Duurzame innovatie en transities voor de chemische industrie

Dr.ir Jaco Quist, Duurzame Innovatie en Transities
TU Delft, Faculteit Technologie, Bestuur, Management
j.n.quist@tudelft.nl

12 oktober 2022,
Minisymposium Stoffen, Herziening REACH; een tijd van transities voor de chemische industrie

TU Delft

Profiel & Faculteit

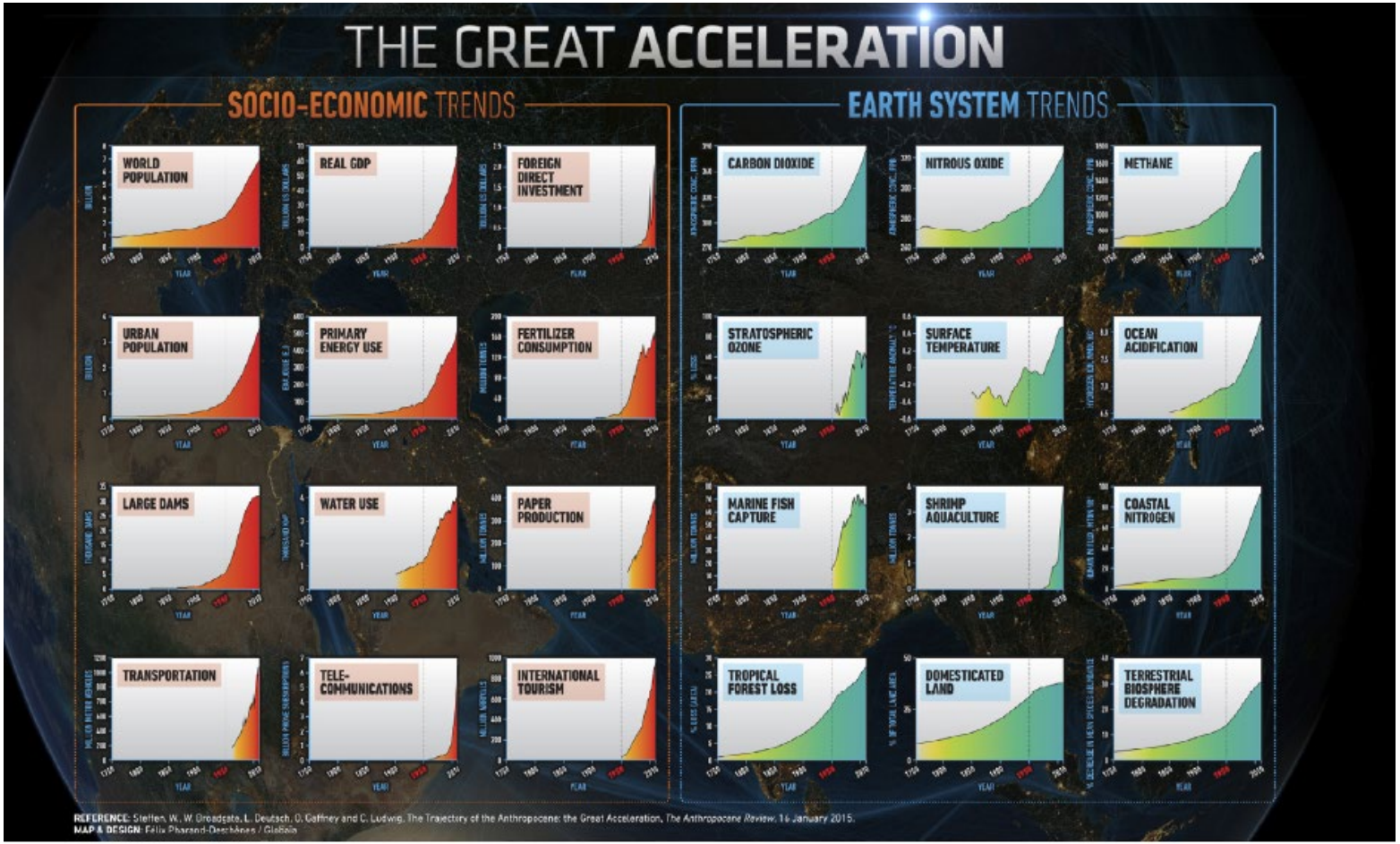
DCL
Delft Circularity Lab

- WU Moleculaire Wetenschappen (1985 - 1992)
- DTO programma (1994 - 1997)
- Sinds 1998 TU Delft, faculteit TBM
  - *Duurzame Innovaties, Transities, Backcasting*
  - *Circulaire Economie, Energy Transitie,*
  - *Duurzaam Consumeren & Produceren*

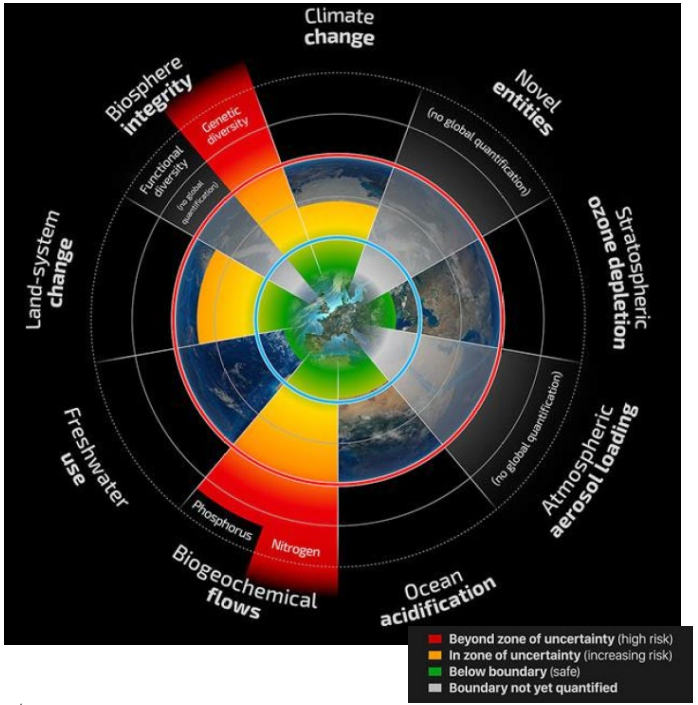
Opleidingen TBM

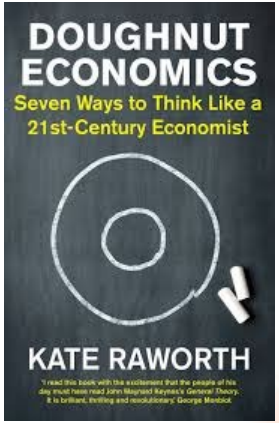
- Bsc Technische Bestuurskunde
- MSc Complex Systems Engineering and Management
- MSc Management of Technology
- MSc Engineering and Policy Analysis (located in The Hague)
- MSc Industrial Ecology (met CML Leiden)

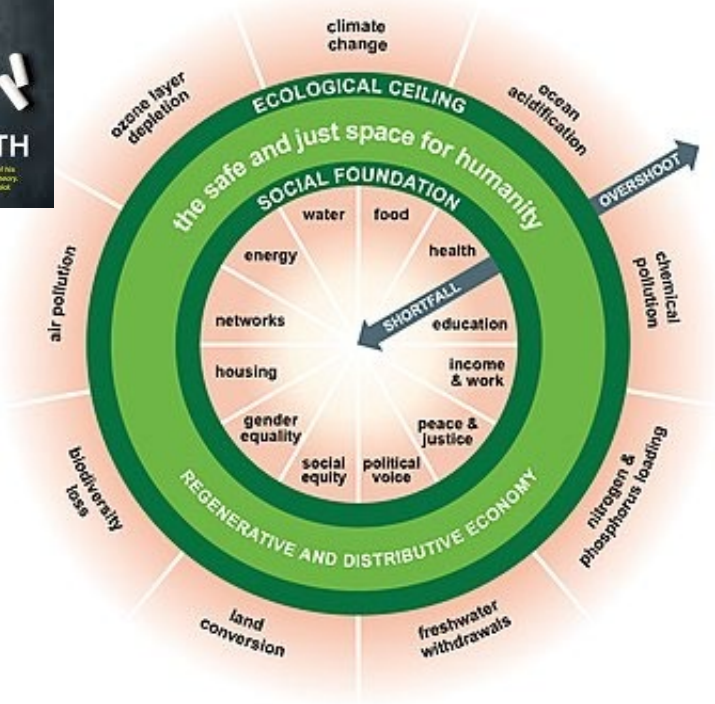
BE SURE TO WASH YOUR HANDS AND ALL WILL BE WELL
COVID 19
RECESSION
CLIMATE CHANGE
BIODIVERSITY COLLAPSE


THE GREAT ACCELERATION
SOCIO-ECONOMIC TRENDS
EARTH SYSTEM TRENDS
WORLD POPULATION
REAL GDP
FOREIGN DIRECT INVESTMENT
CARBON DIOXIDE
NITROUS OXIDE
METHANE
URBAN POPULATION
PRIMARY ENERGY USE
FERTILIZER CONSUMPTION
STRATOSPHERIC OZONE
SURFACE TEMPERATURE
OCEAN ACIDIFICATION
LARGE DAMS
WATER USE
PAPER PRODUCTION
MARINE FISH CAPTURE
SHRIMP AQUACULTURE
COASTAL NITROGEN
TRANSPORTATION
TELE-COMMUNICATIONS
INTERNATIONAL TOURISM
TROPICAL FOREST LOSS
DOMESTICATED LAND
TERRESTRIAL BIOSPHERE DEGRADATION
REFERENCE: Steffen, W., W. Broadgate, L. Deutsch, O. Gaffney and C. Ludwig, The Trajectory of the Anthropocene: the Great Acceleration, The Anthropocene Review, 16 January 2015.
MAP & DESIGN: Félix Pharand-Deschênes / Globalia

TU Delft

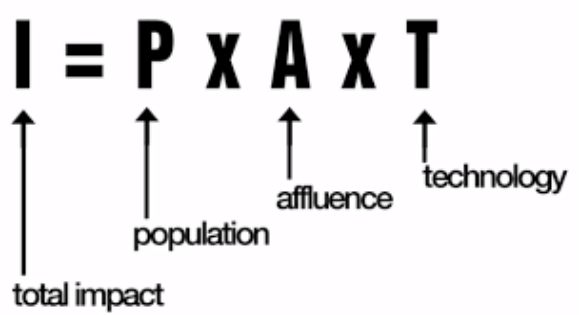

Climate change
Biosphere integrity
Genetic diversity
Functional diversity
(no global quantification)
Novel entities
(no global quantification)
Stratospheric ozone depletion
Atmospheric aerosol loading
(no global quantification)
Ocean acidification
Biogeochemical flows
Phosphorus
Nitrogen
Freshwater use
Land-system change
Beyond zone of uncertainty (high risk)
In zone of uncertainty (increasing risk)
Below boundary (safe)
Boundary not yet quantified

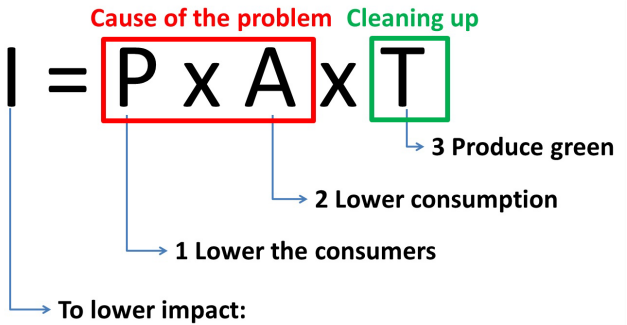

DOUGHNUT ECONOMICS
Seven Ways to Think Like a 21st-Century Economist
KATE RAWORTH


climate change
ozone layer depletion
ocean acidification
chemical pollution
air pollution
nitrogen & phosphorus loading
biodiversity loss
land conversion
freshwater withdrawals
ECOLOGICAL CEILING
the safe and just space for humanity
SOCIAL FOUNDATION
OVERSHOOT
SHORTFALL
water
food
health
education
income & work
peace & justice
political voice
social equity
gender equality
housing
networks
energy
REGENERATIVE AND DISTRIBUTIVE ECONOMY

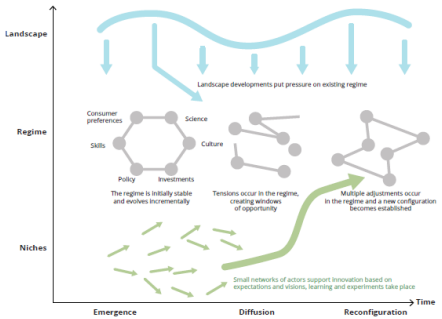
TU Delft

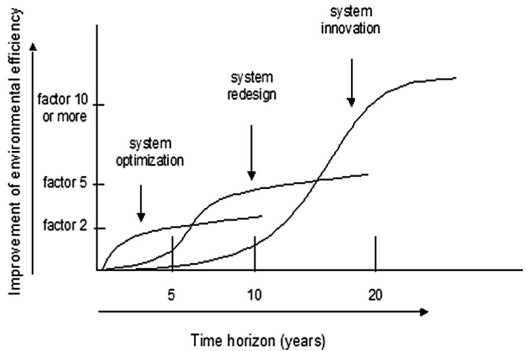
Omvang uitdaging: IPAT formule





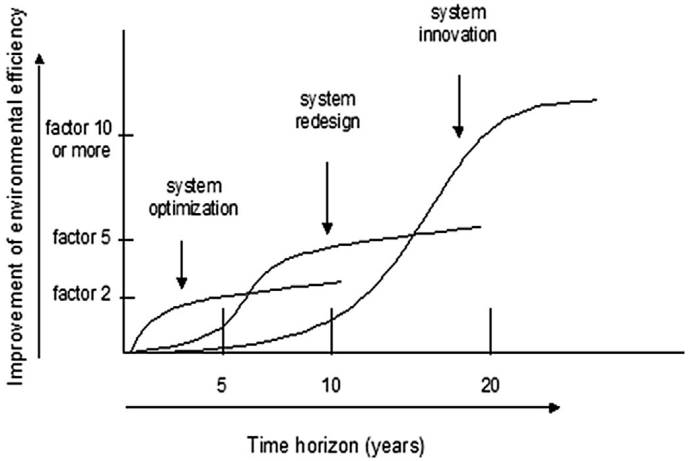
- **Groeiende** (wereld)bevolking
- **Groeiende** welvaart (BNP)
  - **3%,** 50 jaar, 5x welvarender
  - **5%,** 50 jaar, 11x welvarender
- **Factor 4:** verdubbeling welvaart, halvering milieubelasting
- **Factor 20**: 20x milieu-efficienter voorzien in maatschappelijke behoeften

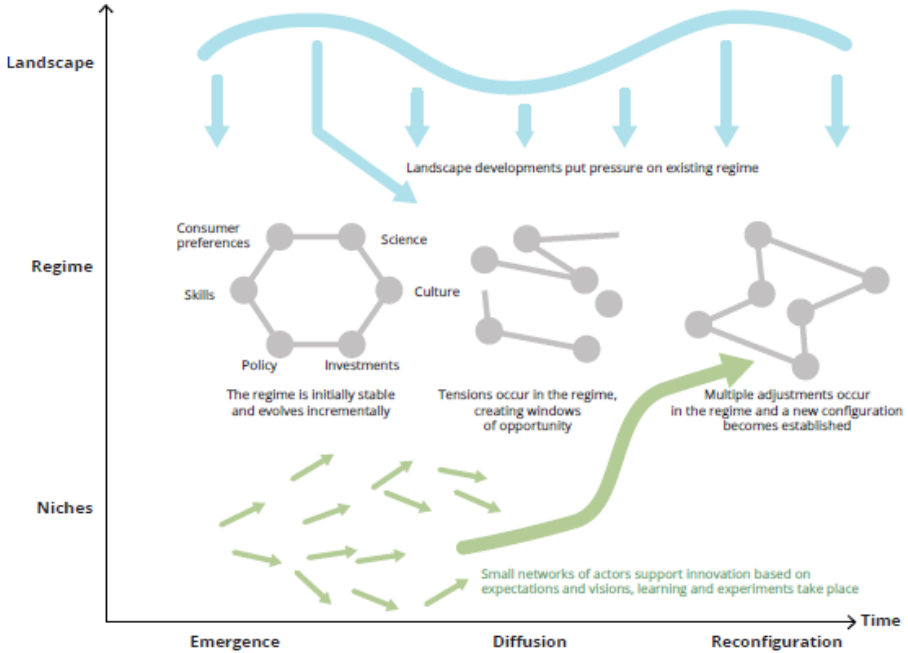




TU Delft

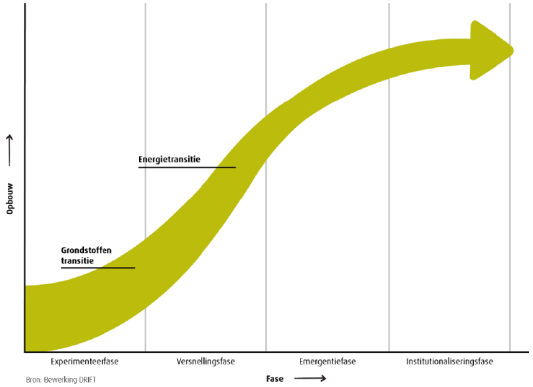
Transities


Improvement of environmental efficiency
factor 10 or more
factor 5
factor 2
system optimization
system redesign
system innovation
5
10
20
Time horizon (years)

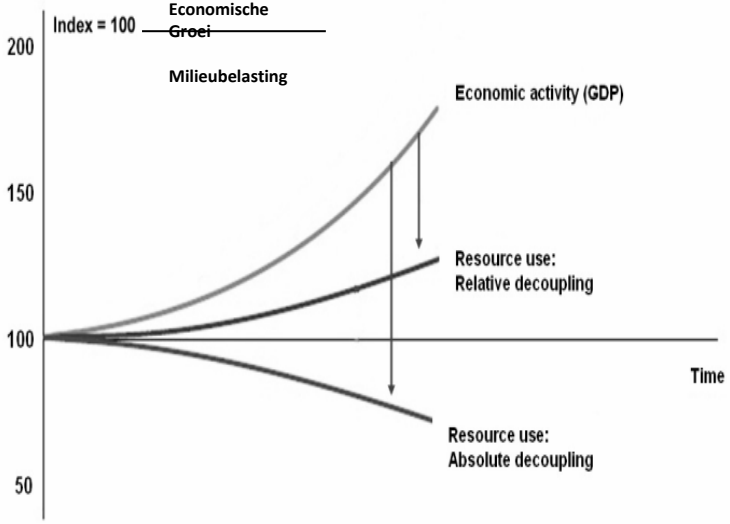

Landscape
Regime
Niches
Landscape developments put pressure on existing regime
Consumer preferences
Science
Skills
Culture
Policy
Investments
The regime is initially stable and evolves incrementally
Tensions occur in the regime, creating windows of opportunity
Multiple adjustments occur in the regime and a new configuration becomes established
Small networks of actors support innovation based on expectations and visions, learning and experiments take place
Time
Emergence
Diffusion
Reconfiguration

Wat te doen?

- Duurzaam **innoveren**
- Duurzaamheids **transities**
- **Circulair,** minder e**missies**
- **Klimaatneutraal** & energietransitie
- **Ontkoppeling** groei & milieubelasting
- Duurzame **Business Modellen**
- Uitgebreide Producenten Verantwoordelijkheid



Ontkoppelingstrategieen



Production side *Eco-efficiency strategies*		-----	Consumption side *Sufficiency strategies*	
Mining and Production	Products and services	Use of products and services	Expenditure mix	Quality of life realised
New tech-nology and end of pipe	*Greening products and service systems*	*Intensifying use ('PSS')*	*Enhancing immaterial consumption*	*Improving QoL/Euro spent*
20-50% Factor X	*20-50% Factor x*	*Factor 2*	*Factor 2*	*Factor 2-4*
↑ *Invest green* ←				

Duurzame Business Modellen

Value proposition

1. Product/ service,
2. Customer segments and relationships,
3. Value for customer, society, and environment

What value is provided and to whom?

Value creation & delivery

4. Activities,
5. Resources,
6. Distribution channels,
7. Partners and suppliers,
8. Technology and product features

How is value provided?

Value capture

9. Cost structure & revenue streams,
10. Value capture for environment & society
11. Growth strategy/ ethos

How does the company make money and capture other forms of value?

Source: Bocken & Short (2015) Towards a sufficiency-driven business model

Uitgebreide Producenten Verantwoordelijkheid

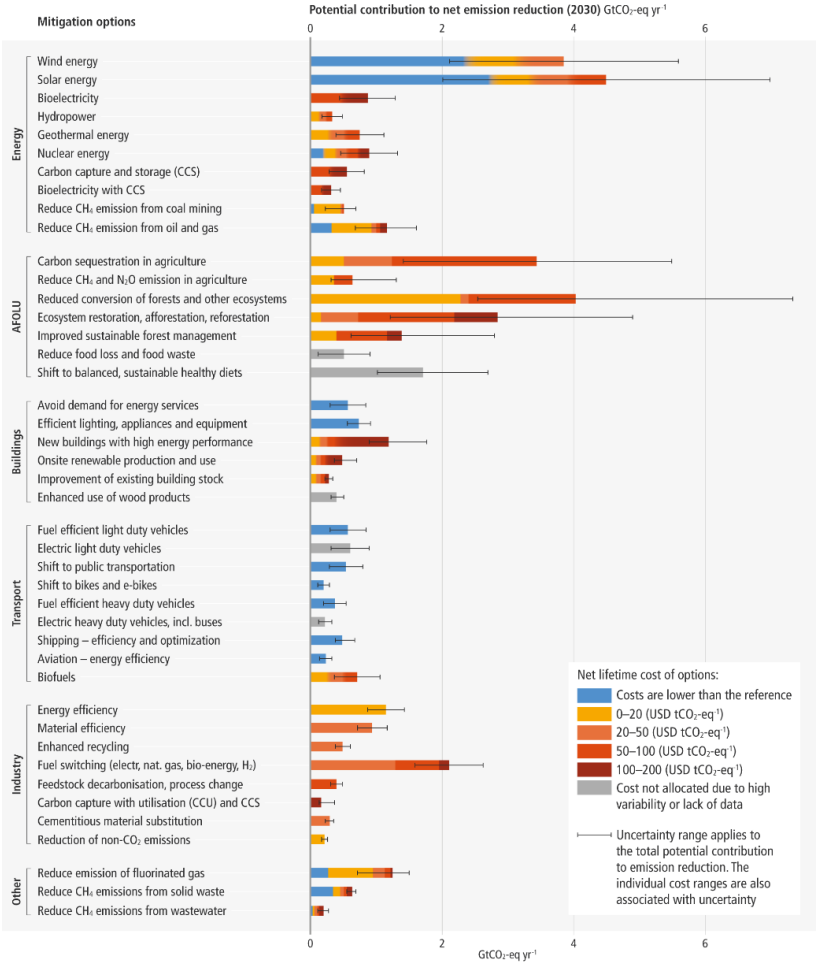
Type	Examples
Regulatory instruments	• Take-back requirements • Recycled product standards • Prohibition of certain hazardous materials • Disposal bans • Emission limits
Financial instruments	• (Advanced) Disposal fees (ADF) • Deposit-refund systems (DRS) • Product taxes • Upstream combination tax/subsidy (UCTS) • Virgin material taxes
Information instruments	• Environmental report requirements • Environment labeling requirements • Awareness-raising campaigns

IPPC mitgatierapport

Zelfde methodologie

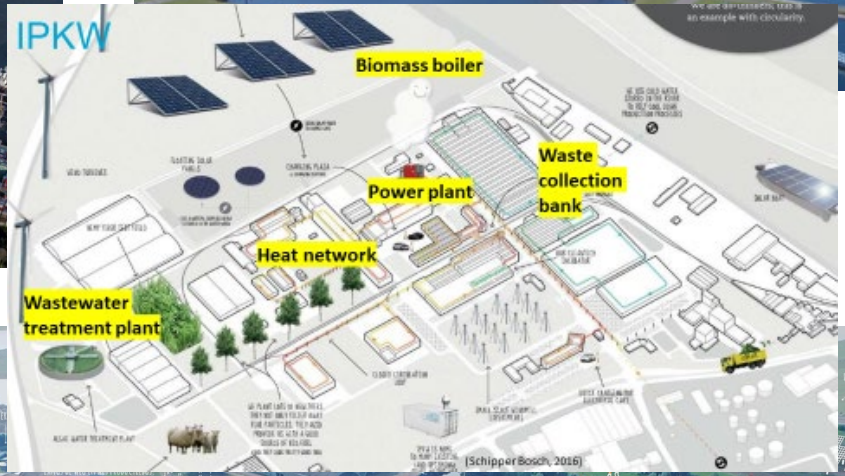
(reference scenario, definition of potential, target year, cost definitions)

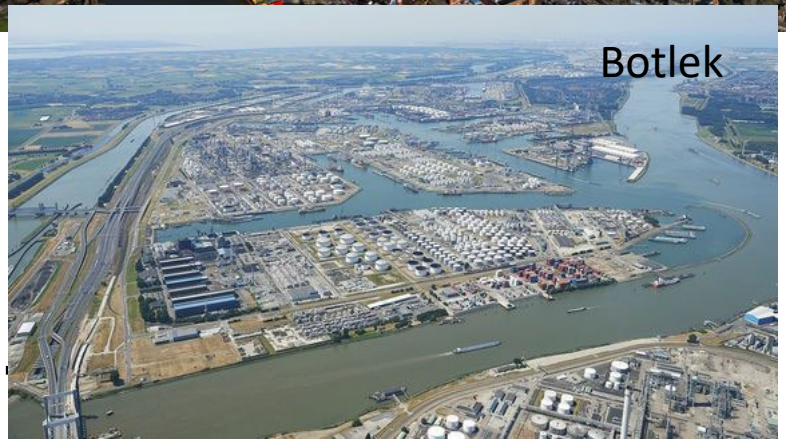
Many options available now in all sectors are estimated to offer substantial potential to reduce net emissions by 2030. Relative potentials and costs will vary across countries and in the longer term compared to 2030.



DCL
Delft Circularity Lab

Bedrijventerreinen en industrieparken





NWA-ORC voorstel: Scope & visie

- **Circulaire bedrijventerreinen** in 2030 in NL (ook klimaatneutraal en klimaat-adaptief)
- Invoering **industriële symbiose** industrieparken in NL in 2040 (low carbon, water, minder materialen, circulair)
- Industriële chemieclusters NL duurzaam, toekomst-bestendig **zonder fossiele feedstock** in 2050
- Focus op **sociale** & **organisatorische innovatie** en **governance**, in samenwerking met stakeholders en bedrijven.

Tot besluit

Grote duurzaamheidsuitdagingen

- **Duurzame innovatie** en **transities** belangrijk en nodig
- Duurzame **business model innovatie, ontkoppeling**, **dematerialisatie,** Uitgebreide Producenten Verantwoordelijkheid
- **Veel** innovatiepotentieel (voor klimaat en circulair), ook m.b.t **bedrijventerreinen** en **industriegebieden**
- Lange-termijn visie(s) belangrijk voor transities + niet technische kant

N.a.v. REACH & minisymposium

- Zeer relevante case als voorloper **transitie duurzame chemie**
- **Vermindering toxiciteit** ook belangrijk voor CE transitie
- Wat zijn de **kennisvragen**? Niet alleen materialen, maar ook systeemniveau
- Wat zijn de sociale & organisatorische innovaties en governance vragen?
- Hoe werken veranderingen door op het socio-technisch systeem?
- Wat zijn **posities en belangen** van actoren, m.n. de industrie?
- Welke kansen en voordelen zijn er voor actoren, m.n. industrie?

TU Delft

Contact: Dr Jaco Quist, TU Delft, Faculteit Technologie, Bestuur, Management, Jaffalaan 5, 2628 BX Delft, j.n.quist@tudelft.nl