

Education on Biobased economy

- Centre for Biobased Economy
- Wageningen UR

Gerlinde van Vilsteren, 14 June 2016

Global challenges

Food security



Climate change



Food and Nutrition



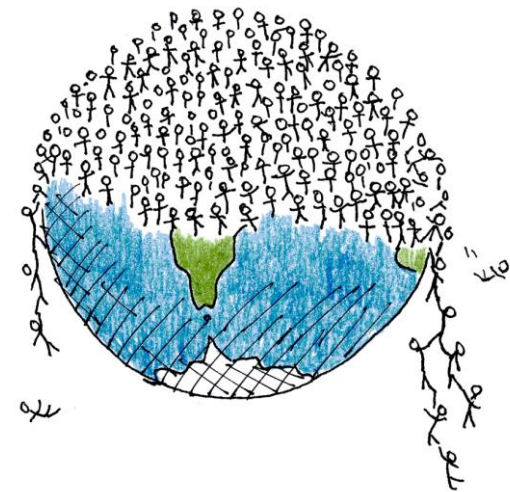
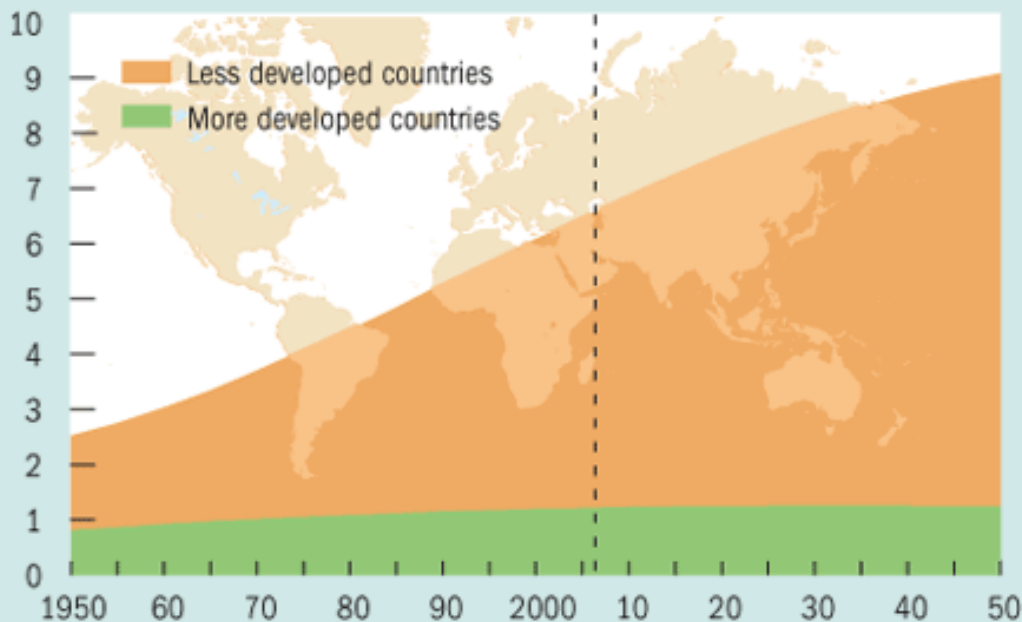
Bio-based Economy



Driving forces Bio-based society - Demographic growth

The world's population is expected to reach 9.1 billion by 2050, with virtually all population growth occurring in less developed countries.

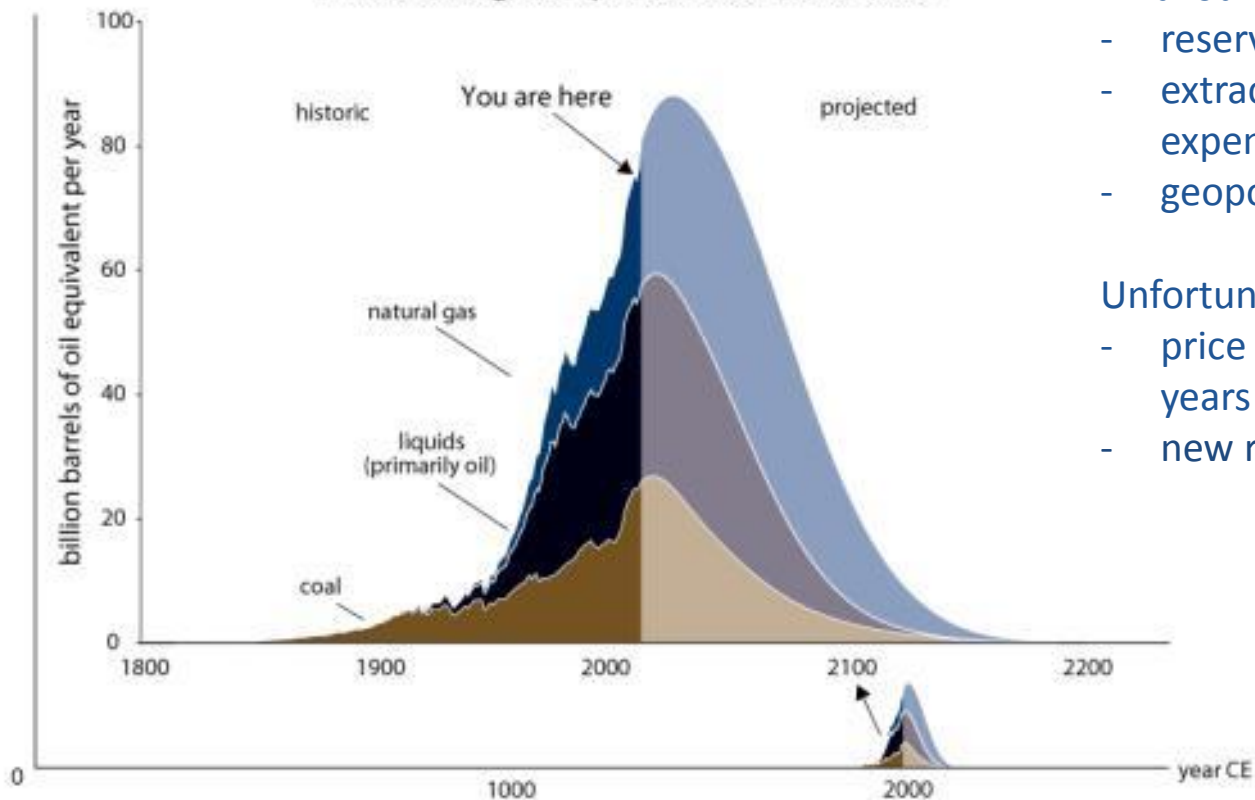
(population, billions)



Source: IMF

Driving forces Bio-based society - Oil reserves

Fossil fuels: global production, 1800–2200



In favour of the bio-based economy:

- reserves decrease
- extraction becomes harder and more expensive
- geopolitics

Unfortunately:

- price is and will stay low for coming years
- new reserves are found, shale gas



Driving forces Bio-based society - Climate change



Driving forces Bio-based society – Economic growth

- (Regional) economic growth and employment
- New chances for farmers



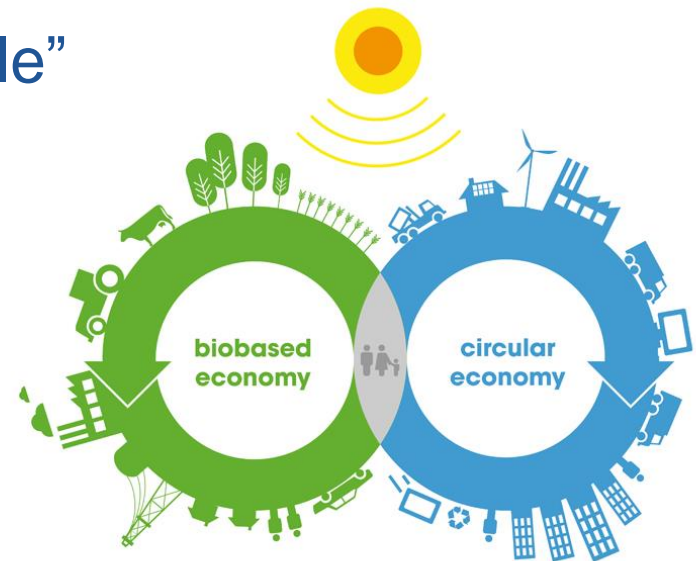
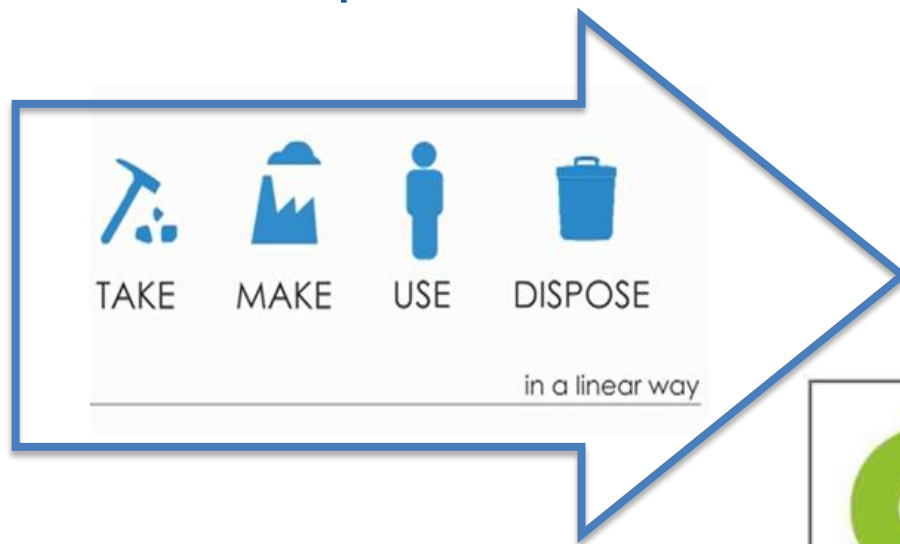
Towards a bio-based society

- For prosperity and well-being for 9 billion people in 2050, we need other ways of production of food, feed, materials and energy.
 - Resource efficiency
 - Energy from the sun, geothermal energy and other unlimited sources.
 - Biomass to produce food, feed and materials.



To a new circular economy

- From “linear” to “cradle to cradle”
C2C to circular economy
- From possession to sharing

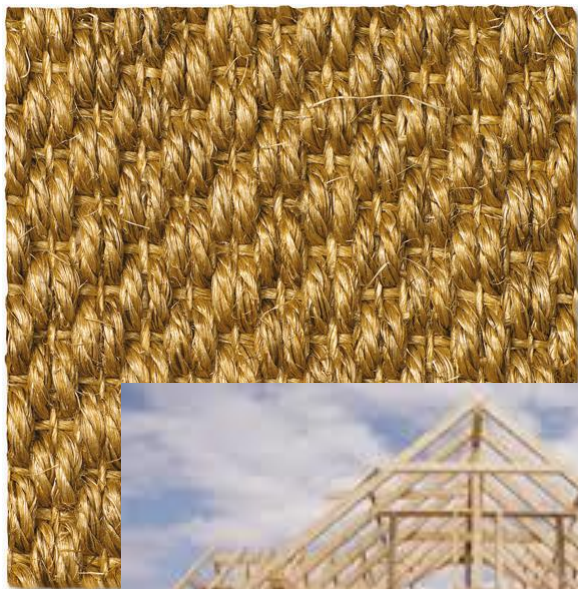


© www.partnersforinnovation.com

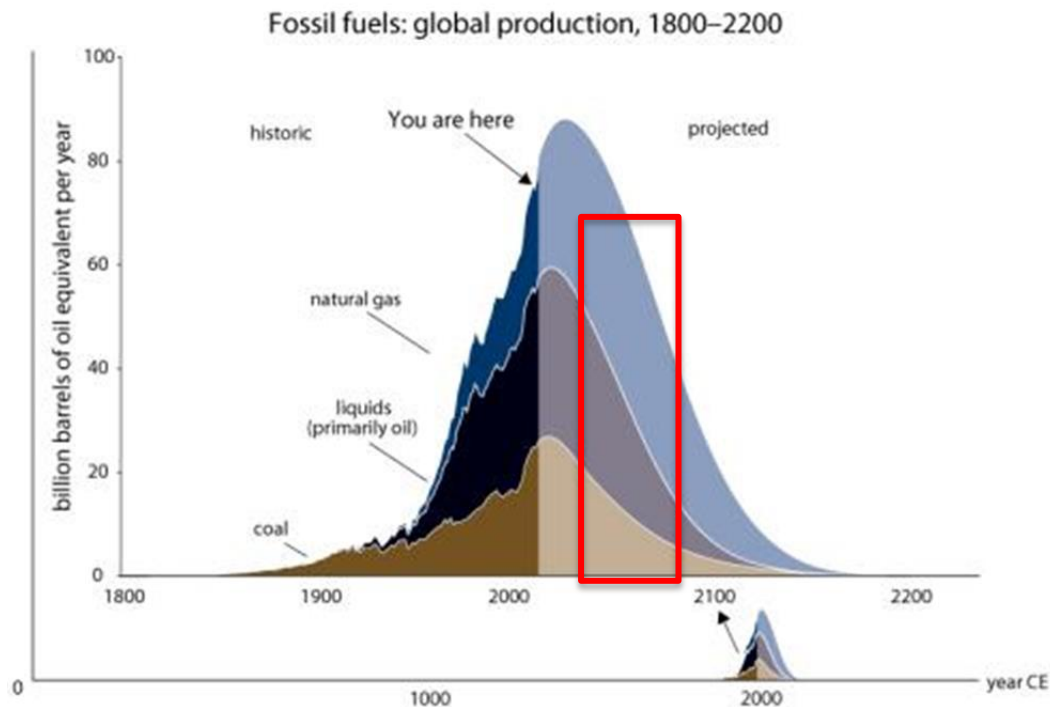


<https://www.youtube.com/watch?v=>

And it is not totally new....



The fossil based economy was a hiccup in history

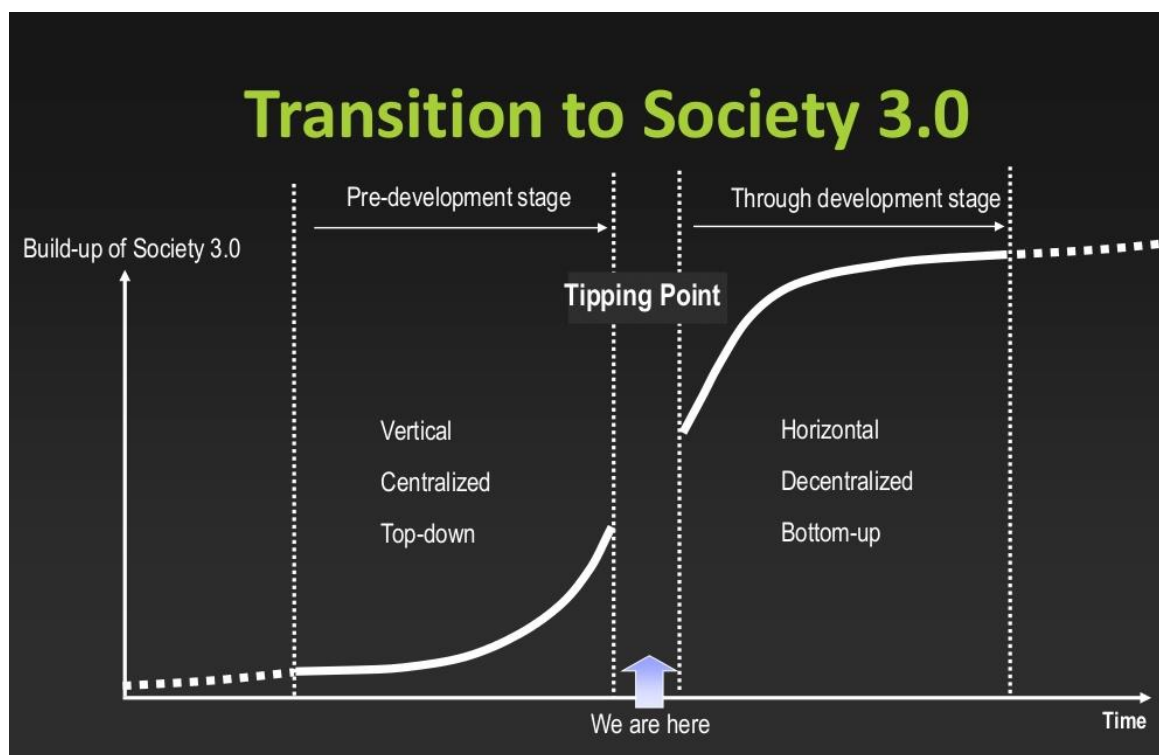


Rocky Mountain Institute © 2011. Published by Chebea Green in *Reinventing Fire*. For more information see www.RMI.org/ReinventingFire.

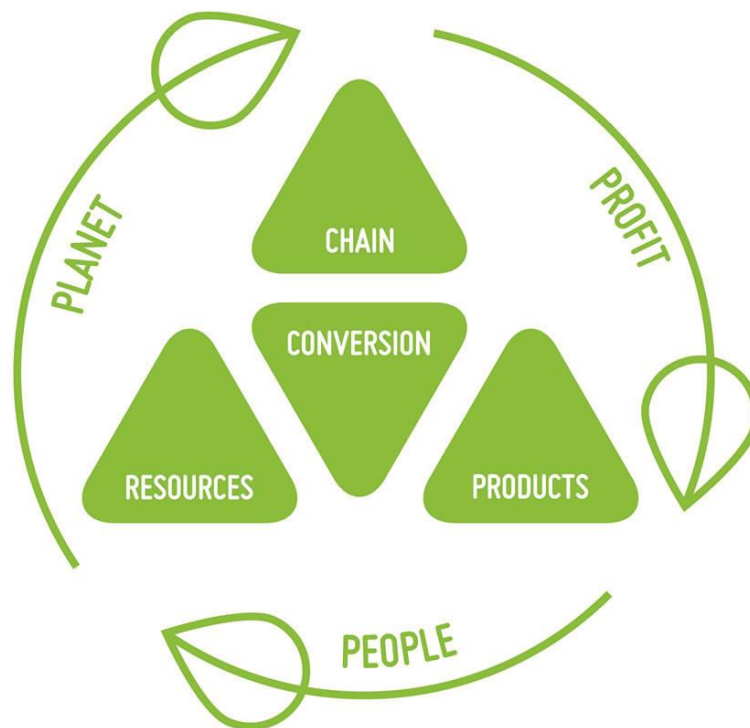
Our students are the ones who will realize this transition to a bio-based society

Transition to a bio-based society will take some time.....

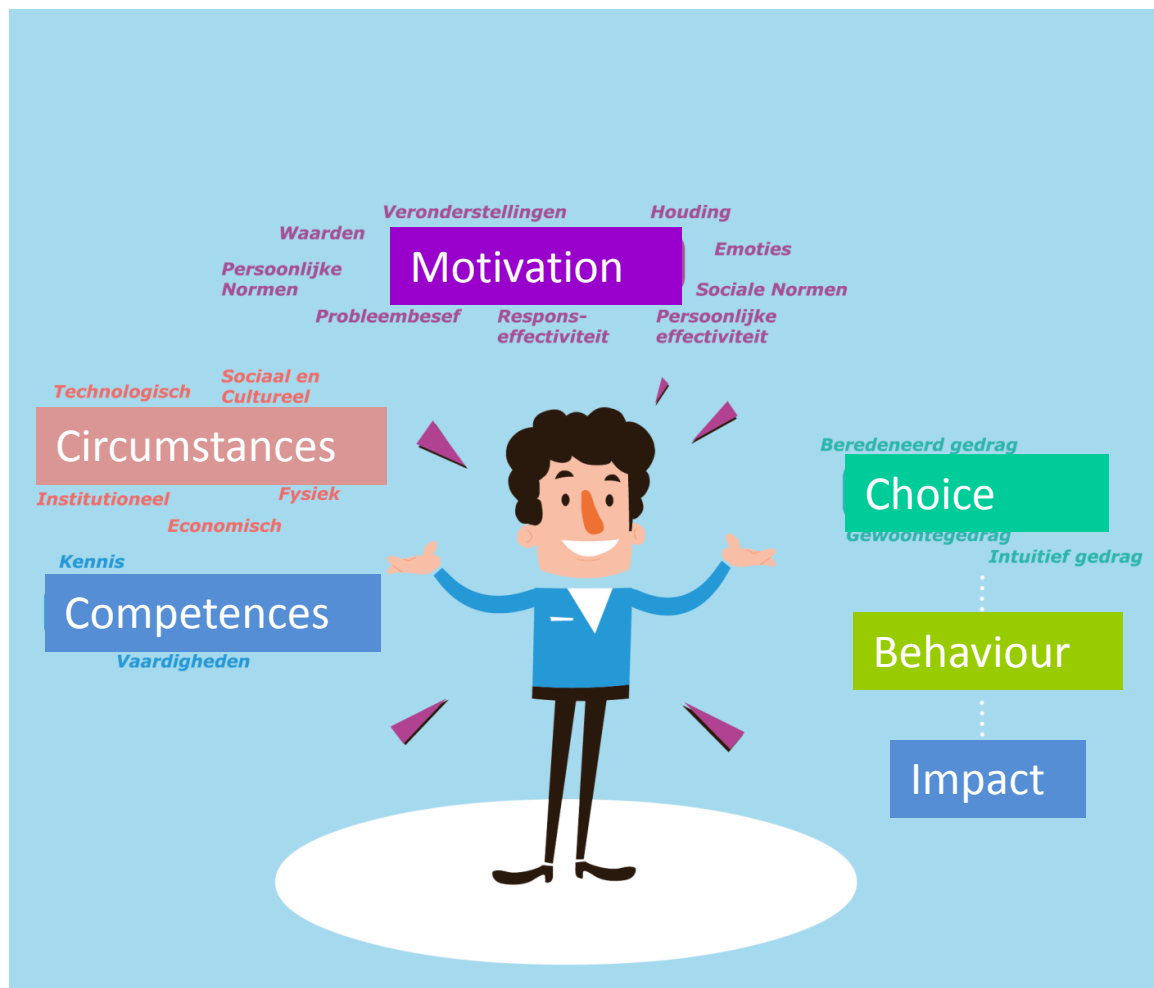
- Technological advances will be slowed by legislation. Societal, environmental and economical factors develop differently up to the tipping point. Then acceleration starts.
- Time line: decades



Multi-factor, transdisciplinary approach - People, planet, profit



People - Will a bio-based product be bought?



Dutch report: “Doen en laten: effectiever milieubeleid door mensenkennis” – *acting and not acting*

Raad voor leefomgeving in infrastructuur (RLI)

Centre for Biobased Economy

CBBE

The Centre for Bio-Based Economy (CBBE) is a Dutch collaboration between educational institutes and industry to educate professionals for a strong bio-based Economy.

- Knowledge transfer and innovation in education
- Applied research
- Joint projects with industry

The CBBE includes Wageningen UR | CAH Vilentum | HAS Hogeschool | Inholland | Van Hall Larenstein | Hogeschool van Arnhem en Nijmegen | Avans Hogeschool | HZ

Cooperation in the NL - Centre for Biobased Economy



CAH VILENTUM
DRONTEN/ALMERE



HOGESCHOOL INHOLLAND
DELFT



AVANS HOGESCHOOL
BREDA



HZ UNIVERSITY OF APPLIED SCIENCES
VLISSINGEN



HOGESCHOOL VAN HALL LARENSTEIN
LEEWARDEN/VELP



WAGENINGEN UR
WAGENINGEN



HAN BIOCENTRE
NIJMEGEN/ARNHEM



HAS HOGESCHOOL
DEN BOSCH/VENLO

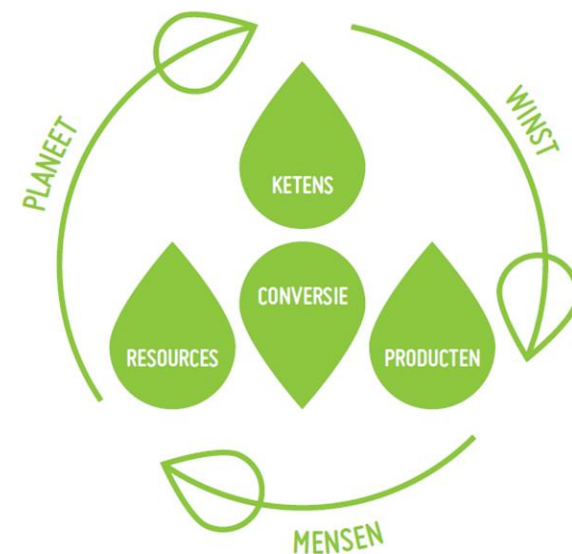


- Time period: 2011-2016
- Website: www.cbbe.nl en www.coebbe.nl
- Logo:



Outcome CBBE overall

- Enhanced cooperation between WU and Universities of applied sciences (UAS) and between different UAS
- Education:
 - New courses and minors, incorporated in the curricula
 - New teaching material, such as wikiwijs and MOOC's
 - Continuous learning – from primary school to Life Long Learning
 - Website for sharing teaching material
 - CBBE-days for teachers
- PhD's:
 - UAS-teachers do PhD-tracks at WU
- Research projects with companies
- Knowledge dissemination



Consequences of biobased transition for education

Survey under secondary school students, 2011 (n=4000)

Executed by Newcom, Amsterdam

- 7% is familiar with the term bio-based economy
- 70% is not familiar with the term bio-based economy
- When explained: 70% became enthusiastic
- 40% were interested to follow a program related to bio-based



Learning objectives BBE-education

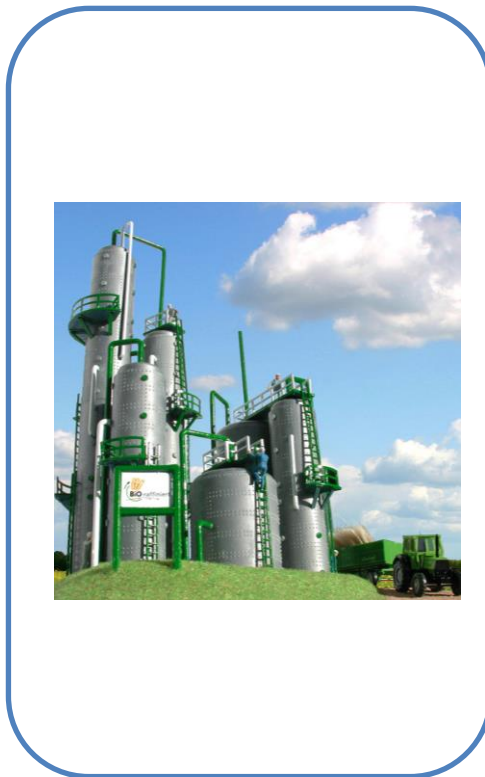
- Disciplinary expertises will stay the starting point
- Another mindset is required - holistic
 - Look broader than own sector
 - Think in value chains and cycles
- Multidisciplinary and across borders of traditional sectors
- Transition to a bio-based society (will take time)

Three pillars within the Wageningen University

Primary production



Conversion/refinery



Socio-economic



Topics for our MOOC, starting januari 2017

- Topics
 - Production
 - Bioconversion/biorefinery
 - Chemical conversion/separation
 - Sustainability analysis
 - Logistics
 - Economics
 - Marketing

Education for biobased economy

- At all levels
- Life Long Learning
- Degree and non-degree
- Practicals
- Examples out of the practice of companies

Continuous learning for the Bio-based Economy

Starting at primary school up to life long learning

- Modules and laboratory experiments for all ages (> 10 years)
- 'minor' for vocational education
- CBBE-wiki for first year students at Univ. of Appl. Sc:
http://maken.wikiwijs.nl/51426/Introduction_to_the_Biobased_Economy
- BSc-courses, minors, MSc-specialisation, PhD-courses
- Courses and training for Life Long Learning

But also for teachers and a wide audience

- MOOCs
- Training and courses for the teachers
- Website with public educational material, coordinated by WU (www.biobasedacademy.nl)



CBBE-teachers days 2015-2016

	Sustainable Transition / Sustainability Analysis	Biobased Resources / Plant ingredients	Biorefinery / Biobased Products	Biobased Logistics / Value chains
Date:	4 february 2015	24 june 2015	5 novembre 2015	21 january 2016
Organising UAS	VHL	HAS Hogeschool / WU	HAN / Avans / CAH Vientum	Inholland

In average 30-40 participating teachers

Cooperation with other educational institutes

Vocational education

- Centres for innovative craftsmanship
- Training the teachers
- CBBE-teachers days
- EBBEY (European consortia on vocational education)

Universities

- In the Netherlands (TU-Delft – BE-Basic, RU-Groningen, UM-Maastricht)
- In Europe CLIB and a lot of research projects

Examples

Sea weed

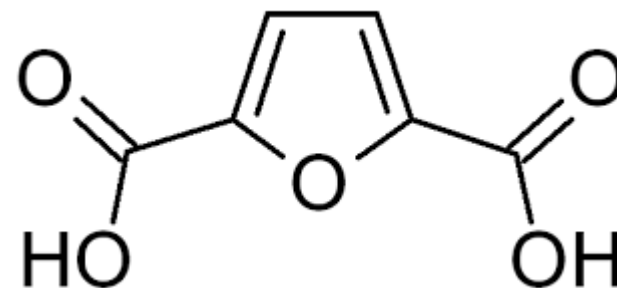
- Biomass production at sea
- Polysaccharids, such as alginates and carrageenans
 - Thickener and stabilizer in food
 - Water binding properties
 - As resource for bio-plastics and pharma



<http://www.wageningenur.nl/nl/Onderzoek-Resultaten/Themas/Biobased-economy/Show/Nieuwe-producten-uit-zeewier.htm>

Sugar acids from agricultural residues

- Sugar acids from agricultural residues are converted in furan dicarboxylic acid (FDCA), a building block for PET like packaging materials.
- Wageningen UR-FBR, Cosun, Refresco, Arkema and NorthSeaweed



<http://www.wageningenur.nl/nl/Onderzoek-Resultaten/Themas/Biobased-economy/Show/Bouwstenen-voor-duurzame-verpakkingsmaterialen-op-basis-van-agrozijstroom-AF12128.htm>

New resources for rubber

Guayule for rubber and latex



Guayule



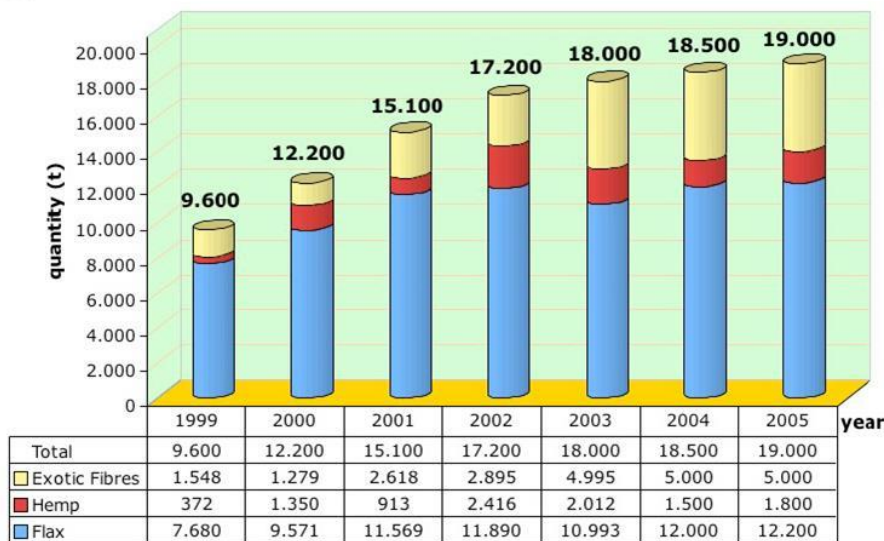
Rubber and latex



Automotive



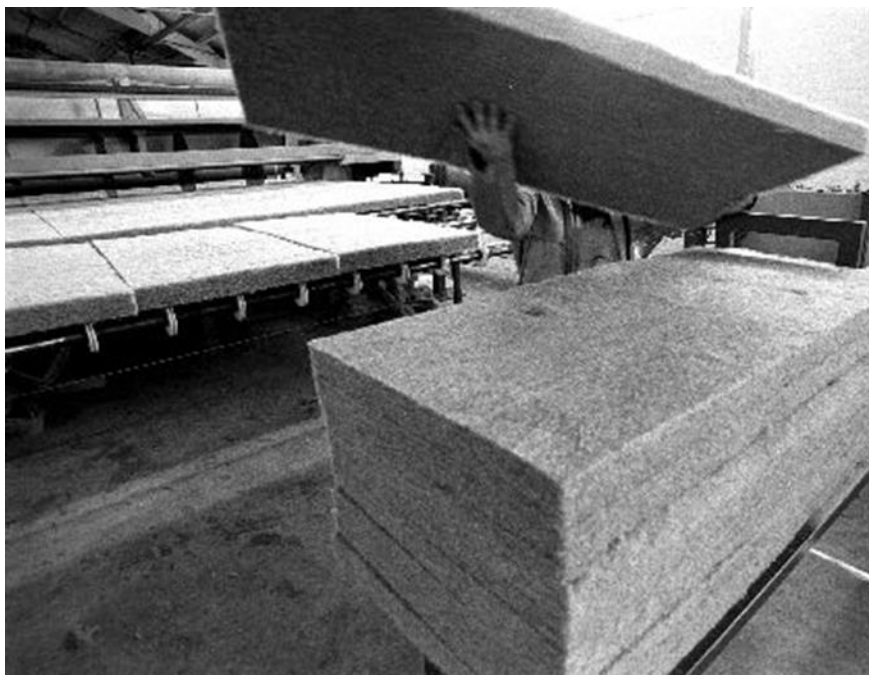
Use of Natural Fibres* for Composites in the German Automotive Industry 1999-2005



* without wood and cotton

2012 in EU: 90 kton (source Nova)

Bio-based building materials



Isovlas Oisterwijk b.v.

From waste to PolyHydroxyAlkanoates (PHA's)



Plant Bottle



plantbottleTM

up to **30%** plant-based
100% recyclable bottle

redesigned plastic,
recyclable as ever.

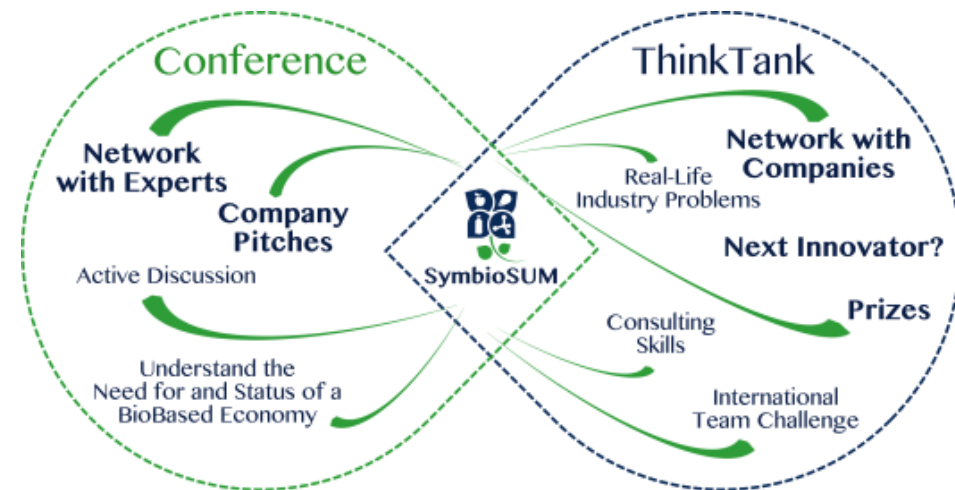


International Biobased Economy Student Symbiosum (IBBESS)

Organized by students of
Wageningen University

Sun 28 August 2016 until Wed 31
August 2016 in Wageningen

Please let us know if you want to
participate through
info@ibbess.org.



For further information see:
<http://www.wageningenur.nl/en/activity/IBBESS-Conference-2015.htm>

Bio-based economy - past, present and future

With acknowledgement to
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Wageningen UR

