforcement of the coastal strip at Delfland. To develop the coast, a considerable amount of sand has been deposited which, aided by the tides and currents, subsequently distributes itself along the coast, therefore reinforcing the dunes and widening the beach.





In Delft's historic city centre, the Dutch Golden Age of the 17th century has been beautifully preserved.

'A world-class level of knowledge is available at the institutes in Delft'

Wim Drossaert, Director of MWH|Syncera, on the water and delta technology cluster in Delft.

Clever bacteria

It sounds like a medley of science fiction and the legend of Hans Brinker, the brave Dutch boy who put his finger in a hole in the dike to prevent a flood. The Deltares research programme into the use of microbiology to improve soil is called SmartSoils. The research programme integrates various areas of knowledge in which Delft excels, such as industrial biotechnology, geotechnology and nanotechnology. This has resulted in the creation of a new specialisation, bio-geoengineering, at the forefront of which is Deltares and the TU Delft. Deltares has already enjoyed early success with the SmartSoils project; it acquired a patent for 'Biogrout', the reinforcement of ground through the production of calcite. Using the innovative Biosealing process, holes were sealed in an aqueduct in Haarlemmermeer and a dike in Austria. This is probably only the beginning of groundbreaking developments.

UNESCO - IHE

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Is the Netherlands able to share the experience gained from the Delta Works with other countries? This was the question that led to the formation of the international water institute, IHE, in 1957. In 2003, the institute was incorporated into the United Nations, forming the UNESCO-IHE Institute for Water Education. Over some fifty years, more than 14,500 students, from more than 150 different countries have followed educational programmes in water and the environment at UNESCO-IHE. The UNESCO-IHE institute is the only organization in the UN system authorized to confer accredited MSc degrees. The institute also plays an important part in research and policy development in the field of water and delta technology for developing countries.

INTEGRATED MULTIDISCIPLINARY KNOWLEDGE

A wide perspective of the problems, a multidisciplinary approach and close cooperation. These are the characteristics of the research institutes for water and delta technology in Delft.

TNO

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Research at TNO focuses on innovative solutions for wastewater and clean drinking water. The recycling of wastewater and rainwater by private individuals and industry demand solutions that can be applied locally. The TNO is working on new technologies and water systems, by combining membrane technology, microbiology and electrochemistry.

DELTA RES

/
Deltares is an independent research institute for water, soil and subsurface issues and is active in deltas, coastal areas and river basins throughout the world. It was founded in 2008 through the merger of Delft Hydraulics, GeoDelft, the Subsurface and Groundwater unit of TNO and parts of Rijkswaterstaat. Deltares develops knowledge for innovative solutions that make living in delta areas safe, clean and sustainable. Through a multidisciplinary approach, Deltares can offer integrated and innovative solutions for living safely and sustainably in delta, coastal and river areas.

SPIN-OFF COMPANIES

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The presence of large research institutes provides fertile ground for engineering firms and spin-off companies. The wide-ranging expertise available at the various firms characterises the versatility of Delft's water sector. For example, Deltasync is an important research centre for urban planning in delta regions, with expertise in floating constructions. Alert Solutions develops innovative measurement systems for dikes, roads and water defences. Finally, MWH, which is an engineering and environmental management consultancy based in Delft specialising in dealing with water, waste and energy using sustainable technologies.

Drinking Seawater

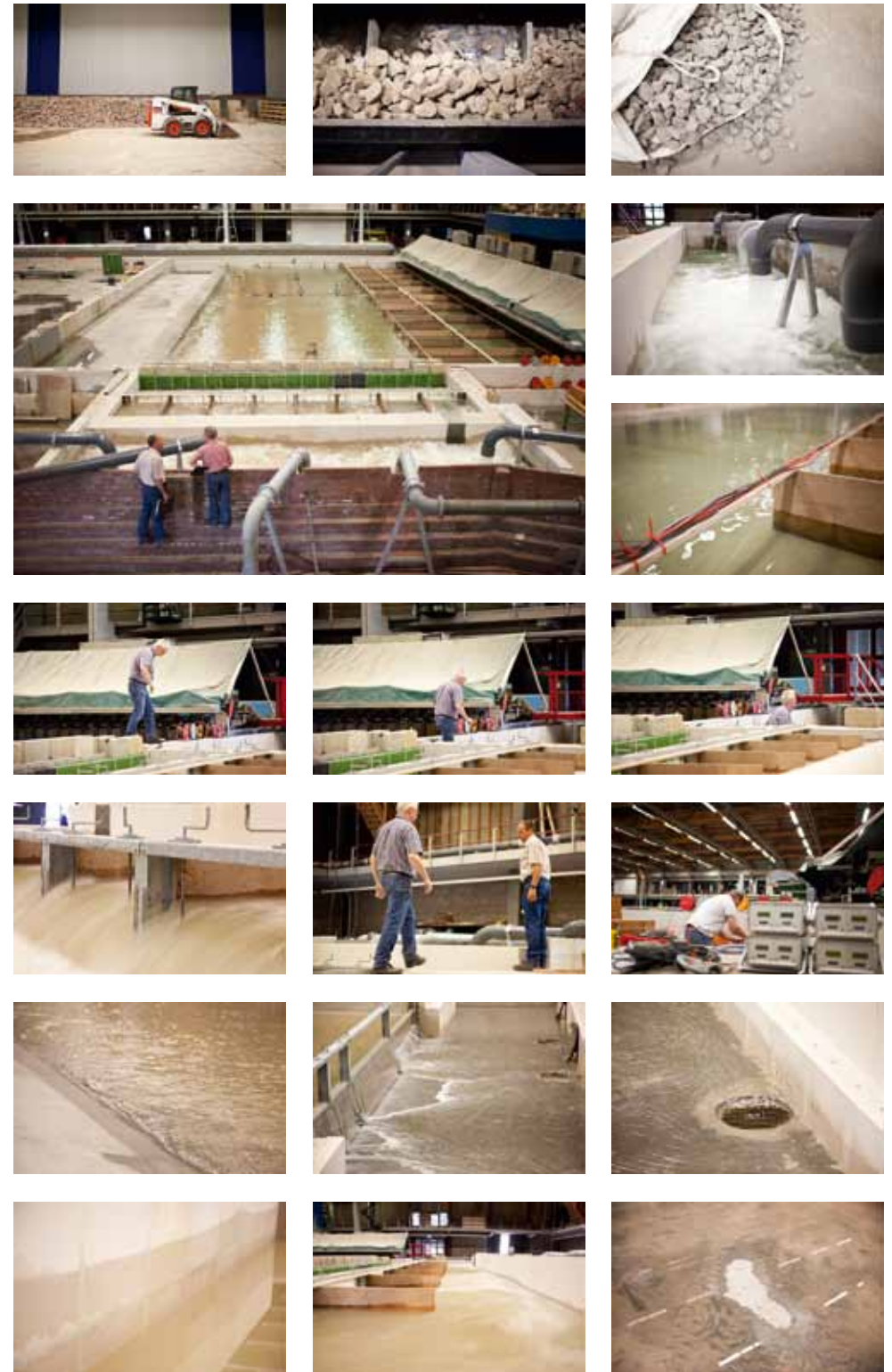
Water pollution and a shortage of clean drinking water are gradually becoming more problematic throughout the world.

Both the TU Delft and TNO work towards innovative solutions for water purification.

BiAqua is a purification technique developed by the TU Delft; this technology is not based on chemical or physical solutions, but on biomaterial.

BiAqua eliminates phosphate, a chemical that acts as food for bacteria and algae, and combats carcinogens, including arsenic and bromide. As a spin-off company of the TU Delft, BiAqua works on the commercial application of this technology.

TNO developed Memstill, a new technology that produces clean drinking water from seawater. Memstill works without using chemicals; ultra-fine filters purify and desalinate the sea water. Memstill has already been used successfully in Singapore.



Deltares, Testing Facility

AMBITION INNOVATION SCIENCE PORT HOLLAND

Science Port Holland, a high-quality Research and Development Park covering about 1,200,000 square metres planned for the south side of Delft, is currently under development. This hotspot for high-tech knowledge exchange and innovation is situated just a stone's throw from the TU Delft and TNO.

AMBITION /

Science Port Holland's ambition is to be one of the best and most important science parks in Europe. The combination of research institutes and R&D activities is unique in the Netherlands and will have an international impact. Companies that establish themselves in Science Port Holland can make maximum use of the knowledge at the TU Delft, the TNO, Deltares and the Erasmus Medical Centre in Rotterdam, and rely on the full cooperation of the authorities in a leading economic location.

Water and delta technology are the main aims in the acquisition of Science Port Holland. Deltares is located at the edge of the Science Port Holland. The institute plans to create a 300-metre-long delta gully in the science park, which would enable the testing of complex situations on a 1 to 1 scale.

ACCESSIBLE /

Science Port Holland consists of Technopolis and Schieveen, two sites alongside the A13 motorway between Delft and Rotterdam. In the future, users of public transport will benefit from a new tram line passing through the university district, running from Delft Station and with a terminus at the Technopolis and (perhaps at a later stage) Schieveen.

Early Warning

As a result of climate change, flooding is more common nowadays. This emphasises the importance of a reliable prediction system for delta regions. The Flood Early Warning System (Delft-FEWS) from Deltares links together various sources of information, such as weather forecasts, water levels and simulation models for the progress of floods. Numerous smart software modules enable a customised prediction system to be built anywhere. This system would provide an overview of the flood risks, as well as the dangers in terms of water quality. Delft-FEWS is currently already used in England and the United States, and is on its way to becoming the world standard for water information systems.



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and nature
lovers.

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