

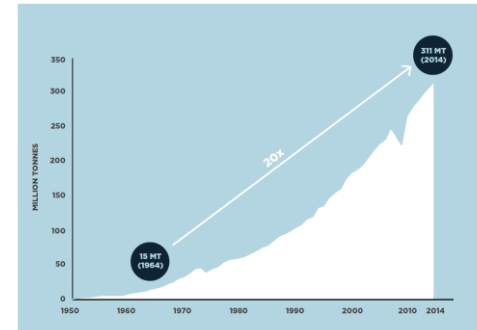
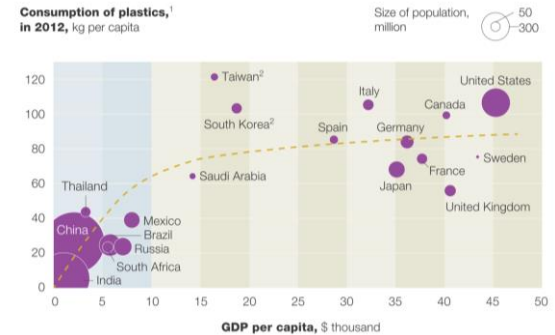
Power/biomass to chemicals

André Heeres, Chains 2018 (Hanzehogeschool/Syncom)

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move the world.

Drivers biobased transition

- Environmental aspects
- Exhaustion of oil/decoupling from fossil feedstock
- Demographic trends
 - Growth world population
 - Increasing prosperity (middle class)
- Economic opportunities!



Ellen McArthur foundation, 2016

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Power/biomass to chemicals

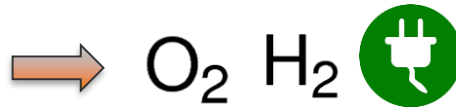


- Northern Part of The Netherlands

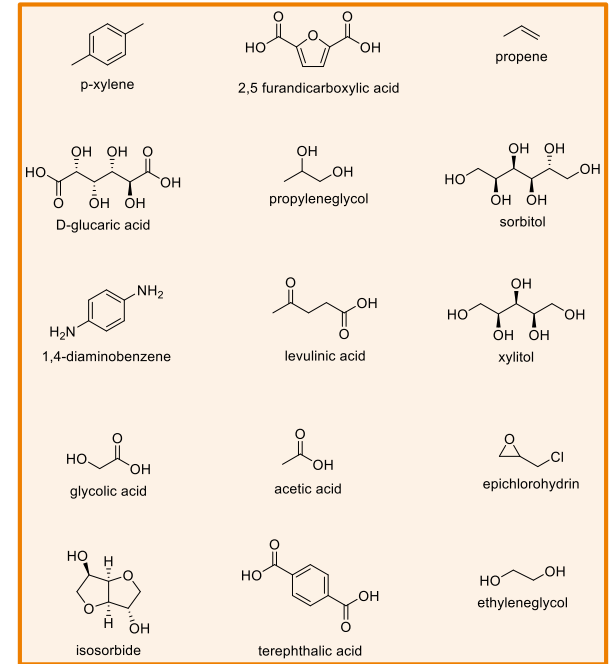


- Knowledge Institutes (4x)
 - University of Groningen
 - Hanze University of Applied Sciences
 - NHL Stenden
 - Van Hall Larenstein
- Chemistry sites (2x)
 - Eemsmondregio/Delfzijl
 - Emmen (plastics)
- Harbour/(Sea)
- Biomass available

Landscape "Delfzijl"

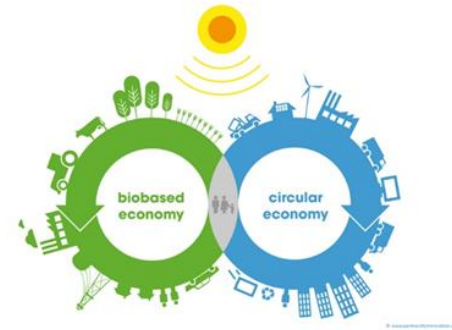
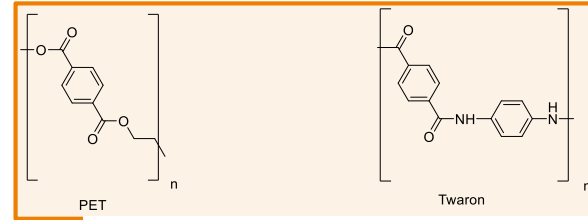
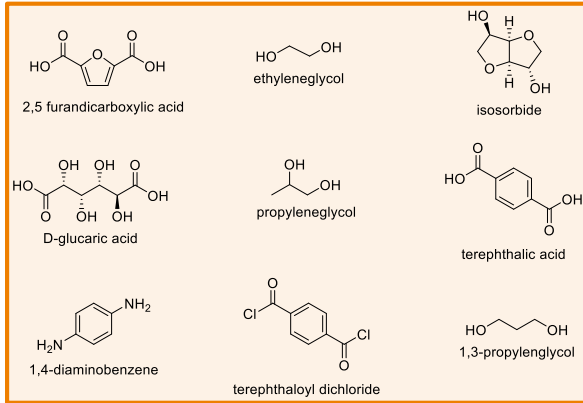


- Chemistry site Delfzijl**
- Chlorine (Cl_2 , $NaOCl$), hydrogen peroxide (H_2O_2) and oxygen (O_2) (small amounts)
 - Hydrogen (H_2) (small amounts)
 - Monochloroacetic acid ($ClCH_2COOH$)
 - Sodium hydroxide ($NaOH$), hydrochloric acid (HCl) en sulphuric acid (H_2SO_4)
 - Formaldehyde (H_2CO)
 - Ammonia (NH_3), acetic acid (CH_3COOH)
 - Methanol ($MeOH$)
 - Glucose (pilot), glycerol
 - Zeolite catalysts



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.... and further to Emmen



.....and recycle properly?

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Program

- Green Hydrogen Technology (Hans Lammers, Nouryon)
- Biobased production of Cornerstone Chemicals (Pieter Imhof, BioBTX)
- Recycling of polyesters: Closing the Loops (Vincent Voet, NHL Stenden)