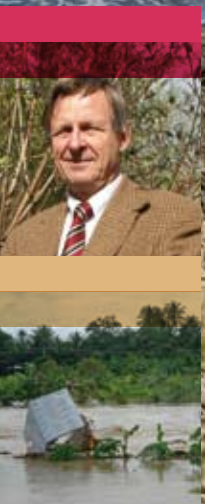


# Building with nature

A new answer to climate change



Professor Han Vrijling, Delft University of Technology:  
“Maintain existing dikes properly”

Climate-proof reconstruction  
of Aceh

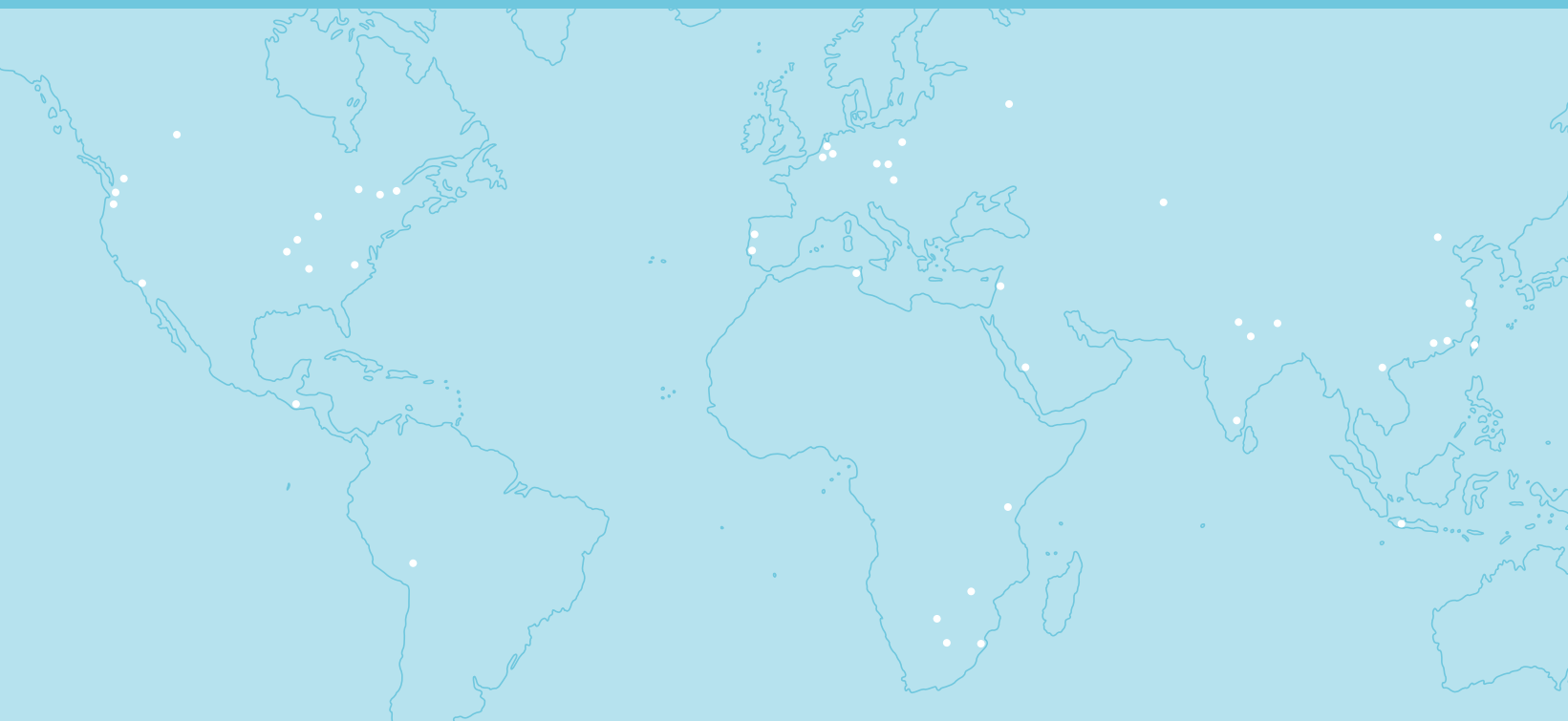
## DHV GROUP, CONSULTANTS FOR THE SUSTAINABLE DEVELOPMENT OF OUR LIVING ENVIRONMENT

The DHV Group is a global provider of consultancy and engineering services in the markets of Transportation (including Aviation), Building & Manufacturing, Water, Spatial Planning & Environment. We meet our clients' needs by applying the concept of '*Local Delivery of Global Solutions*': the cutting-edge knowledge of the group is provided through a close-knit network of offices in Europe, Asia, Africa and North America.

Our network of colleagues and alliances is connected through our shared mission, values and projects, focused on the development of innovative concepts and solutions for a sustainable development of our living environment.

## OFFICES WORLDWIDE

Bolivia, Botswana, Canada, China, the Czech Republic, Guatemala, Hong Kong, India, Indonesia, Israel, Kenya, Mozambique, Nepal, the Netherlands, Poland, Portugal, Russia, Saudi Arabia, South Africa, Taiwan, the US, Vietnam, Zimbabwe.



### COLOPHON

DHVTimes reports on the worldwide activities of DHV. The magazine is published three times a year and is available free-of-charge. To subscribe, please contact the editor. Meet us at [www.dhv.com/dhvtimes](http://www.dhv.com/dhvtimes) or call +31 33 468 20 15.

### EDITORIAL BOARD

Shanti Chelliah, Andrea Conrad, Henk Gerritsen, William Hartman, Robin Hayes, Dick Kevelam, George Onderdelinden, Jan Oomen, Peter Vlugt.

### CORRESPONDENTS

Machteld Blokhuis, Andrea Conrad, Gea Peek, Mirjam Soeterbroek, Mariken Broekhoven, Robin Hayes, Tim Jeanné, David Ji, Anke Mastenbroek, Anneke ter Mors, Sandra van Pernis, João Valle Costa.

### CONTRIBUTORS

Peter Vlugt, Harry van Doorn, Addo van der Eijk.

### EDITORIAL TEAM

DHV, Peter Vlugt (editor in chief), Suzanne van der Werf. P.O. Box 1132, 3800 BC Amersfoort, tel +31 33 468 20 15, fax +31 33 468 20 33, e-mail [dhvtimes@dhv.com](mailto:dhvtimes@dhv.com).

Other publications may use articles with prior permission and acknowledgement of DHVTimes as the source.

### TRANSLATION

DBF, Alphen a/d Rijn, the Netherlands.

### LAY-OUT

DHV, Shared Service Center Communications, Bert van Rootselaar.

### PHOTOGRAPHY

Arriva (8), BV Beeld (11), DHV (3, 6, 9, 10, 11, 12, 13, 16, 18, 19), Ed Seeder Fotografie Heerhugowaard (7), Flickr.com (12,18), Hollandse Hoogte (omslag, 14, 15), Jan Zonneveld (17), NACO (90), Perkins & Will (12), Rijk Meerbeek (4, 5), SSI (10), VN (10).

### PRINT

Servicepoint, Amersfoort, the Netherlands. Printed on chlorine-free bleached paper.



# Strong combinations

- 4 **INTERVIEW**  
Professor Han Vrijling, Delft University of Technology:  
“Maintain existing dikes properly”
- 7 **ON LOCATION**  
‘Passive houses’, Roosendaal, The Netherlands
- 8 **PROJECT**  
Green gas for buses
- 9 **DHV GROUP NEWS**
- 13 **PROJECT**  
Study of CO<sub>2</sub> storage below the North Sea
- 14 **COVERSTORY**  
Building with nature
- 17 **PROJECT**  
Climate assessment of sea defenses Aceh
- 18 **SHORT NEWS**  
‘Building with Nature’ conference
- 18 **SHORT NEWS**  
Yellow River expedition
- 19 **VISION**  
Marjan den Braber, DHV:  
“We want to make our designs climate-proof”

There are no two ways about it: the climate is changing and the consequences are far-reaching: communities will be disrupted by periods of extreme drought, sudden floods and frequent cyclones. All over the world there are experts who are seeking creative and sustainable solutions to these problems. The experts at DHV Group willingly take on this challenge. Our comprehensive specialized knowledge plus knowledge of the specific local situation add up to a strong combination that enables us to meet the needs of authorities, companies and private organizations.

For almost 100 years now, we have been delivering solutions for protection against climatic effects. Matters that are growing in importance include the local situation and culture, nature and environment, economy and climate change in the long term. This edition of DHV Times is a showcase for these challenges. A highly promising approach is the concept called Building with Nature (page 14). Moving in step with the forces of nature makes it possible to combine land reclamation, flood protection and nature conservation. Our initial projects have received praise and I am convinced that more will follow. Another strong concept is the extraction of biogas from sewage sludge (page 8). It is an approach that brings together different areas of specialization to produce considerable added value; the use of sludge from a water treatment plant to obtain gas that fuels city buses. It reduces the waste problem and the buses no longer emit carbon dioxide or particulate matter.

Thinking about the climate is advancing. It is a challenge that requires cooperation between the public sector, knowledge institutions and private sector. The climate is another example of an issue that calls for innovation, and we want to put and keep its urgency high on the agenda. The challenge is enormous and multifaceted. By providing integral solutions, we will continue to make a positive contribution to assuring a sustainable living environment.

Bertrand van Ee  
Chairman of Executive Board  
DHV Group



Professor Han Vrijling was closely involved in the 1970s in one of the most famous Dutch flood defenses: the Eastern Scheldt storm surge barrier. The barrier was designed to withstand extreme gales and high water for a prolonged period of time. A quarter of a century later, climate change is preoccupying us as never before and experts predict a significant rise in sea levels. Should we again embark upon such prestigious projects on this scale, or should we adopt a different approach? Professor Vrijling remains down-to-earth and advocates above all the proper maintenance of existing dikes.

Professor Han Vrijling, Delft University of Technology:

# “Maintain existing dikes properly”



**What is climate change and how great is the problem globally?** — “Climate change is a worldwide problem. Basically, the climatic phenomena are becoming more extreme everywhere. We must be ready for more and severer storms and for more periods of greater heat and cold. A logical consequence of these extreme conditions will be a shortage of water at one place and a big peak at another. The changes will also create a situation where certain places will be hit by more frequently by more severe gales. The scale of the problem is far from clear at present. There are mostly predictions and whether they will become reality is uncertain. Twenty-five years ago it was already predicted that before the year 2000 the water would rise by more than 1 meter, but it did not happen. So you have to be realistic. We should not allow ourselves to be overcome by anxiety but should continue to take measurements.”

**What is the scale of the problem and where are the risk areas in the world?** — “It’s a global problem. Everywhere in the world there are areas located in the danger zone. Well-known risk areas obviously include the low-lying deltas such as the Netherlands, but also river basins. Parts of Central England went under water in 2007 because the rivers were unable to cope with the large quantity of rain. Those areas were either unprotected or protected by poor dikes or dikes that were too low. This exposes the

## HAN VRIJLING

Professor Han Vrijling (1947) qualified as an engineer in 1974 at the Delft University of Technology, followed by a degree in business economics in 1980. In 1976, he worked on the design of the storm surge barrier in the Eastern Scheldt in Zeeland province in the Netherlands. It was there that he developed the probabilistic approach to designing flood defenses. He was responsible for all the research for the project. In 1986, he was named Deputy Head of the Water Engineering Department of the Construction Division of the Directorate General for Public Works and Water Management. In 1995 he was appointed professor of Hydraulic Engineering and Probabilistic Design at the Delft University of Technology. From 1980 to 2005 he was involved internationally in numerous hydraulic engineering design projects.

areas to danger. Just look at what happened in New Orleans in 2005 because of Hurricane Katrina. The dikes there were unable to withstand such a storm.”

**Which changes must we make because of climate change, and is climate adaptation a solution?** — “If the predicted rise in sea levels continues, we must make sure that there are reliable sea defenses. In actual fact the condition of the dikes is a far more urgent problem than the gradual rise of water levels. Many dikes are already too low or are poorly maintained, even in the Netherlands. I would tackle the existing dikes before embarking on new, ambitious projects. In principle, you can raise and widen dikes endlessly. You can also hold back water by more natural, adaptive methods such as having unembanked marshland that grows in step with rising water levels. >>

**“We must measure properly and not panic”**



It's more attractive, but also more expensive. Ultimately, it is up to politicians to pick the method, and in part the decision will depend on how much money they are willing to pay to protect the country. In the Netherlands, only 0.2% of national income is spent on dikes. That's not much."

**DHV Group has offices in countries including the Netherlands, Indonesia, Portugal and China. What should these countries prepare for and over what kind of timeline?** —

"All countries in the world need to be ready for the effects of climate changes. The problem is that rich countries are better able to do so than poor countries. Bangladesh, Burma and Vietnam have agricultural economies and lack the money to build ultramodern sea defenses. Without interventions the agricultural parts of these countries will be flooded more and more often. This could be an economic disaster for the industrial parts. You cannot do this to people. So measures need to be taken urgently."

**What are the most important measures that must be taken and when should they be in place?** —

"As I said, what we need more than anything else are properly maintained dikes. Even in the Netherlands only 44% of dikes satisfy safety re-

**"All countries in the world need to be ready for the effects of climate changes"**

#### RESPECT FOR WATER

Water should be held back, but it should also be given space if circumstances so demand. The world needs solutions which address the interests of both mankind and nature. We must think of land and water, of today and tomorrow. Within the DHV Group, SSI, Delcan and Hydroprojekt cooperate in the field of water management. They present a clear vision and offer appropriate solutions, whereby the keywords are *quality, quantity, sustainability* and *safety*. Other important considerations are cost, and achieving harmony between residential, business and recreational usage.

quirements, despite the numerous disasters and warnings in recent years. The other 56% either do not meet requirements or it is unknown whether they do so. Apparently, the maintenance of dikes is not 'sexy' enough and there is a far greater preference for new and major projects. I would say this: we should not allow ourselves to be swept along by grand stories about enormous rises in sea levels. Do not panic and start by properly measuring the changes. The action taken needs to be appropriate to the results. It is far more important to get existing dikes into good shape than to set up all kinds of new and ambitious projects. There is in any event a great demand for safety, so there will undoubtedly be a lot of work for companies like DHV." ●

**INFO** Tjibbe van Ellen

**TELEPHONE** +31 33 468 33 98

**E-MAIL** tjibbe.vanellen@dhv.com



## 'Passive houses' active in saving energy



Later this year, three new houses will be completed in the De Kroeven district of Roosendaal, a city in the south of the Netherlands. The houses are in a striking red cuboid form, with one corner largely taken up by windows. Other than the color and the design, however, there is little to suggest that these houses are any different to their counterparts elsewhere. But these are 'Passive houses', and the first of their kind in the Netherlands. DHV has acted as energy and building physics consultants throughout the design and construction process. A Passive house has extremely low energy consumption due to the use of special insulation, its orientation to the sun and its compact design. DHV experts working on this project state that the maximum energy requirement for

heating is only 15 kWh/m<sup>2</sup>, approximately one third of that of a traditional housing unit. The Roosendaal houses are the first social housing project in the Netherlands to incorporate this concept and were commissioned by the Aramis housing association. The Passive house principle can be used in both residential and non-residential property, and both during construction or later renovations. DHV is currently involved in several other Passive house projects in the Netherlands and is a partner in the 'Promotion of European Passive Houses' project (PEP). ●

**INFO** Ragna Clocquet / Loes Joosten

**TELEPHONE** +31 40 250 92 59 / 94 08

**E-MAIL** ragna.clocquet@dhv.com / loes.joosten@dhv.com

# Cleaner, quieter, cheaper



The Dutch Province of Zuid-Holland commissioned DHV to develop the idea of 'green' gas for the public transport buses in the city of Dordrecht.

## PROJECT

Buses powered by green gas

## LOCATION

City of Dordrecht, the Netherlands

## COMMISSIONING CLIENT

Province of Zuid-Holland

## DHV'S ROLE

Bringing together the supply and demand sides, producing the business case, providing technical, financial and process-related expertise.

## DURATION

By 2011, seventy buses powered by green gas will be in service in Dordrecht.

**By 2011, many of the buses serving the Dutch city of Dordrecht will be fuelled by 'green' gas produced from waste vegetable matter and the by-products of water purification processes. This is clearly good for the air quality in the city, and for the environment in general. A notable feature of this project is that it involves the entire chain, from water treatment plant to bus company. DHV was able to consolidate the many advantages into 'an offer that can't be refused'.**

Diesel fumes from buses are not only bad for human health, they can stand in the way of the future development of our cities. Building plans are often rejected due to poor air quality. Dordrecht has experienced this problem on a number of occasions. However, once the buses operated by local transport company Arriva are powered by green gas, the city will once again be able to breathe easily. "Green gas has many advantages as a transport fuel," explains Pieter Tanja, a DHV strategic consultant specializing in sustainable mobility. "Apart from being almost climate-neutral, gas-driven engines emit a far smaller quantity of fine particulates and are considerably quieter." The figures are indeed impressive: an 80% reduction in fine particulates, 95% less nitrogen dioxide and (overall) a near-100% reduction in CO<sub>2</sub> emissions. The opportunities in Dordrecht are exciting. "The entire chain can be located on one and the same site: the water treatment plant and waste management center which provide the raw materials from which the green gas is produced, and the bus company itself. This reduces the cost of transport and greatly

increases energy efficiency." In Dordrecht alone, 2.6 million kilograms of green gas can be derived from waste every year. That is enough to run some seventy buses.

DHV was commissioned by the Province of Zuid-Holland to develop the idea and bring the various parties around the table.

"Because our plan involves a particularly large-scale application, investments can be recouped relatively quickly. The parties are extremely enthusiastic," says Helle van der Roest, principal consultant with DHV Water, who has now joined the discussions along with Katrien Hemmes, senior (bio) energy consultant. Their participation illustrates the broad scope of the project.

"The business case for the chain as a whole demands expertise drawn from various disciplines. DHV can offer all the required knowledge. As a water specialist, Van der Roest's focus is on the 'sludge' which is left over after the water treatment process.

"Rather than drying it out, burning it or composting it, the sludge can be converted into gas in large fermentation tanks. The quality of that gas is equivalent to that of

natural gas," he states. "And the same can be done with waste vegetable matter," adds Katrien Hemmes. Success in Dordrecht is just the beginning. The various disciplines within DHV are now combining their strengths to promote further green gas projects throughout the country. "We are already involved in setting up four similar projects," Van der Roest announces. ●

**INFO** Helle van der Roest, Katrien Hemmes or Pieter Tanja

**TELEPHONE** +31 33 468 24 07 / 27 21 / 30 19

**E-MAIL** helle.vanderroest@dhv.com, katrien.hemmes@dhv.com, pieter.tanja@dhv.com

# DHVnews

Gansu Green School / United Nations Global Compact / Climate change study / Largest arch bridge in Poland / Climate effects by region / Sustainable museum in Shanghai / Russian megaproject completed / Online helpdesk sustainable procurement helpdesk / Biodiversity website

NACO will make a major contribution to the development plans for King Khalid International Airport, Riyadh

## MASTER PLANS FOR AIRPORTS SAUDI ARABIA

INFO Andrea Conrad

TELEPHONE +31 70 344 63 00

E-MAIL andrea.conrad@naco.dhv.com

In order to accommodate an increasing number of flights and to promote regional economic growth, the civil aviation authorities in Saudi Arabia have announced substantial investments in King Fahd International Airport (Dammam) and King Khalid International Airport (Riyadh). NACO, a DHV Group company, has been commissioned to produce the 'master plans' which will determine the long-term development of these airports. This involves identifying all expansions and improvements which are likely to be required between now and the end of the plan period in 2038. The master plans are to be completed in early 2009. In addition to providing technical services, NACO will join DHV and Innova Aviation Consulting LLC in performing a full Environmental Impact Assess-

ment and a financial-economic analysis. The partners will also produce landside simulations and investigate ways of increasing income from activities such as retailing and catering. ●

## GREEN HEART

INFO Remko Rosenboom

TELEPHONE +31 33 468 31 44

E-MAIL remko.rosenboom@dhv.com

Are current spatial developments in the 'Green Heart' region of the Netherlands able to withstand climate change



DHV has investigated the likely effects of climate change on the landscape of the Green Heart region, much of which comprises peat meadows. The peat could gradually dry out.

over the next one hundred years? A study conducted by DHV and H+N+S Landscape Architects suggests that, unless appropriate measures are taken, agriculture, nature and the urban environment could suffer serious adverse impact due to a shortage of clean, fresh water. This finding is based on the 'driest' climate change scenario. The researchers are therefore calling for gradual but effective measures to be put in place to avert this situation. The study was commissioned by the provincial authorities of Zuid-Holland

and Utrecht and relied on the 'backcasting' method, which entails working backwards from a certain future situation to determine precisely when certain policy decisions must be made. ●

## NEW COASTAL UNIT BOHLWEKI-SSI

INFO Tandi Breetzke

TELEPHONE +27 031 719 5536

E-MAIL tandib@ssi.co.za

Bohlweki-SSI Environmental has established a coastal management unit to provide expert assistance on coastal projects and to develop capacity, particularly within coastal municipalities. The unit will address sea-level rise and coastal erosion in South Africa. The young unit has drawn up a couple of specialist reports already, and has also been appointed to assist the Provincial Environment Department in respect to providing short-term specialist support. In addition, the unit has applied to undertake two inno-



The coastal management unit of Bohlweki-SSI will focus on the rising sea levels and coastal erosion in South Africa.



Children attending Xinhuaamen primary school will soon have a new school building, thanks in part to DHV's donation. Their old school was irreparably damaged by the earthquake of may 2008.

vation projects, one to assist coastal local authorities and communities preparing for climate change, and another one to prepare a toolkit for the implementation of the National Environmental Management: Integrated Coastal Management Bill (soon to be enacted). ●

## GANSU GREEN SCHOOL

**INFO** Tiffany Tsui  
**TELEPHONE** +31 33 468 39 93  
**E-MAIL** tiffany.tsui@dhv.com

Xinhuaamen Elementary School, a school located in Tianshui City, in China's Gansu Province, suffered irreparable structural damages during the earthquake which struck China in May 2008. Arcelor Mittal (China) Co., Ltd. has committed to donating all the materials needed for rebuilding the school, and has appointed DHV as its leading design consultant. DHV's challenge is to design and construct a sustainable, earthquake-proof school building. As the school

will be a showcase building, it is important to come up with a design that will fit local needs and budgets. Furthermore, it will have to be replicable elsewhere. The original building had a 4,122 square-meter floor area, which will be increased to 6,600 m<sup>2</sup>. When completed, the school will accommodate 2,000 students. It will be a joint effort of DHV Shanghai (the leading consultant) and KOW Architects (DHV's partner). DHV Shanghai will participate on a zero-profit basis. ●

## UNITED NATIONS GLOBAL COMPACT

**INFO** Tobias Stöcker  
**TELEPHONE** +31 33 468 25 07  
**E-MAIL** tobias.stocker@dhv.com

The DHV Group has joined the United Nations Global Compact, a worldwide voluntary corporate-responsibility initiative. By joining the compact, the DHV Group is incorporating the principles of the Global Compact into its strategy, culture and day-to-day operations.



The initiative was founded on the principle that business, trade and investment are essential pillars for prosperity and peace. But in many areas, business is all too often fraught with serious problems, like exploitative practices, corruption, income inequality, and barriers that discourage innovation and entrepreneurship. By engaging in responsible business practices, companies can build trust and social capital in many ways, thus contributing to broad-based development and sustainable markets. The DHV Group will communicate annually and publicly the progress made in implementing the principles of the Global Compact. ●

## CLIMATE CHANGE STUDY

**INFO** Luis Alperin, MSc  
**TELEPHONE** +613 738 41 60  
**E-MAIL** l.alperin@delcan.com

The Corporation of the City of London in Ontario, Canada, hopes to learn what impact climate change will have on its public infrastructure, like roads, bridges and pumping stations. Therefore, the City is developing a Climate Change Adaptation Strategy, in partnership with the University of Western Ontario (UWO) and Delcan, to balance the analytical academic review with practical engineering expertise. The strategy will also look into current and future design standards, adaptation of current planning studies and the adaptability of existing infrastructure to handle future conditions. The first study commissioned as part of the strategy is to make a high-level assessment of the vulnerability of the infrastructure to changing climate conditions. An original systematic proce-



The largest arch bridge in Poland, co-designed by DHV Polska.

ture will be used to gather and examine available data in order to develop an understanding of the relevant climate effects and their interactions with infrastructure. So far the city has committed 1.3 million over three years to developing the strategy. ●

## LARGEST ARCH BRIDGE IN POLAND

**INFO** Cezary Saganowski  
**TELEPHONE** +48 22 606 29 52  
**E-MAIL** cezary.saganowski@dhv.com

The largest arch bridge in Poland was recently opened just outside the city of Pulawy. It is part of the city's peripheral road and spans the River Vistula. At a total length of 1038 meters with a free span of 212 meters, this is also one of the largest bridges in all Europe. The bridge was designed by DHV Polska in association with its partner Pomost, and has been named after the late Pope John Paul II, who was himself from Poland, of course. DHV Polska was also responsible for the original

feasibility study and the Environmental Impact Assessment. ●

## CLIMATE EFFECTS BY REGION

**INFO** Monique de Groot  
**TELEPHONE** +31 570 63 93 48  
**E-MAIL** monique.degroot@dhv.com

Dutch provincial authorities want to know how to take account of climate change in their spatial planning activities. A consortium comprising DHV and two Dutch research institutes, Alterra and KNMI, has therefore produced a 'cli-

mate sketchbook' for seven provincial authorities. It contains a full list of all potential climate effects that each province could face. The consortium has now been commissioned by the Association of Netherlands Provinces to start work on a follow-up project which will focus on the effects of climate change on nature management, agricultural policy and regional water management. The consortium is also working on a 'geo-database' which will contain all available information about our changing climate and the likely consequences at provincial level. The Association of



Living on water: the future for the Netherlands?

Netherlands Provinces has produced a brochure setting out the main findings of the climate sketchbooks. ●

## SUSTAINABLE MUSEUM IN SHANGHAI

**INFO** Tiffany Tsui  
**TELEPHONE** +31 33 468 39 93  
**E-MAIL** tiffany.tsui@dhv.com

A new Natural History Museum is soon to be built in the center of Shanghai, China. Its design must meet very stringent sustainability requirements. The museum's management has asked DHV to form an international, multi-disciplinary Sustainability Team to oversee all aspects of the design and structural engineering processes. In doing so, DHV will work closely alongside the architects, Perkins & Will, the Tongji design institute and Royal Haskoning China. The intention is that the new museum should be the first in China to hold the LEED Gold certificate. LEED (Leadership in Energy and



Artist's impression of the Shanghai Natural History Museum at night.



DHV was responsible for the complex hydraulic engineering for the St Petersburg Storm Barrier.

Environmental Design) is the benchmark standard for the design, construction and operational management of 'green' buildings with high energy efficiency. ●

## RUSSIAN MEGA-PROJECT COMPLETED

INFO Ben Reeskamp

TELEPHONE +33 468 33 67

E-MAIL ben.reeskamp@dhv.com

On October 8, the gates of the St Petersburg Storm Surge Barrier were officially opened to shipping by Vladimir Putin, Prime Minister of Russia. The barrier has a total length of 25.4 kilometers, and is the largest and most complex dam structure in the world. It includes six lock complexes, a tunnel, a movable bridge, dams with a total length of 23 kilometers and two shipping channels, one of which can be closed off by flood gates modeled on the Maeslantkering near Rotterdam. Eventually, a six-lane highway is to be built atop the structure, thus com-

pleting the ring road around St. Petersburg. As part of an international consortium which also included Halcrow (UK), Norplan (Norway) and Lenhydroproject (Russia), DHV is responsible for the highly complex hydraulic engineering for the flood barrier, the total construction costs of which are 1.2 billion US dollars. ●

## ONLINE HELPDESK SUSTAINABLE PROCUREMENT

INFO Jan Bart Jutte

TELEPHONE +31 33 468 33 76

E-MAIL janbart.jutte@dhv.com

DHV and fellow consultancy Significant have set up an online helpdesk at [www.helpdeskduurzaaminkopen.nl](http://www.helpdeskduurzaaminkopen.nl). The initiative is in response to the government's announcement that it is to adopt a system of 'sustainable procurement'. From 2010, the vast majority of goods and services purchased by public sector organizations (which currently have an annual value of some forty billion euros) must meet strin-

gent environmental and social criteria. The strict requirements will apply to everything from office furniture to catering, and from estate management services to public transport and road building. An increasing number of private sector organizations also wish to implement a sustainable procurement policy. We therefore see growing demand for the necessary knowledge and expertise. The online helpdesk has been set up to meet this demand and to assist all organizations, whether public or private, in achieving their sustainability ambitions. ●

## BIODIVERSITY WEBSITE

INFO Arthur van Baalen / Bujar Nushi

TELEPHONE +31 33 468 30 55 / 28 79

E-MAIL arthurvanbaalen@dhv.com / bujar.nushi@dhv.com

The European Centre for Nature Conservation (ECNC) has commissioned DHV to design and produce a website which will act as the portal to all information about biodiversity

in Europe. The site will make extensive use of various GIS applications, including Google Maps. The ECNC is a non-governmental organization which is concerned with the conservation of nature and biodiversity throughout Europe and the neighboring countries. It is an international network organization which cooperates closely with other European organizations and governments. The new website must appeal to a particularly wide readership, from policy-makers to journalists, and from academic researchers to members of the general public. It will go 'on line' during the first half of 2009. ●



DHV produces a website with all information about biodiversity in Europe.

# Natural gas out... CO<sub>2</sub> in



**One of the causes of global warming is the ongoing emission of carbon dioxide, the accumulation of which results in the so-called greenhouse effect. Solutions are being eagerly sought throughout the world. DHV and the Netherlands Organization for Applied Scientific Research (TNO) have conducted a joint study to determine whether the Dutch continental shelf under the North Sea can be used for CO<sub>2</sub> storage. The results are encouraging, but several further steps must be taken before the idea can be put into practice.**

“The Netherlands Oil and Gas Exploration and Production Association (NOGEP) commissioned DHV and TNO to identify which gasfields, if any, can be used to store CO<sub>2</sub>”, recounts Robert van der Velde, senior DHV consultant and project director. “TNO examined the deep subsoil, while we considered all the technical aspects of the required above-ground infrastructure. The conclusion is that approximately one third of the gasfields on the Dutch continental shelf are indeed suitable for CO<sub>2</sub> storage. That may not seem many, but between them these fields would account for two thirds of the total available storage capacity. We could deposit a total of 900 Mton CO<sub>2</sub> here, the equivalent of one power station’s emissions for the next 180 years.” The storage of carbon dioxide below ground is a relatively new concept, but DHV has already established itself as a market leader in environmental and safety studies for the oil and gas industries. “This was not our first study into CO<sub>2</sub> storage, but it is certainly the first time that an area has been subject to such a detailed examination,” states Van der Velde.

In the operational phase, CO<sub>2</sub> would be pumped in liquid form through a wide, 130 kilometer pipeline from Rotterdam to the central part of the Dutch continental shelf. There, it would be ‘injected’ via the former gas platforms and wells into the exhausted gasfields deep under the sea bed. The recent study suggests that reusing existing drilling platforms and gas wells in this way is essential to the concept, since it would be prohibitively expensive to create an entirely new infrastructure. It is therefore extremely important that the existing structures remain in place. While it is certainly technically possible to store CO<sub>2</sub> under the North Sea, there are a number of obstacles to overcome first. “It seems unlikely that we shall be able to transport CO<sub>2</sub> on any large scale before 2020. In the meantime, we must prove that the idea will work in practice by means of small-scale trial projects and demonstrations,” says Robert van der Velde. There are also a number of legal issues at play. “If private sector firms are to become involved, it is essential that responsibility and liability are clearly established at each stage. Once a

field has been filled and sealed, responsibility must transfer to the government. If not, it will be impossible to find a company willing to participate. The government also has an important role to play in creating the appropriate conditions for market parties to become involved.” Another, not insignificant, consideration is the cost. “A study comparing the costs of various transport and storage scenarios is to commence shortly. We certainly want to take part in that,” states an enthusiastic Robert van der Velde. ●

## PROJECT

Potential for CO<sub>2</sub> storage in depleted gas fields, Phase 1: Technical assessment

## LOCATION

The Dutch continental shelf, under the North Sea

## CLIENTS

NOGEP and the Netherlands Ministry of Economic Affairs

## DHV’S ROLE

Project direction, study of the above-ground infrastructural requirements for offshore CO<sub>2</sub> storage

## DURATION

Consultancy, October 2007 – June 2008

**INFO** Robert van der Velde

**TELEPHONE** +31 75 653 04 05

**E-MAIL** robert.vandervelde@dhv.com



Climate change is something we can no longer ignore. In the field of hydraulic engineering in particular, the concept of 'going with the flow of natural forces' is rapidly growing in popularity. Alongside the 'hard' solutions of dams, dikes and other water defenses, we examine alternative 'soft' forms of water protection and land reclamation which are undertaken in harmony with nature and the sea. DHV is doing much to promote this approach worldwide.

# Building with nature

## A new answer to climate change

Although some measures to slow the rate of global warming are being taken, climate change will remain a fact of life for the foreseeable future. This is why we must also seek means to mitigate the effects under the general heading of 'adaptation'. This applies equally to the Afsluitdijk in the Netherlands, the northern coast of China or the Mississippi Delta in the southern USA, where recent events have demonstrated that natural phenomena such as hurricanes are becoming more fierce and less predictable.

### MARSHLANDS

In the American state of Louisiana, a new approach to coastal defense can now be seen. In and around the Mississippi Delta, open marshlands have a very important role to play. As Dick Kevelam, coastal development consultant with DHV explains, "Open wetlands can slow the progress of tropical storms and hurricanes, and literally 'take the wind out of them'. This greatly reduces the risk of flooding in the low-lying areas. Creating new marshlands specifically for this purpose will also help to promote and protect vulnerable ecosystems in salt-water, freshwater and brackish areas alike."

The restoration and development of marshland vegetation is among the chief aims of a new empoldering technology developed by DHV in association with two Dutch research institutes, IMARES and Deltares. The measures are part of the 'Dutch Perspective' plan for the region, commissioned by United States Army Corps of Engineers (USACE) and the Netherlands Department of Public Works and Water Management (Rijkswaterstaat), and devised by the Netherlands Water Partnership. The sole objective of empoldering areas of the Mississippi Delta region is to create new marshlands.

"In the new polders, vegetation will develop far more rapidly than otherwise, and will therefore compensate for soil compaction and rising sea levels," Kevelam continues. "Moreover, the proposed method is less expensive than artificially raising the entire area, and much less expensive than building huge storm surge barriers."

### NATURE AS A SEA DEFENSE

'Building with nature' is also the key feature of an advisory report for the reinforcement of the Afsluitdijk, the huge 32-kilometer wall which closes off the IJsselmeer (lake) from the Wadden Sea in the northern



Under DHV's plans, Yankee Pond in the Mississippi Delta will play an important part in flood protection.

Netherlands. As part of a 'market survey', DHV, IMARES and the Alle Hoesper design agency have proposed creating salt marshes on the seaward side of the huge structure. Only the higher areas would be under water in the event of a storm. Here too, there are several benefits, as the country would gain better sea defenses together with an entirely new nature offering opportunities for recreation. The consortium's proposal involves converting some 1,500 hectares to saltmarsh. The area will then expand naturally due to plant growth and tidal silt deposits. Similar areas off the coast of Groningen and Friesland have produced enough data over time to establish that this approach really does work, conclude the IMARES partners. "In effect, you are creating a broad, soft embankment. It is far less complex than the traditional method of increasing the height of >>

**"Open wetlands can slow the progress of tropical storms"**



As part of a 'market survey', DHV, IMARES and the Alle Hoeser design agency have proposed creating salt marshes on the seaward side of the Afsluitdijk.

the dikes, but it offers at least the same degree of safety," states Jasper Fiselier of DHV, spokesman for the consortium. The creation of the salt marshes would result in a new offshore nature area some thirty kilometers in length. A cycle route at the base of the dike would enable the public to enjoy this new addition. The plan also includes a visitors' center from which the progress of the project can be followed. The proposed solution falls within the available budget, and therefore becomes a viable alternative to the 'standard' reinforcement work which is due to be completed by 2015.

## “Caofeidian is to be an example for China and the rest of the world”

### NEW COASTAL CITY

There is an area on the northern coast of China which, given its structure of islands and lagoons, is remarkably similar to the Wadden Sea region of the Netherlands. It is here that the 'ecological coastal city' of Caofeidian is being built. Eventually it will cover an area of 150 km<sup>2</sup> and have a population of one million. DHV won an interna-

tional design competition for this project, with considerable input from its Shanghai office to ensure that Dutch expertise could be applied to the Chinese situation as effectively as possible. "Caofeidian is to be an example for China and the rest of the world," says Dick Kevelam. "This being a relatively dry part of China, part of the project involves finding ways to source and reuse fresh water, with the greatest possible attention to sustainability." Under the plan, the islands furthest offshore form a seawall which will protect the enclosed lagoon against flooding in the event of high waters. A city can then be built within the lagoon on artificially raised islands, the surface of which will be high above the water level. In this situation, heavy rainfall would cause the formation of a freshwater 'bubble' which would then rise up and float atop the (heavier) salt groundwater. The design also provides for the restoration of part of the original mudflat coast of the area, while existing areas will be preserved.

### GLOBAL SOLUTIONS

"At these three locations, which are in entirely different parts of the world, we can see how the Dutch hydraulic engineering tradition of raised islands, dams, dikes and drained polders can be combined with ever more innovative concepts, the 'soft' forms of coastal protection and land reclamation, achieved in harmony with nature and the sea," Kevelam sums up. "This offers a sus-



DHV's design for the ecological coastal city of Caofeidian will show the rest of the world how to build in partnership with nature.

tainable basis for spatial planning, water management, landscape development, ecology and biodiversity. Our solutions can justly be called 'global solutions, although they can always be adapted to the local situation. In that respect, our regional offices will play an extremely important part." ●

INFO Dick Kevelam / Jasper Fiselier

TELEPHONE +31 33 468 33 53 / 22 12

E-MAIL dick.kevelam@dvh.com  
jasper.fiselier@dvh.com

# Climate-proof reconstruction of Aceh



DHV will assess which measures prevent the river Kreung Aceh bursting its banks.

## PROJECT

Climate assessment of Sea Defense Project.

## LOCATION

Province of Aceh, Sumatra (Indonesia).

## CLIENTS

The Netherlands Embassy in Jakarta and the Indonesian Agency for Rehabilitation and Reconstruction (BBR).

## SERVICES

Identification of potential climate change and performance of climate-related assessments.

## DURATION

July 2008 – February 2009.

**The province of Aceh on the Indonesian island of Sumatra was seriously affected by the tsunami of 26 December 2004. A broad-based package of measures is now planned to prevent future flooding, or at least offset the effects. DHV has now supplemented the available knowledge, having conducted an extensive assessment of the ways in which authorities must take climate change into account. The study focused on the proposed sea defenses in the region.**

The tsunami had a devastating impact on Aceh. Some 170,000 people lost their lives and the city of Banda Aceh was all but destroyed. In 2006, the 'Sea Defense Project' was launched to protect the region from another disaster of this magnitude. It involves collaboration between the Dutch embassy in Jakarta and the Indonesian Agency for Rehabilitation and Reconstruction (BBR). "There are already countless projects planned to counter the threat of flooding," explains Annemarieke Verbout, consultant with DHV. "There is to be a tsunami early warning system, various physical water defenses, a complete overhaul of the urban drainage system, designated 'safe areas' in which people can take refuge, and a number of emergency reservoirs." Verbout has been investigating whether the proposed measures are 'climate-proof'. "To determine how the various measures will stand up to future climatic conditions, we first devise various climate scenarios. These are then incorporated into the analyses, the design criteria and the designs themselves. Take the expected rise in sea levels, for example. Obviously, any coastal defense works must take this into account."

Verbout has recently returned from Aceh where she worked closely alongside Indonesian experts from the IPB Bogor University of Agriculture. "It was quite a challenge just to find the necessary meteorological data for the scenarios," she recalls.

## CLIMATE SKETCHBOOKS

Verbout's contribution has gone beyond assessing the measures set out in the Sea Defense Project. "We studied and listed all possible effects of climate change on the region as a whole. For example, drought in combination with a rising sea level could lead to soil salination." Verbout has considerable experience in climate issues. She produced the 'climate sketchbooks' for seven Dutch provincial authorities. "The sketchbooks set out very clearly the potential effects of climate change on various land usage functions, whether in terms of urban planning, nature, agriculture or infrastructure. There could be a higher risk of flooding, or conversely drought, water shortages and soil salination. In Aceh, climate change is not very high on the political agenda at present. We intend to hold two workshops shortly in an attempt to make local

authorities aware of the issues at stake." Verbout will shortly be evaluating her provisional findings for the Kreung Aceh basin. (The Kreung Aceh is the river which passes through the city of Banda Aceh.) "One way in which to prevent the river bursting its banks would be to dig an extra drainage channel to the sea. We shall soon visit the region again to assess whether measures like this will indeed make the area more 'climate-proof', and we hope to have completed our advisory report early next year." ●

**INFO** Annemarieke Verbout

**TELEPHONE** +31 33 468 27 86

**E-MAIL** annemarieke.verbout@dhv.com



Green roofs and walls can mitigate the effects of climate change.

## Building with Nature conference

How can mankind use natural processes in order to adapt to climate change? This is the key question which will be addressed by a conference held in Amsterdam in February 2009, organized jointly by WWF, DHV and the Cooperative Program on Water and Climate.

Using nature as a tool in adapting our environment to meet the demands of climate change is also known as 'building with nature'. It can be seen as a further step in the evolution of hydraulic engineering, urban planning, agricultural practice and nature management. It is a new development whereby natural processes are used to mitigate the negative effects of climate change. Examples include the use of plants and existing bodies of water for water storage, planting vegetation on roads, roofs and walls, sustainable groundwater management, the use of natural purification processes in the water chain, and new soil management approaches.

The intention of the forthcoming conference is to explore and illustrate ways in which nature can contribute to safety, the human environment in our towns and cities, biodiversity and even economic prosperity. The results of the conference will be extremely relevant to further meetings, such as the World Water Week in Stockholm and the World Water Forum, and to initiatives such as the World Estuary Alliance. ●

**INFO** Jasper Fiselier

**TELEPHONE** +31 33 468 22 12

**E-MAIL** jasper.fiselier@dhv.com



## Yellow River expedition

The EU-China River Basin Management Programme (RBMP), supported by the Yellow River Conservancy Commission, recently initiated a ten-day expedition to the source of the Yellow River. During the expedition, the potential impact of climate change on the Yellow River source area was discussed with representatives of several local government sectors and Chinese experts. The expedition resulted in recommendations being made for river-basin planning, so as to adapt to climate change in the Yellow River basin. DHV is acting as the leader of the Technical Assistance Team attached to the project, which is composed of six consultancies: DHV, COWI (Denmark), Atkins (U.K.), SWECO (Sweden), Alterra and Wetlands International (both of the Netherlands).

Global warming has had a negative impact on the vulnerable ecosystem of the source area, causing glaciers to melt and retreat, lakes to shrink and grassland to degrade. The Yellow River's annual precipitation and runoff has declined over the last fifty years. Climate change is included in the "Yellow River IRBM Policy and Strategy", one of the key parts of the Yellow River component of the EU-China River Basin Management Programme, whose aim is to study possible climate change scenarios and adaptive strategies. The EU-China River Basin Management Programme is initiated by the European Commission and the Chinese government to discuss European and Chinese experiences in water-resource management and establish integrated river-basin management models in the Yellow River and Yangtze River basins. The program will be completed in 2012. ●

**INFO** Theo Henckens

**TELEPHONE** +31 33 468 25 61

**E-MAIL** theo.henckens@dhv.com

Marjan den Braber, DHV:  
 “We want to make  
 our designs  
 climate-proof”



#### CURRICULUM VITAE

Marjan den Braber (40) joined DHV in 2001. She studied Civil Engineering at TU Delft and Public Administration at the University of Leiden. Previous employers include the Province of Utrecht and Rijkswaterstaat, the Department of Public Works and Water Management. Since coming to DHV, she has filled positions as a management consultant and head of department. As a strategic consultant with DHV Land and Water, she is now responsible for process management, communications and consultancy on large spatial development projects related to water. Marjan is currently working alongside expert partners on a 'Climate Atlas' for a group of Dutch provincial authorities, and is also spokesperson for the Waddenwerken Afsluitdijk consortium.

How climate-proof is our policy, plan or proposed investment? Now that it is becoming increasingly clear that the climate really is changing, it is a question that we hear more and more often. It is also one that we increasingly ask ourselves when we produce our designs and plans. Being climate-proof is not a dominant consideration for buildings and systems with an economic horizon of about 15 years, provided that future expansions do not have to be factored in. But it is an important matter when planning and designing projects like residential districts and coastal defenses for a useful life of 50 or 100 years or even longer.

How will climate change impact and what matters must we take into account? We want to make well-founded pronouncements on these questions, which is why we cooperate in the Netherlands with the Royal Netherlands Meteorological Institute (KNMI). Scientific knowledge of the primary effects of climate change (sea level, precipitation and temperature) yields valuable and sometimes surprising information. Worldwide, for example, there are marked differences in the expected rise in sea levels. Sharp differences are already being measured for rises in temperature: Western Europe seems to be warming up faster than other parts of the world, for example. In the driest and hottest scenario, the area of the Netherlands known as the Green Heart will resemble the Po Valley in Italy around 2100. Differences in forecast precipitation patterns

already exist at regional level, for example between the coastal zone and the hinterland.

Adaptation to climate plays a role in many fields. Protection against floods and the availability of fresh water are major issues in all delta regions and island territories. Bangladesh has requested international aid, the Maldives will concentrate the population on 20 of the 200 islands and the Delta Commission has presented its plan in the Netherlands. Coping with the effects of heat and drought are matters that tend to receive little attention in regions with moderate climates, like the Netherlands and Poland. Experience gained in warmer DHV home countries like China and Portugal will become all the more relevant at more and more places. Will fresh water be the oil of the future?

Which feasible and affordable measures can we take to become climate-proof? Once we know what awaits us, that will be the next question we must answer. The Intergovernmental Panel on Climate Change (IPCC) gave a fine overview in its 2007 report of strategies for dealing with the consequences of climate change. At DHV we feel that we have a challenge to design sustainable strategies that combine robustness for the future with an added value for the present-day economy, nature and quality of life. Our sources of inspiration are potential combinations of adaptive and mitigating measures and the use of natural, self-regulating processes. In our search for sustainable strate-

gies for adapting to climate change, we also seek cooperation and dialogue with our business relations. Therefore, I invite you to examine next February with us, the World Wildlife Fund, the Cooperative Programme on Water and Climate and numerous knowledge institutions the opportunities that exist for utilizing natural processes. I look forward to seeing you at Aquaterra 2009 in Amsterdam. ●

INFO Marjan den Braber

TELEPHONE +31 33 468 30 88

E-MAIL marjan.denbraber@dhv.com

