

# Holland Biotech Pavilion

BIO World Congress on Industrial Biotechnology  
Montreal, Canada

July 19-22, 2015



# Visit the Holland Biotech Pavilion at booth #125



**Join the  
Business  
Partnering  
Reception**

Tuesday July 21  
4.00 pm - 5.30 pm.

**Win a Dutch  
bicycle,  
sponsored by  
Rabobank!**

Presented by Rochus Pronk,  
Deputy Head of Mission



## The Netherlands: leading player in the fields of biotechnology and biochemistry

The Netherlands is home to internationally renowned scientists with a strong reputation for knowledge and expertise in the fields of industrial biotechnology and biochemistry.

Strong collaborations between the world-class academic and industrial sector, supported by the government, has led to ground breaking research and successful innovations.

Several locations in the Netherlands offer state-of-the-art lab space and offices, as well as open access, shared facilities with high-end lab equipment, ready for pilot and demonstration projects for companies and researchers who want to avoid the capital outlay for setting up their own facilities. It is also an ideal location for new production facilities as it provides the necessary infrastructure.

The Holland Biotech Pavilion has been coordinated by BE-Basic Foundation: a leading international public-private partnership that develops industrial biobased solutions to build a sustainable society. To switch from fossil fuels to biomass, we require new technologies and insights for all industries that provide us with food, chemicals, materials and energy. BE-Basic Foundation initiates and stimulates collaborations between academia and industry, between scientists and entrepreneurs and between the Netherlands and abroad. More information: [www.be-basic.org](http://www.be-basic.org).



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## Welcome at the Holland Biotech Pavilion!

Once again, we are present at the BIO World Congress on Industrial Biotechnology in Montreal. This year, we proudly present no less than 12 Dutch companies and organisations, representing outstanding expertise and know-how in the fields of biotechnology, biochemistry, energy, feedstock production, transport and logistics.

### Dutch Expertise

The Netherlands is a major hub for international business because of its strategic location, pro-business government, tax laws, and labour force. We believe in strong ties and collaborations between businesses, universities, research institutes and the government. This intense cooperation has led to ground-breaking research and successful innovations. Our state-of-the-art facilities allowed The Netherlands to become a global centre for industrial biotech collaboration and pilot projects.

### Excellent Logistics

The Netherlands is the perfect gateway to Europe, thanks to our excellent connections by road, air and water. Our sea ports are among the largest in the world and we keep adding harbours by reclaiming more land from the sea. These ports are home to a wide range of suppliers and end-users of oil, gas, biomass and chemicals. Moreover, they give access to the European market which contains more than 350 million consumers.

### Strong Partnership

The strong bilateral trade relations between The Netherlands and Canada characterize the partnership between the two countries. In 2014 the bilateral trade amounted to CAN\$ 8 billion, which makes Canada our 9th biggest export destination. Did you know that The Netherlands is the second largest investor in Canada? Clearly, connections run deep between the two nations.

### New Opportunities

I am sure this congress will be as inspiring as the previous years, allowing new successful international partnerships to grow. Let's explore the business possibilities to build an innovative biobased economy together.

We invite you to visit the Holland Biotech Pavilion at booth 125 to explore the promising opportunities within these economic sectors.

### Cees Kole

Ambassador of the Netherlands to Canada





## BE-Basic Foundation

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## BE-Basic Foundation

**BE-Basic Foundation is a leading international public-private partnership that develops industrial biobased solutions to build a sustainable society. BE-Basic stands for *Biotechnology based Ecologically BALanced Sustainable Industrial Consortium*.**

To switch from fossil resources to biomass, new technologies and insights are required for all industries that provide us with food, chemicals, materials and energy. BE-Basic initiates and stimulates collaborations between academia and industry, between scientists and entrepreneurs and between the Netherlands and abroad to build a biobased economy together.

### Our objectives

- To build a competitive, secure and sustainable biobased economy through industrial biotechnology that is less dependent on fossil resources, with a positive global climate effect.
- To monitor ecological stresses, and to control and improve local soil and water environments.
- To support societal embedding of products, services and processes of the biobased economy.

To reach our objectives, BE-Basic coordinates and stimulates RD&I programs for science and technology development, especially –but not exclusively- on environmental and industrial biotechnology. We focus on integral and sustainable biobased solutions, that balance and optimize economic value and climate impact for non-energetic (chemicals, materials, food&feed) and energetic (transportation fuels, power/heat) uses. Those balances are reached best by applying cascading and integral biorefinery concepts, and prioritise energetic uses for those sectors without alternatives (aviation, marine and heavy road transport).

### BE-Basic activities

Our current activities include research & development (and societal embedding and education programs), innovation development (BE-BIC) and international collaborations. About half of BE-Basic's activities is funded by public funds from the Ministry of Economic Affairs, Agriculture and Innovation's Economic Structure Enhancement Fund (FES), the Top consortium for Knowledge and Innovation for the Biobased Economy (TKI-BBE) and EFRO programmes. The other half is funded by BE-Basic partners (industry and knowledge institutions). BE-Basic has an actual R&D budget of over €40 million (-US\$50 million) per year.

BE-Basic coordinates the Holland Biotech Pavilion at the BIO World Congress on Industrial Biotechnology 2015.



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## BE-Basic Brazil

The BE-Basic Foundation is an international public-private partnership that develops integral industrial biobased solutions to make the switch from fossil-based to biomass-based feedstocks and to build a competitive, secure and sustainable society with a positive global climate effect.

We foster collaboration between academia and industry, between scientists and entrepreneurs and between the Netherlands and abroad, e.g. in Brazil. Like elsewhere, BE-Basic Brazil brings together chemicals/materials, fuels, energy and agro-food industry sectors. Only together we can build a sustainable biobased economy.

## BE-Basic in Brazil

Brazil is the world's largest sugarcane producer and second largest ethanol manufacturer. With around 40 years of experience, Brazil has by far the most skills and knowledge about developing an infrastructure and capacity to produce biobased energy based on sugar cane. This provides major opportunities and mutual lessons for BE-Basic and Brazilian partners.

In 2012, BE-Basic and TU Delft opened a joint office in Brazil to further intensify and facilitate the cooperation with our Brazilian partners such as São Paulo Research Foundation (FAPESP), especially its bioenergy program BIOEN, Brazilian Bioethanol Science and Technology Laboratory (CTBE), Universities of Campinas (UNICAMP) and Sao Paulo (USP), Federation of Industries of São Paulo State (FIESP), Brazilian Association of Chemical Industry (Abiquim), the Biokerosine Platform of Minas Gerais, and small and large Brazilian / multinational industries.

## Ambitions and Activities

Our activities in Brazil focus on (joint) research, education and business development with our Brazilian partners, for example:

- Entrepreneurship training, together with industrial and financial partners
- Collaborative projects with industry and academia, from R&D to industrial innovation
- Advanced (post-)graduate courses, also on-line, and (dual degree) PhD programs between leading Brazilian and Dutch universities
- Exchange of staff and (PhD) students, sharing of piloting facilities
- Joint collaboration in global policy programs, such as in the recent SCOPE / UNEP / UNESCO report on "Bioenergy & Sustainability"

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## Biobased Delta

Agro and chemistry meet within a radius of 60 km in the Biobased Delta, a region in the South-western Netherlands. Collaboration between and integration of technologically advanced farmers, the presence of agro & food companies, large chemical players, the presence of brand owners, a large number of innovative SMEs, renowned knowledge institutions, educational institutions, pilot and demonstration plants, and supporting governments: together they form the innovation eco system of Biobased Delta.

## Triple Helix

Building on a Triple Helix, the Biobased Delta has set a comprehensive structure that supports the acceleration of innovation, development and further growth of the biobased economy in the region. SMEs act as a catalyst for interaction between the involved actors. The governing board of the Biobased Delta consists for the greater part of business people, supplemented by people representing research, educational, advocacy and governmental parties. Together they have set and are executing an ambitious agenda for the next decades. The ecosystem of the Biobased Delta will allow for successful integration and new value chains, implying an acceleration of biobased business.

## Europe's sweet spot

With the abolishment of Europe's sugar quota in 2017 new market opportunities to extract biobased chemicals from sugars have arrived. The Biobased Delta has a competitive feedstock and cost position for sugars. With the fast growing fermentation business, Biobased Delta is on its way to become Europe's chemical 'sweet spot'.



BIOPROCESS  
PILOT FACILITY

## Bioprocess Pilot Facility

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## Bioprocess Pilot Facility

Situated at the Biotech Campus Delft, the Netherlands, the Bioprocess Pilot Facility B.V. (BPF) is a unique open access facility. Companies and knowledge institutions can develop new sustainable production processes by converting bio-based residues into useful chemicals or fuels and production processes for Food and Pharma.

The facility has been specifically designed to enable the transition from laboratory to industrial scale. The facility has a modular setup. BPF allows users to construct complex operations by linking the separate process modules: Pretreatment, Hydrolysis, Fermentation and/or Downstream Processing.

About 30 people, mainly experienced process operators are working at the BPF.

### Biobased scale up expertise:

BPF is a service provider with very flexible facilities to help our customers to scale up their process. We have experience with many different chemicals, food and pharma ingredients of which many cannot be disclosed because of confidentiality. Known examples are ethanol, lactic acid, DDDA and 7-ADCA.

Because of its high quality standards, the BPF can also be used to produce kg-quantities of material for pre-marketing and application tests at customers and/or preclinical trials (for Food or Pharma applications). The BPF has a long standing historical track record in bioprocess piloting with an experienced crew.

### Facilities

We have 4 different pilot plants which can interact:

- **Pretreatment** (biomass, also lignocellulosic) on benchscale and pilot scale.
- **Fermentation** from 10l up to 8m<sup>3</sup>. (ATEX, GMO)
- **Downstream processing**, chemical processing (ATEX)
- **Food grade** with fermentation and DSP.

All product streams can be connected, to mimic a downscaled process of a commercial plant. The scaling up of the lab process can then be proven on pilot scale with a good prediction of the process on commercial scale.

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**Biorizon >> The Way to Aromatics**

Shared Research Center Biorizon, an initiative of TNO, VITO and the Green Chemistry Campus, develops technologies to produce aromatics derived from plant-based waste streams. Biorizon is including global leaders in the fields of feedstock, conversion, equipment and end-products as participants, as well as SME companies. Biorizon aims to be a world leader in the development of biobased aromatics within five years, and to make commercial production feasible for industrial partners by 2025.

**Market Demand to Green the Chemical Industry**

Aromatics are among the most important resources for the chemical industry. Currently virtually all aromatic building blocks are made from fossil oil. Biorizon is anticipating the expected growing shortage of aromatics from the petrochemical industry and the widely shared ambition to green the chemical industry.

Biorizon utilizes plant-based waste streams such as lignin and sugars to develop functionalized biobased aromatics for performance materials, chemicals & coatings. This diminishes the dependence on fossil fuel, it lowers CO<sub>2</sub>-emissions and it provides the chemical industry a profitable and sustainable perspective.

**Industry Driven Shared Research Center**

Biorizon is operated as a Shared Research Center, based on the open innovation methodology, bringing together collective intelligence of various industries, companies and knowledge organizations. The multi-disciplined technological need, as well as our long term roadmap make this effort suitable for shared research, sharing intelligence, investments, risks and workload.

Biorizon is a cross-border initiative between TNO, VITO and the Green Chemistry Campus and is part of Biobased Delta. Biorizon is located at the Green Chemistry Campus in The Netherlands, at the heart of industries between Antwerp and Rotterdam.

**Join Biorizon's Community on Biobased Aromatics**

For partners and companies that consider joining our Shared Research Center we've created a community that provides excellent networking opportunities and information on current developments. Please join at: [www.biorizon.eu/community](http://www.biorizon.eu/community)

## Brightlands Chemelot Campus

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## Brightlands Chemelot Campus

Research and development take place at Brightlands Chemelot Campus and education is given in the fields of chemistry and materials, and the related life sciences. The focus is on high-quality materials, biomedical materials, and bio-based materials. The campus is developing into a creative breeding ground for innovation and for new companies with thousands of highly trained employees. This dynamic situation is the result in part of collaboration among the business community, education and knowledge institutes, and the government. The campus makes an active contribution through activities such as facilitating the construction of pilot plants and the acceleration of new business development.

Chemelot Campus, under the name Brightlands, works together with Maastricht Health Campus and Campus Greenport Venlo; the three campuses are located in the province of Limburg. Brightlands is also involved in the research program at Maastricht University, Zuyd University of Applied Sciences and the Province of Limburg.

For more information, visit: [www.brightlands.com](http://www.brightlands.com).



## InnovationQuarter

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## InnovationQuarter

InnovationQuarter is the regional development agency for West Holland. InnovationQuarter finances innovative and fast-growing companies, assists foreign companies in establishing their businesses in West Holland, and organizes collaboration between innovative entrepreneurs, knowledge institutes and government. In this way, and in cooperation with the business community, InnovationQuarter supports the development of West Holland to become one of the most innovative regions in Europe.

InnovationQuarter has a dedicated, inward promotion team in place to facilitate you in finding the right locations and facilities for setting-up or expanding your business in West Holland. We help you with our services, know-how and networks.

- Detailed information – we provide you with the information you need regarding the Dutch business climate, such as labor market, taxation, real estate, incentives.
- Extensive networks – we facilitate introductions to our extensive networks, which include both the private and public sector.
- Site selection – we facilitate and organize your fact finding trip on the ground, arrange customised meetings and personally guide you through the procedures of setting-up your business and the complete site selection process.
- R&D matchmaking services – we help facilitate connections to collaboration partners, research institutes, test facilities, or companies.
- Investor relations - we continue to support you as your business moves through all phases of growth, expansion or relocation.

InnovationQuarter is an initiative of the Ministry of Economic Affairs, the Province of South Holland, the Cities of Rotterdam, The Hague, Leiden, Delft, Dordrecht, and Westland, Delft University of Technology, Leiden University, the Leiden University Medical Center and Erasmus Medical Centre.



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## Netherlands Foreign Investment Agency (NFIA)

For foreign companies wishing to establish their business in the Netherlands and to take advantage of the Dutch business environment as a strategic base to cover Europe, the Netherlands Foreign Investment Agency (NFIA) is the first port of call.

The NFIA was established for the specific purpose of helping and advising such companies by providing them with advice, information and practical assistance, quickly and on a confidential basis, as well as providing them access to a broad network of business partners and government institutions, all free of charge.

Founded 35 years ago, the NFIA is an operational unit of the Dutch Ministry of Economic Affairs. Throughout the years it has supported thousands of companies from all over the world to successfully establish their business in the Netherlands.

NFIA support starts in the country of origin. To that end, the NFIA has offices in Europe (HQ in The Hague, London, Istanbul), the US (New York, Boston, Chicago, Atlanta, San Francisco), Asia (Tokyo, Osaka, Taipei, Shanghai, Beijing, Guangzhou, Seoul, Delhi, Mumbai, Singapore and Kuala Lumpur), the Middle East (Dubai, Tel Aviv) and Brazil (São Paulo). In addition, the NFIA closely cooperates with Dutch embassies, consulates-general and other organizations that represent the Dutch government around the world.

The Netherlands is a leading player in the international industrial biotechnology and biochemistry industry and home to internationally renowned scientists and companies in this field. Thanks to the proximity of the Port of Rotterdam, Europe's largest sea port, the area offers excellent international logistical access, a high density of suppliers and end-users in the surrounding industrial zone. This, combined with abundant availability of feedstock, enables efficient industrial biotech production.

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## Netherlands Office of Science and Technology (NOST)

The mission of the Netherlands Office for Science and Technology (NOST) is to provide a service for research institutions and industry in the Netherlands, with the aim of facilitating international R&D and innovation collaboration and the internationalization of public-private consortia and Centers of Excellence in the Netherlands.

The network's tasks are three-fold:

- (1) Inquiry based research and evaluations for the R&D and innovation community of the Netherlands;
- (2) Being a liaison for connecting public and private actors active in science, technology and innovation in the Netherlands and the United States and Canada.
- (3) Assisting R&D intensive companies in the United States and Canada to set up business relations with the Netherlands. The NOST officers facilitate formal and informal collaborations through scouting and matchmaking in the field of scientific research and technology development.

The NOST works closely with our counterparts in the Embassy network that promote trade with, and foreign direct investment in, the Netherlands.

Currently the NOST network has approximately 25 officers stationed in the USA & Canada (Washington, D.C. and San Francisco), the European Union (Brussels), France (Paris), Germany and Switzerland (Berlin), Japan and Taiwan (Tokyo, Taiwan), Malaysia and Singapore (Singapore), South Korea (Seoul), China (Beijing, Shanghai, Guangzhou), India (New Delhi, Mumbai), Israel (Tel Aviv), Turkey (Ankara), Brazil (Sao Paulo), and Russia (Moscow).



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## Photanol

Photanol has developed a breakthrough technology that turns CO<sub>2</sub> from an issue into an asset. Our platform can convert CO<sub>2</sub> directly into valuable products, powered by the sun. We use cyanobacteria that live on CO<sub>2</sub> and sunlight. Our microbiologists engineer these bacteria by introducing properties (genes/enzymes) of other organisms (such as fermentative bacteria, yeasts and plants) to have them produce and excrete valuable compounds by design. They now divert their energy use from growing and multiplying toward making the desired product in a very efficient way. This production technology can produce an almost infinite number of chemicals for use in fuels, plastics, food, personal care products, etc. Not made from fossil resources, not made from crops, but from CO<sub>2</sub> and energy provided by the sun.

Our platform offers our partners a way to avoid dependence on fossil resources, to avoid using crops, to obtain a more economically attractive route to an existing product or to get access to new products.

Photanol has proof of concept on a wide range of products and operates a pilot plant to prove reliable production under relevant conditions.



**Port of Amsterdam**

**Port of partnerships**

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### **Port of Amsterdam**

The port of Amsterdam is one of the world's key international logistic hubs, offering a unique combination of logistics, services and industry. Today it's West-Europe's 4th largest port.

With inspiring partnerships we open up new horizons, creating opportunities, growth and added value for our customers and stakeholders.

The strategic and central location in Europe makes the port easy to reach and ensures excellent connections to all major European markets by inland water transport, truck and train.

Amsterdam Airport Schiphol, one of Europe's largest intercontinental airports, is just at a 10 minutes driving distance.

### **Energy Hub**

Amsterdam has a unique logistic location within the world's largest energy hub: the ARA range (Amsterdam, Rotterdam, Antwerp). Situated in Europe's largest delta the port of Amsterdam offers a dynamic international hub with a sea-entrance-draft up to 17.8 meters and excellent hinterland connections for inland shipping, rail and road. All together an excellent location for your dry bulk logistics and bio based investments.

## Port of Rotterdam

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## Port of Rotterdam.

### Open a world of opportunities.

Make it happen.

Port of Rotterdam owes much of its success to the pioneering spirit of previous generations of workers, entrepreneurs and innovators. It's that same pioneering spirit that ensures you stay ahead, well into the future.

Doing business in Rotterdam offers you all the advantages of doing business with a world leading port that offers the best port facilities, services and infrastructure available. Port of Rotterdam has a major natural advantage. Europe's largest deep sea port is situated at just the right place: at the mouth of two of the continent's major rivers right next to Europe's busiest sea lane. This makes Rotterdam the fastest option and natural port of choice for trade flowing to and from Europe.

Port of Rotterdam is Europe's best connected gateway and hub. Connected to over 1.000 ports worldwide and to Europe's most extensive and elaborate network of rail, road, short sea, barge connections and pipelines. This brings all major European industrial clusters, and a market of 500 million consumers within 24 hours reach. In Rotterdam we see no limits to your ambition. Choosing for Rotterdam, is choosing to stay ahead.

## Suiker Unie

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## Suiker Unie

Suiker Unie develops, produces and markets sugar and sugar specialties. Her factories for the production of sugar in Dinteloord, Vierverlaten and Anklam (Germany) are among the most modern in the world. Suiker Unie forms part of Royal Cosun. This international group develops, produces and markets natural foodstuffs and food ingredients. Royal Cosun is a cooperative of approximately 10,000 sugar beet growers. The group has an annual turnover of approximately EUR 2.1 billion and has more than 4,000 employees.

Suiker Unie's mission is to be the best at maximising the value and sustainability of all components of the sugar beet for its customers, growers and staff. Being one of the largest suppliers of biomass in The Netherlands, Suiker Unie is strongly investing in the biobased economy by working on bioplastics produced from thick juice, fibres from beet pulp and proteins from sugar beet leaves.

Recently Suiker Unie has built large scale biomass digesters adjacent to all its sugar plants. These digesters ferment more than 100,000 tonnes of vegetable residuals each every year into green gas. Most will come from our own production processes but suitable residual flows, such as potato peelings, chicory pulp and vegetable cuttings, will also be sourced from other businesses. At full capacity, Suiker Unie's three digesters will produce more than 25 million m<sup>3</sup> of green gas per year and feed it into the regional grids.

Suiker Unie is developing its production plants into world class biorefineries. The "Nieuw Prinsenland" Cluster near the Dinteloord site includes a business park and a greenhouse complex. It is based on the principles of cooperation and the exchange of products and residual flows: biomass, heat, water and CO<sub>2</sub>. In Vierverlaten a similar site is being developed near the sugar factory: "Biobased Park WestPoort".

# Introducing the Netherlands



Source: Rijkswaterstaat

A country that the Dutch created in the delta of three large rivers, flowing into the North Sea... Where two thirds of GDP are earned below sea level... Where there used to be a lake almost two million acres wide where Amsterdam Airport Schiphol is today... Where innovative and daring solutions for water control protect half of the country against the risk of being flooded. It earned us a worldwide reputation... **We know water.**

A country that was in need of more land for agriculture... Where land was reclaimed from the sea and kept dry: the famous 'polders'. A country supposedly too cold to grow certain vegetables and flowers... Where greenhouses were invented as a solution to this problem. Where Dutch farmers now produce 2.5 times more food per acre than EU farmers produce on average...

**We know food & flowers.**



Source: Tomato World



Source: Europe Container Terminals BV, Rotterdam

A country that is the gateway to Europe... Connecting nearly half a billion consumers in the European hinterland to the world's producers... Thanks to the world-class Port of Rotterdam, the internationally praised Amsterdam Airport Schiphol, an extensive network of waterways, Europe's strongest road transport sector and an extensive network of rail links **We know logistics.**

A country with an open and cooperative attitude... Whose residents have always felt the need to explore what lies beyond its borders... Where the world's first multinational corporation originated in the 17th century. A country where, today, more than 80% of people who are 15 years or older speak English...

**We know international business.**



Source: Hans Kouwenhoven

## Worldwide ranking

- **1st** Production and auctioning of cut flowers and flower bulbs
- **2nd** Number of broadband connections per 100 inhabitants (39.4%)
- **2nd** Density of road network
- **2nd** Export of agricultural products (103.3 billion US Dollar)
- **2nd** Quality of Water Transportation (9.04)
- **2nd** Logistics performance Index (4.05)
- **4th** Largest seaport in the world (Port of Rotterdam), largest in Europe
- **6th** Exporter of goods (555 billion US Dollar)
- **7th** Foreign direct investment in the Netherlands (From Europe)
- **8th** Import of commercial services (119 billion US Dollar)
- **9th** Dutch investments abroad (976 billion US Dollar)
- **9th** Importer of goods (501 billion US Dollar)
- **9th** Export of commercial services (134 billion US Dollar)

## Facts & figures

- **Form of government** Parliamentary democracy, constitutional monarchy
- **Capital city** Amsterdam
- **Seat of the government** The Hague
- **Composition of the country** Twelve provinces, overseas territories of Aruba, Curaçao and St. Martin. The overseas islands of Boanire, Saba and St. Eustatius, all three of which are situated in the Caribbean, are 'special municipalities of the Netherlands'
- **Language** Dutch, Frisian
- **Monetary unit** Euro
- **Population** 116,848,640 (May 2014)
- **GDP in the EU** 615.4 billion Euro (2014)
- **GDP per capita** 43,146 US Dollar (2012)
- **Trading partners** 1) Germany; 2) Belgium; 3) UK; 4) France;
- **Import partners** 1) Germany; 2) Belgium; 3) China;
- **Dutch investments abroad** 777.2 billion Euro (Ultimo 2013)
- **Foreign direct investment in the Netherlands** 485.9 billion Euro (Ultimo 2013)
- **Command of foreign languages** English (80% of > 15 years old), German (66%) and French (25%)

*Knowledge is power. Sharing knowledge is more powerful. Doing business the Dutch way is doing business with you and for you! It's not about quick fixes or easy money, but about cooperation and consideration of individual needs of partners... Trade is in our DNA.*

## Energy Sector

# Holland innovates in renewable energy

The Netherlands has embraced a courageous vision: by 2050, the country will have a sustainable, reliable and affordable energy system. To achieve this, the Dutch aim to cut CO2 emissions by half to generate some 40 percent of its electricity from sustainable sources like wind at sea and biomass by that time. Carbon emissions will be reduced by increasing the portion of renewable energy, energy saving, nuclear energy and Carbon Capture and Storage.

By 2020, the European Renewable Energy Directive sets the target of 14% renewable energy. Renewable resources will play an important role in the bio based economy.

To stimulate renewable energy production, the government has earmarked an annual sum of € 1.4 billion from 2015, which represents a major step towards achieving the 2020 target.

Innovation and public private partnerships are key to the Dutch approach: the government, private sector, and academia co-operate on the following priority topics: energy savings in industry and the built environment, gas, smart grids, wind at sea, solar energy and bio energy.

The Netherlands is experimenting with energy from waves, algae and biomass and the Dutch have developed innovative solutions in decentralised energy production in greenhouses, CO2 'recycling' and waste heat utilisation for their energy intensive horticulture industry. As a result, compared to other countries, the proportion of installed decentralized capacity in the Netherlands is very high. In addition, the Dutch are investing heavily in Smart Grids, which facilitate developments such as electric vehicles. In fact, the city of Groningen has the first 'live' smart grid community in Europe: PowerMatching City.



*Photo: Flying Focus*

### Websites

[www.cleantechholland.nl](http://www.cleantechholland.nl) - Dutch export platform for Dutch clean tech companies

[www.dekoepel.org](http://www.dekoepel.org) - Dutch Renewable Energy Association (Dutch language)

[www.energiened.nl](http://www.energiened.nl) - Association of Energy Producers, Traders and Retailers (Dutch language)

[www.vlm.fme.nl](http://www.vlm.fme.nl) - Association of Suppliers of Environmental Equipment and Technology

[www.ecn.nl](http://www.ecn.nl) - Energy Research Centre of the Netherlands

[www.biobasedeconomy.nl](http://www.biobasedeconomy.nl) - Networking platform for government, companies, scientists and NGOs

## Key aspects and strengths

- Renowned institutes such as the Groningen Energy Delta Institute train people from all across the globe. In addition, the Netherlands is establishing itself as leader in green gas.
- With its location at the heart of Europe and the logistical, petrochemical and industrial centre around the Port of Rotterdam, the Netherlands aims to become Europe's bio fuel hub.
- There is extensive experience in the field of energy efficiency due to a long tradition of multiannual voluntary agreements on energy efficiency between Dutch industry and the government. This has made Dutch industry one of the most energy efficient in the world.
- The Dutch have leading expertise in offshore wind energy, co-combustion of biomass in coal-fired power plants, pre-treatment methods of biomass, the use of landfill gas, and the use of heat pumps combined with heat and cold storage.
- The Netherlands has an international reputation for research in renewable energy, due, in part, to the work of the energy research centre ECN.

## Facts & Figures

- The Netherlands is a major natural gas producer and the source of advanced gas technology. It is also Europe's leading gas broker and a strategic gas hub. The country produced 80.2 billion cubic metre (bcm) in 2012. Gas exports amounted 60.4 bcm.
- The distribution network for gas is the densest in Europe with a total length of 12,200 kilometres of transmission pipelines and 136,400 kilometres of distribution pipelines.
- The Dutch have unmatched capacity to cope with seasonal fluctuations in gas demand, providing north-western Europe with much-needed flexibility.
- The Delft University of Technology has won the World Solar Challenge, the biennial competition for solar cars, in 2001, 2003, 2005, 2007 and 2013.
- The Dutch have leading expertise in offshore wind energy, co-combustion of biomass in coal-fired power plants, pre-treatment methods of biomass, the use of landfill gas, and the use of heat pumps combined with heat and cold storage.
- There is extensive experience in energy efficiency due to a long tradition of multi-annual voluntary agreements on energy efficiency between Dutch industry and the government. This has made Dutch industry one of the most energy efficient in the world.
- 7.5 million tons of municipal waste is converted in 13 efficient and clean waste incinerators to power, heat and reusable resources from the ashes.
- 'Green gas' technology, the gasification of biomass, has been patented by Dutch energy company ECN. Studies indicate that 'green gas' can replace 10% of Dutch-consumed natural gas by 2020.
- Holland plays a key role as a major oil refining centre in Europe, with an extensive supply network of ports, storage facilities and pipeline connections playing a critical role for oil supplies to the continent. The country is among the largest traders of crude oil and petroleum products in the world.





Photo: Dow

## Chemical Sector

# Holland: your chemical portal to Europe

The chemical industry in the Netherlands, a priority sector of the Dutch government, is strongly focused on sustainability. The chemical industry has therefore agreed on a long-term strategy aimed at increasing productivity, doubling both turnover as well as CO<sub>2</sub> reductions and reducing the environmental footprint. Goal is to be known as the Green Chemistry Country and to be ranked among the top three producers of high-tech materials worldwide by 2050.

The whole chemical supply chain is represented in the Netherlands through its internationally operating world-class companies in each segment. Dutch chemical companies work together in public-private partnerships on innovation and production, and take advantage of regional clustering. Because of its integrated nature, Holland now hosts 19 of the world's top 25 leading chemical companies such as LyondellBasell, Sabic, Teijin and Dow, as well as a number of world class R&D institutes for fundamental and applied research.

### Websites

[www.vnci.nl](http://www.vnci.nl) - Netherlands Chemical Industry Association

[www.kncv.nl](http://www.kncv.nl) - The Royal Netherlands Chemical Society

[www.be-basic.org](http://www.be-basic.org) - Bio-based, Ecologically Balanced Sustainable Industrial Chemistry

[www.ispt.nl](http://www.ispt.nl) - Institute for Sustainable Process Technology

[www.polymers.nl](http://www.polymers.nl) - Dutch Polymer Institute

[www.m2i.nl](http://www.m2i.nl) - Materials Innovation Institute

[www.iro.nl](http://www.iro.nl) - The Association of Dutch Suppliers in the Oil and Gas Industry

[www.nfia.nl/chemical\\_portal\\_to\\_europe.html](http://www.nfia.nl/chemical_portal_to_europe.html) - Holland: your chemical portal to Europe

## Key aspects and strengths

- Holland enjoys an excellent geographical location and infrastructure and knows how to leverage location and infrastructure to ship chemicals quickly and economically to any destination in the world. It operates Europe's largest inland shipping fleet and has an extensive network of roads, railways, and pipelines. Holland is also home to one of Europe's best cargo airports (Schiphol), and Europe's largest sea port (Rotterdam). The Dutch have world-leading expertise in logistics and supply chain management.
- The competitiveness of the Dutch chemical industry lies in its internal and inter-company integration. Chemical companies purchase from – and supply to – one another.
- Within the strong chemical community, the Dutch have formalized and structured the approach to co-operation. This is done with formal, long-term public-private partnerships (such as BE-Basic, the Institute for Sustainable Process Technology and the Dutch Polymer Institute) as well as through 'open innovation' in so called Centres for Open Chemical Innovation (COCI). The five COCIs are Chemelot, the Green Chemistry Campus, Biotech Campus, Plant One, and Green Polymer Application Valley
- The Dutch chemical industry excels in three sustainable areas: 1) the industrial biotechnology cluster combines world-class knowledge on agro-food and chemistry with cross-disciplinary co-operation and innovation. 2) Dutch excellence in high-performance materials (3) and fine chemistry.
- In the area of advanced materials (polymers, composites, etc), the Netherlands consistently punches above its weight, producing world-renowned innovations in materials such as Twaron, Dyneema and Glare, as well as the folding tires for the automotive industry.

Sources: VNCI, NFIA

## Facts & Figures

- The chemical industry is one of the leading business sectors in the Netherlands, making a significant contribution to the economy. In 2013, the turnover was 57 billion euros.
- The Netherlands is the world's 5th ranking chemical exporting country. In 2013, Dutch chemical exports were valued at some 75 billion euros.
- About 80% of chemical products made in Holland are exported. A fifth of all Dutch exported goods come from the chemical sector.
- The chemical industry made a positive contribution of almost €60 billion to the balance of trade in 2012, which was over 60% of the total balance of trade of commodities of the Netherlands.
- Innovation is essential – the Dutch chemical industry devotes about 2.5% of its revenues to in-house R&D, some €1.4 billion per year.
- The Netherlands hosts 16 of the world's top 25 leading chemical companies, including BASF, AkzoNobel and Shell.
- Holland is home to world-class R&D institutes for fundamental and applied research such as TNO, Delft University, Twente University, Wageningen University and Eindhoven University.





[www.be-basic.org/wcib2015](http://www.be-basic.org/wcib2015)

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