



Biobased Chemicals

Opportunities in the Port of Rotterdam

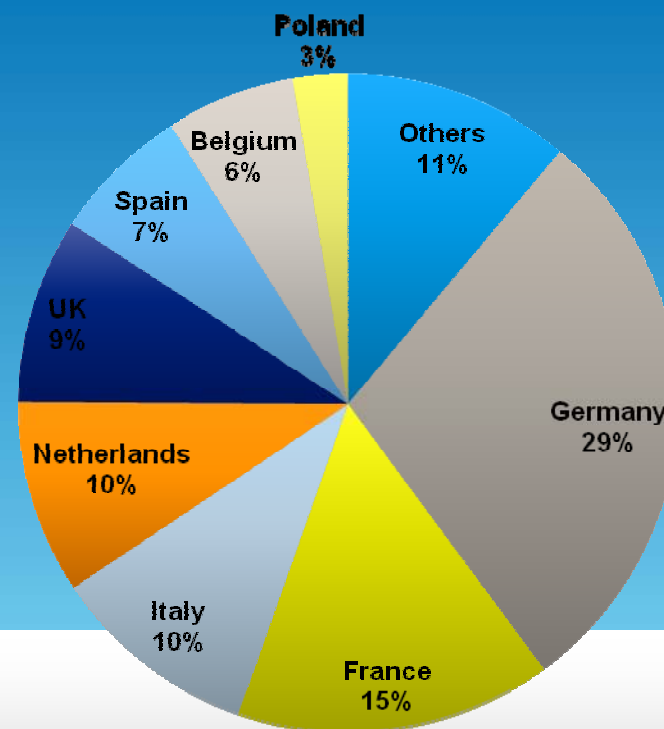
Port of Rotterdam
December 2012

The Netherlands, big in chemicals



Netherlands 4th chemical producing country in Europe

- Net revenue of the Dutch chemical industry: **€58 mld**
- Chemical export: **75%**
- Employment in chemical industry: **63.000**
- R&D in chemicals: **€1,2 mld**



Chemicals in Europe

The Chemical Industry in the Netherlands: World leading today and in 2030–2050

Report Deloitte for VNCI, February 2012



“The chemical industry in the Netherlands will be a key part of the large and highly integrated cluster in the Antwerp-Rotterdam-Rhine-Ruhr Area (ARRRA), one of a few leading chemical clusters in the world. In 2030–2050 the ARRRA will be Europe’s regional hub for feedstock, production, research, and development. This cluster will compete and interact with similar areas in the United States, China, India, the Middle East, and Brazil.”

World-Leading Cluster in 2030-2050:

- Tightly integrated physical network: co-siting, shared infra
- Wide range of feedstock: sustainable biobased feedstocks
- Leading innovation ecosystem: R&D; adequate talent
- Clear regulatory framework: predictable, fair, attractive



Antwerp-Rotterdam-Rhine-Ruhr Area

Biobased industry in Rotterdam



Biomass for co-firing in power plants

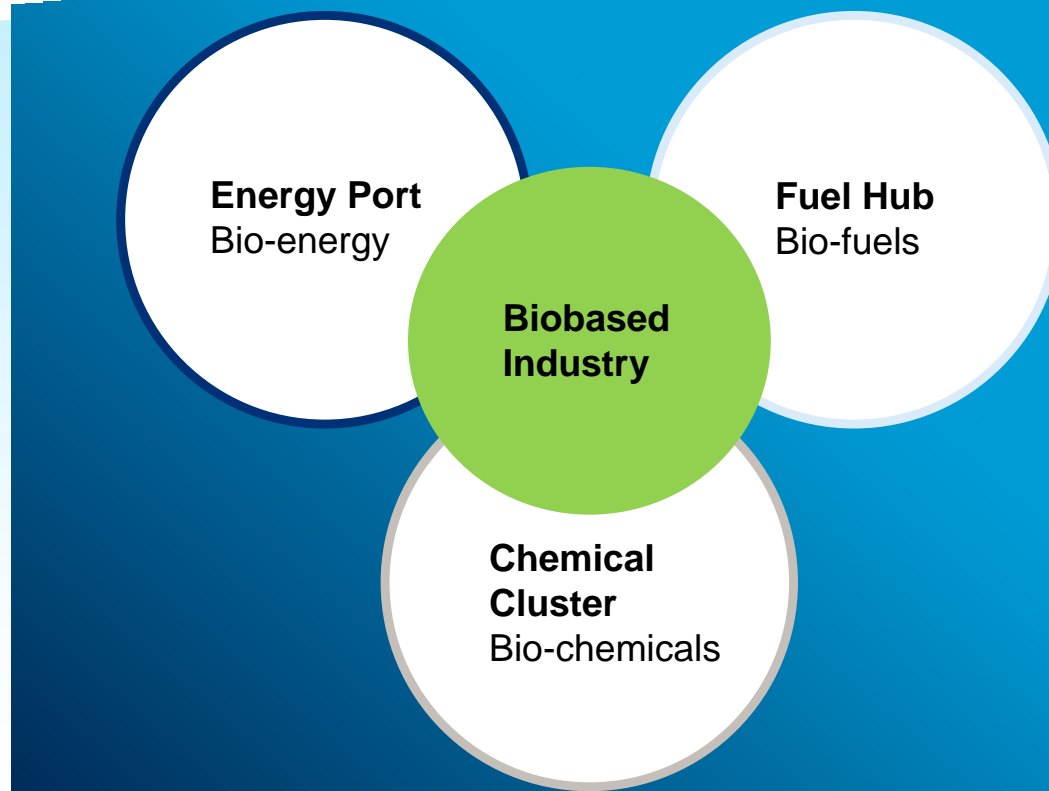
- Legislation: 20% in 2020

Biofuels production and storage

- RED European legislation: 10% renewable fuels in 2020
- Recent proposal of European commission increases uncertainty in the market

Biochemicals

- No legislation yet: market pull in consumer markets (e.g. packaging)
- Shalegas vs high oil prices: push for innovations



Feedstocks of the future

- Sugars from cane / sugarbeet
- Cereals, rapeseed, corn, soy
- Palmoil and other vegoils
- Woodpellets & woodchips
- Residuals from agriculture, other waste streams
- Algae, seaweeds



Sugar beet harvesting in the Netherlands

BioPort Rotterdam



- Agri- and biomass terminals**
ADM, EBS, EMO, Marcor, RBT, ZHD
- Tankstorage for chemicals, biofuels, edible oils**
Caldic, Vopak, Rubis, Odfjell, LBC
- Biomass Co-firing**
E.On, GDF-Suez, AVR
- Biofuels production**
Neste Oil, Abengoa, Biopetrol
- Biobased production plant**
IOI, ADM, Lyondell, Cargill, Wilmar



PRODUCTION & LOGISTICS

Sugar based biochemicals



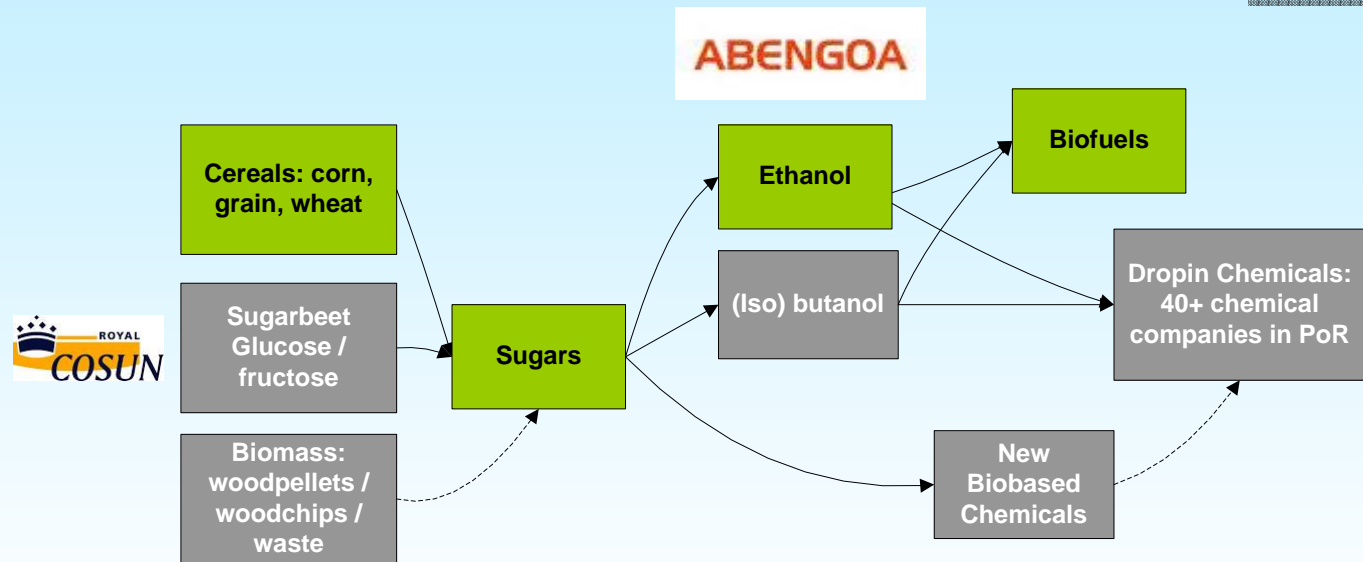
Using **sugars** from cereals, sugarbeet, cane

Developing **partnerships** with all links in the chain

Connecting new **technologies** with existing **chemical** industry

(Green: Available in Port of Rotterdam area)

(Grey: not yet practised in Rotterdam)



SUGAR BASED BIOCHEMICALS

Vegetable oils based biochemicals

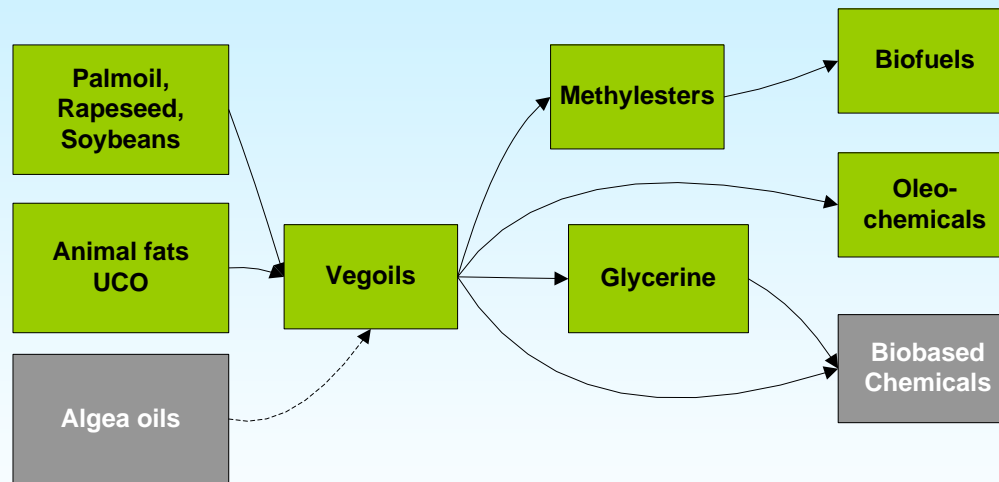
Using **vegoils** from soy, rape, palm

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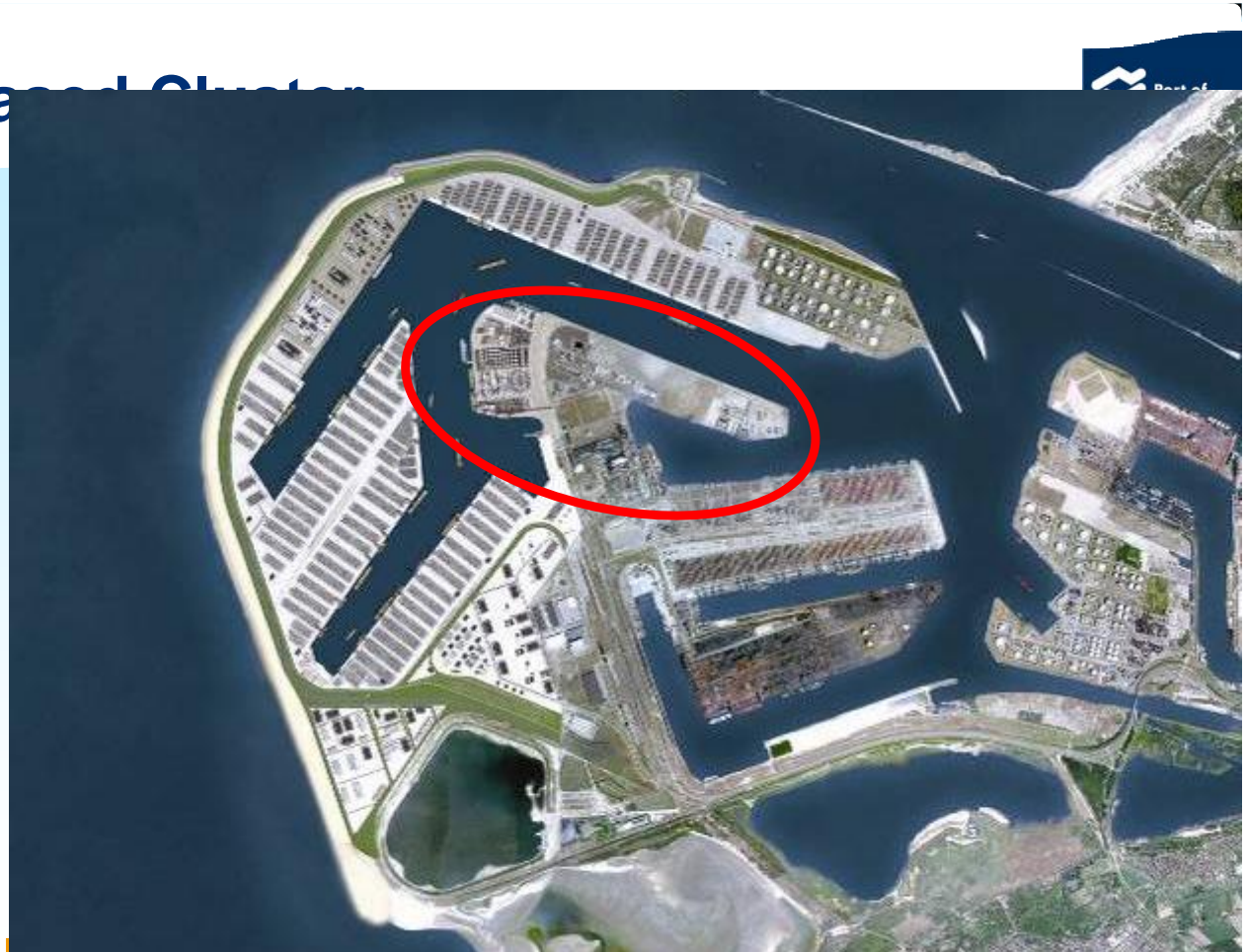
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VEGOIL BASED BIOCHEMICALS

Developing a Biobased Cluster

- Biobased Cluster Maasvlakte
- Dedicated to biobased chemical industry
- Ca. 80 hectares
- Available from 2013
- Waterfront with deep water
- Integration & Clustering with existing industries
- Connected to road / rail / pipeline infrastructure



BIOBASED INDUSTRIAL CLUSTER

Biobased Cluster Maasvlakte



Biochemicals production:

- Biorefinery
- Platform molecules
- Advanced Biofuels (jetfuels)
- Biochemicals (bioplastics)

Multi user utility center:

- Steam / power
- Industrial gasses
- Waste water treatment
- Terminals for liquid & dry bulk



Biobased Cluster Maasvlakte