



Thinking beyond take-make-waste policies: business and societal value of the circular economy

Experiences from a Dutch perspective

□ □ Ton Basten





TNO – Netherlands Organisation for Applied Scientific Research

- › Research and Technology Organization
- › Aim: contribute to solving major economical and societal problems
 - › Through policy, product and process innovation
- › Independent NGO
- › 3500 professionals with highly diverse and complimentary expertise

- › TNO Caribbean Branch Office in Aruba:
 - › to a renewable energy supply

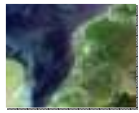


The Netherlands

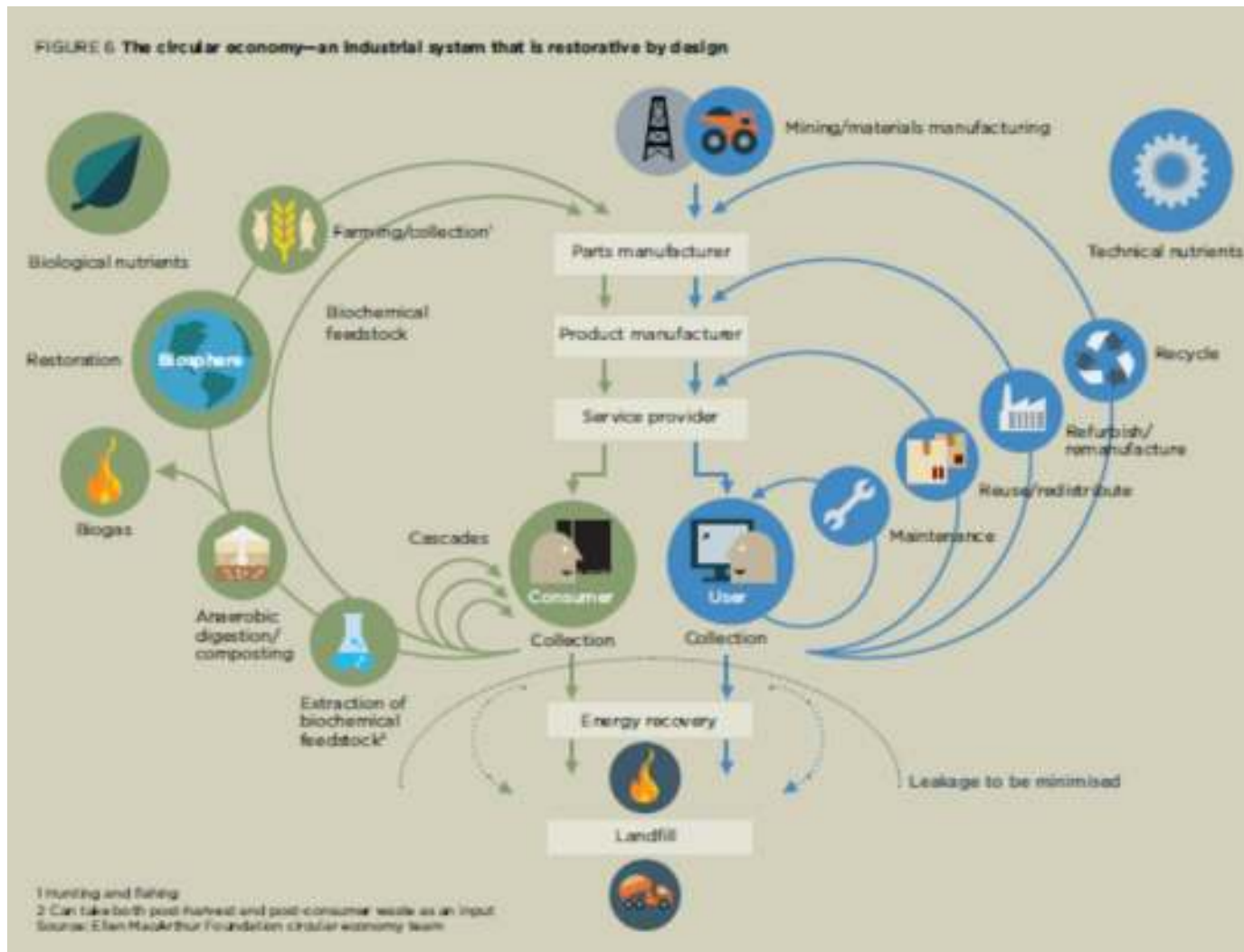
- › 16,8 million Inhabitants
- › 7,6 million households
- › 12 provinces
- › 380 Municipalities
- › 60 million tons waste
- › 8 million tons Household waste

- › GDP 40,000\$/capita
- › National GDP 680 billion





The Circular Economy

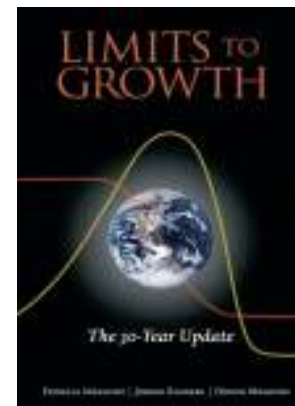




Increased attention for resource efficiency and circular economy

- › Long term worries:
 - › Limits to growth
 - › Climate change
 - › Resource resilience and autarchy

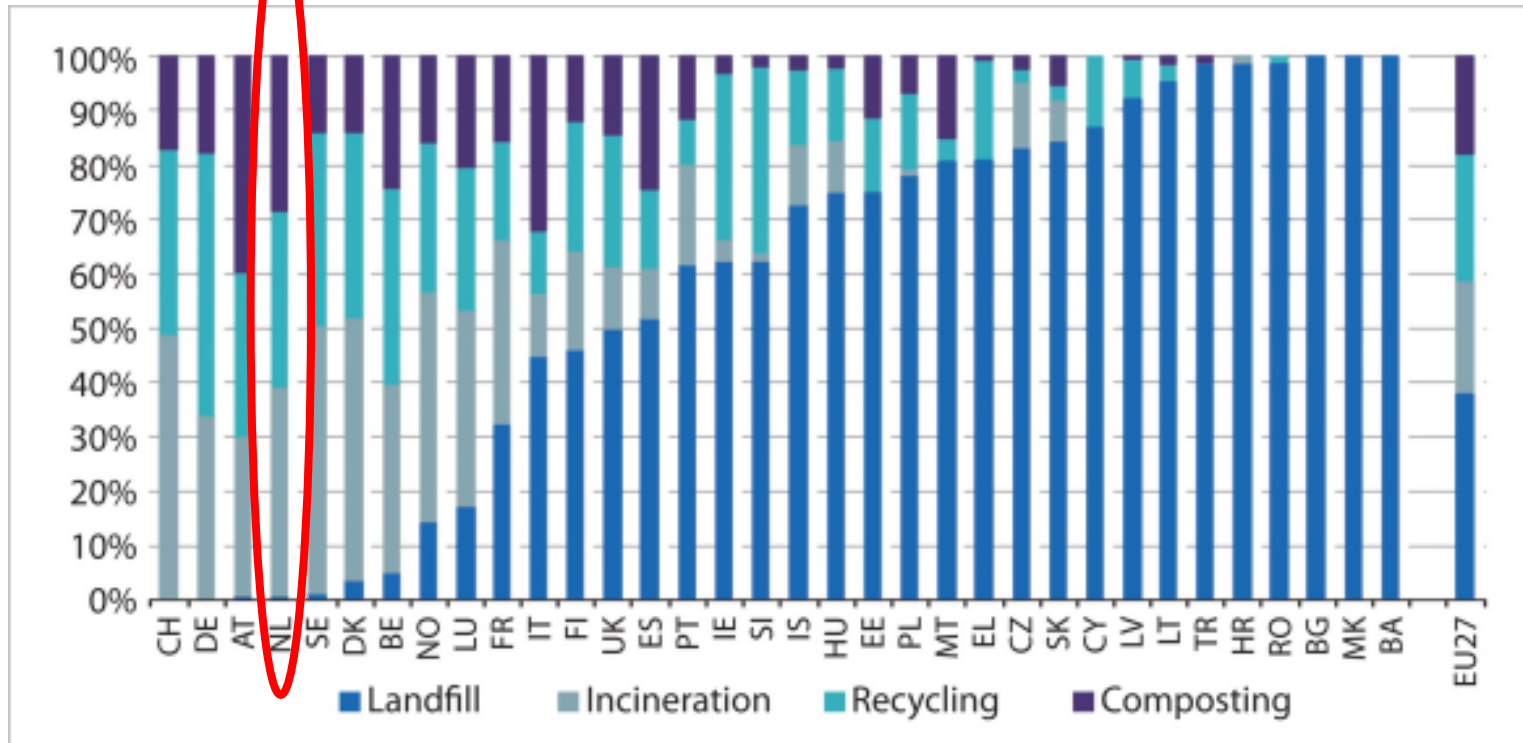
- › **And why now circular economy?**
 - › promise of jobs, not only highly skilled ones



- › Circular economy \neq Recycling \neq waste management
- › **But:**
- › Recycling and waste management is integral part of circular economy
- › A circular economy can't be developed without sound waste management



Waste management in The Netherlands





How did waste management evolve: never waste a good crisis

- › Short introduction of Dutch waste management
- › 1920's : unmanageable landfills → Waste incineration

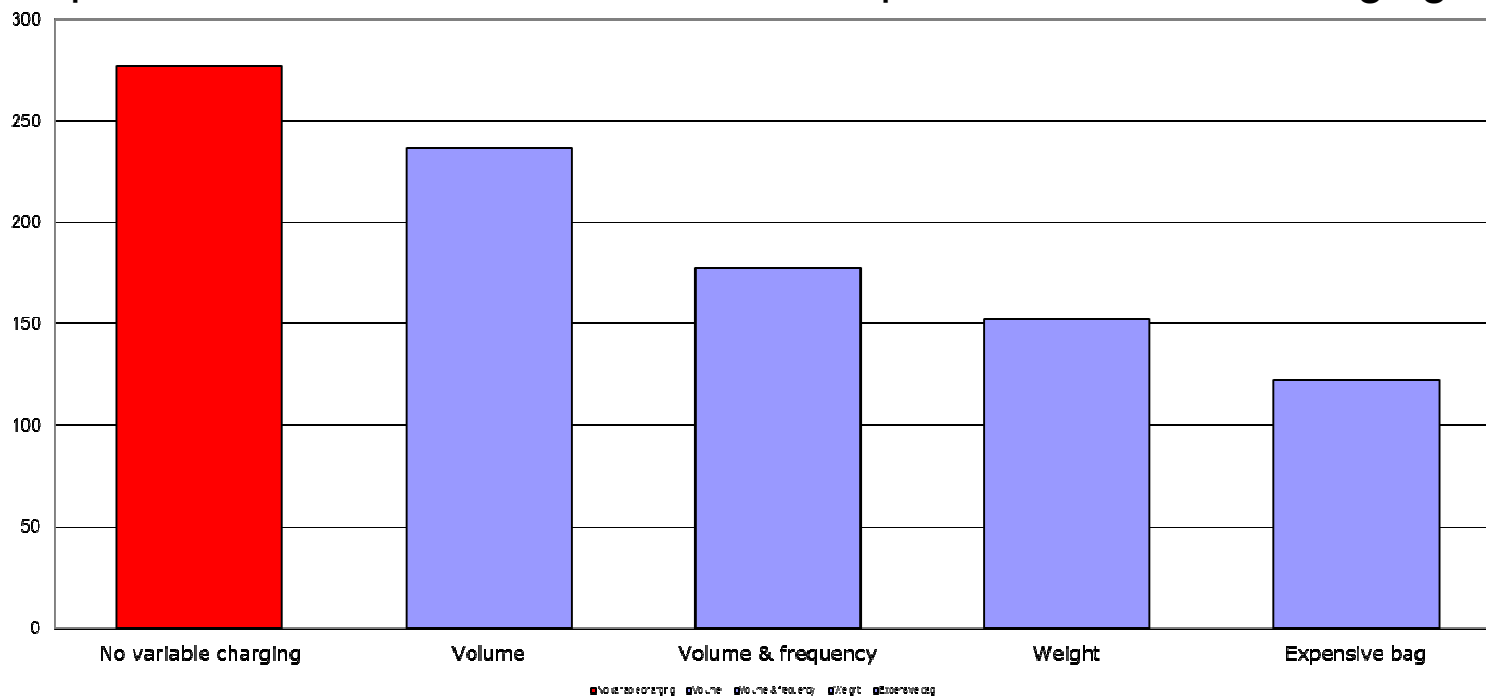


- › 1980: Lekkerkerk: polluted ground
- › 1980: Volgermeerpolder: chemical waste on landfill
- › 1989: Likkebaardpolder: dioxines in milk through incineration
- › Profound influence on Dutch Waste Policies



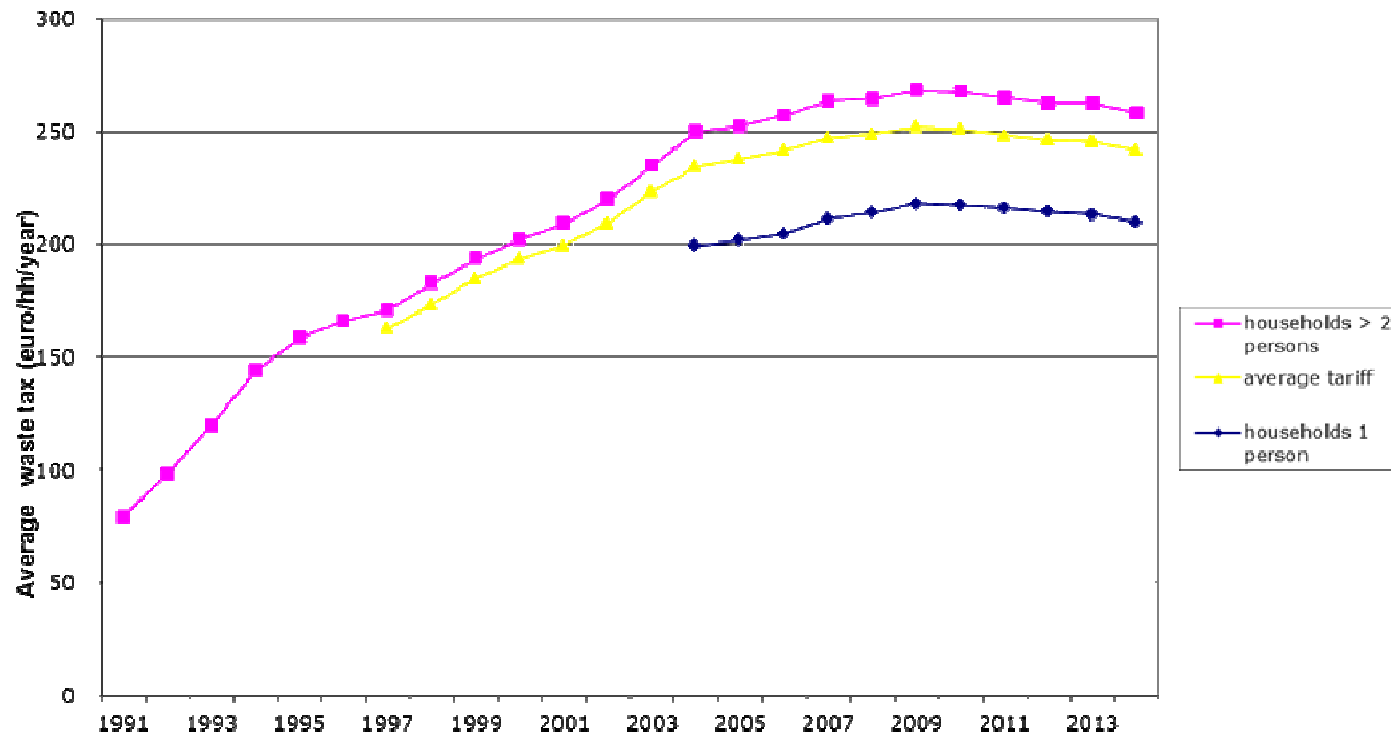
Financial incentives cause reduction in unsorted waste volume

› Up to 50% reduction in residual waste upon differentiated charging





Waste management leads to increased waste taxes

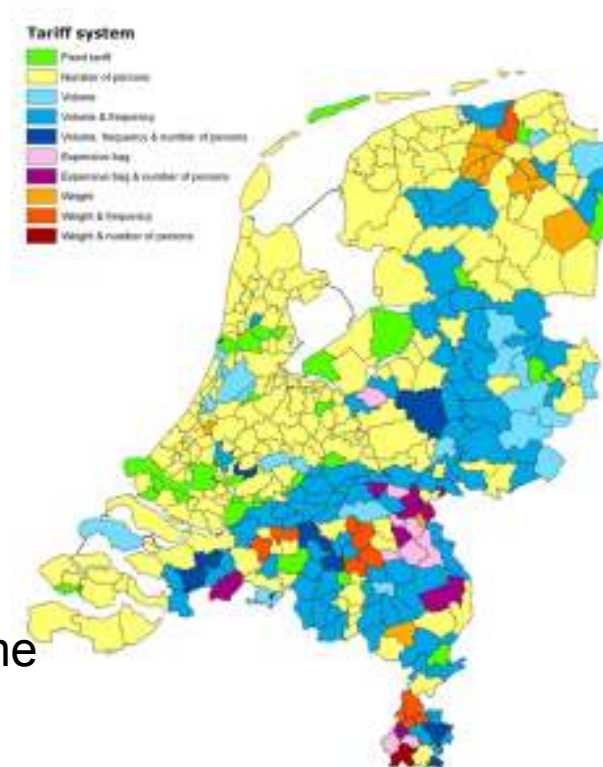


- › Growth GDP/capita: from 29,000 to 40,000 \$/capita
- › Increased tax from 0.2% to > 0.5%



Waste management benefits from experiments and technological progress

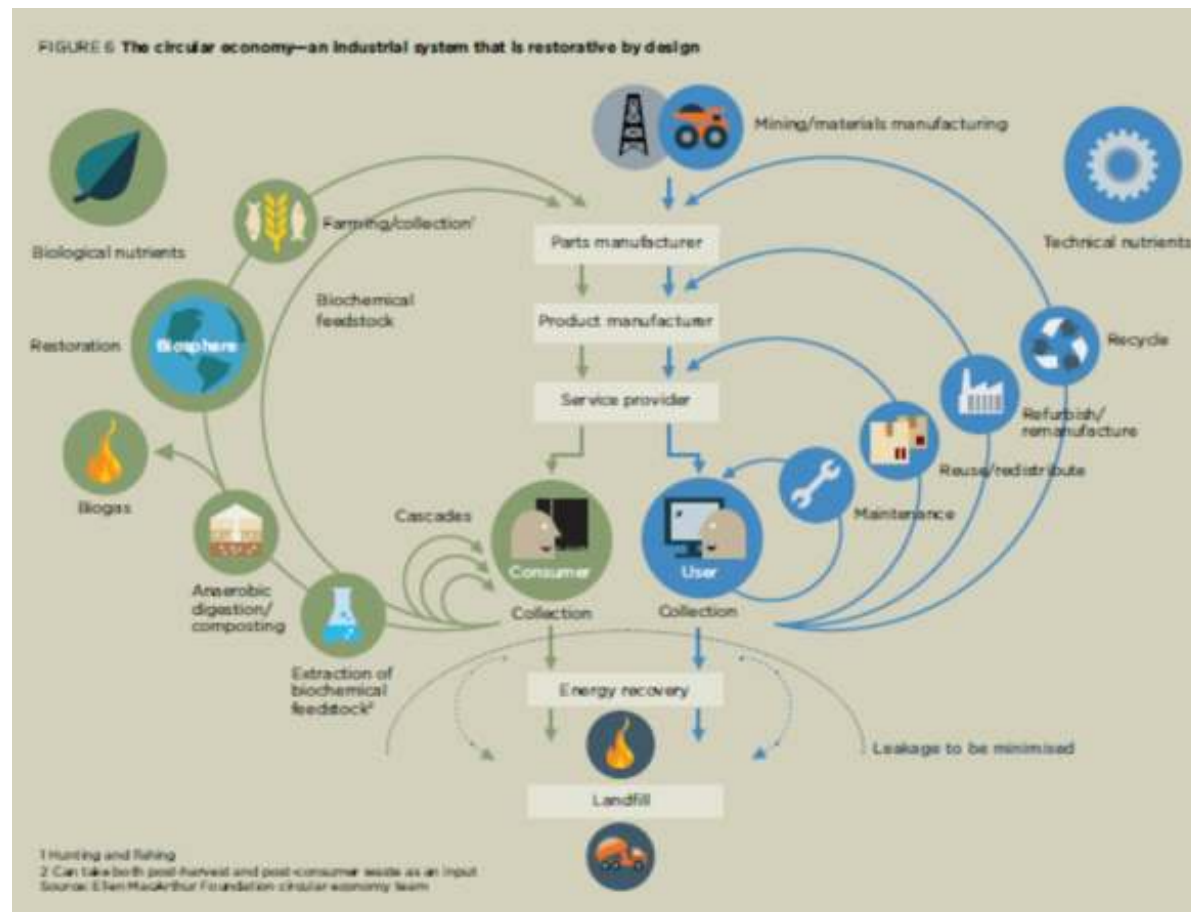
- › Municipalities are responsible:
 - > 400 'solutions'/experiments
- › Permits based on Best Available Technologies:
 - › Continuously increasing standards
 - › Based on LCA
- › **BUT:**
 - › System is based on waste volume!
 - › No real incentive to decrease volume
 - › **Overcapacity incineration!**
 - › **No systems approach**
 - › **No designing out waste**





May 4th 2015
OAS - Circular economy

Beyond waste management: the concept of a circular economy

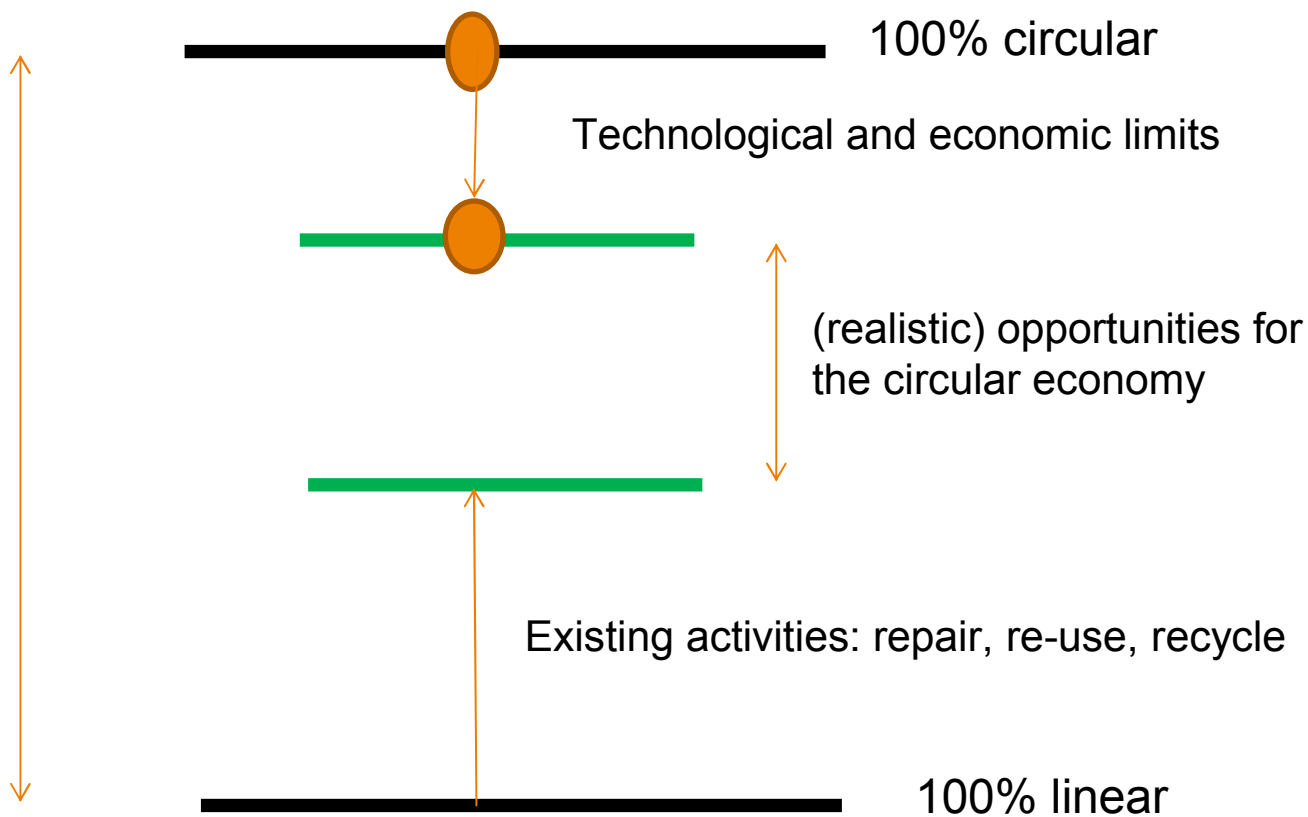




Circular economy in The Netherlands

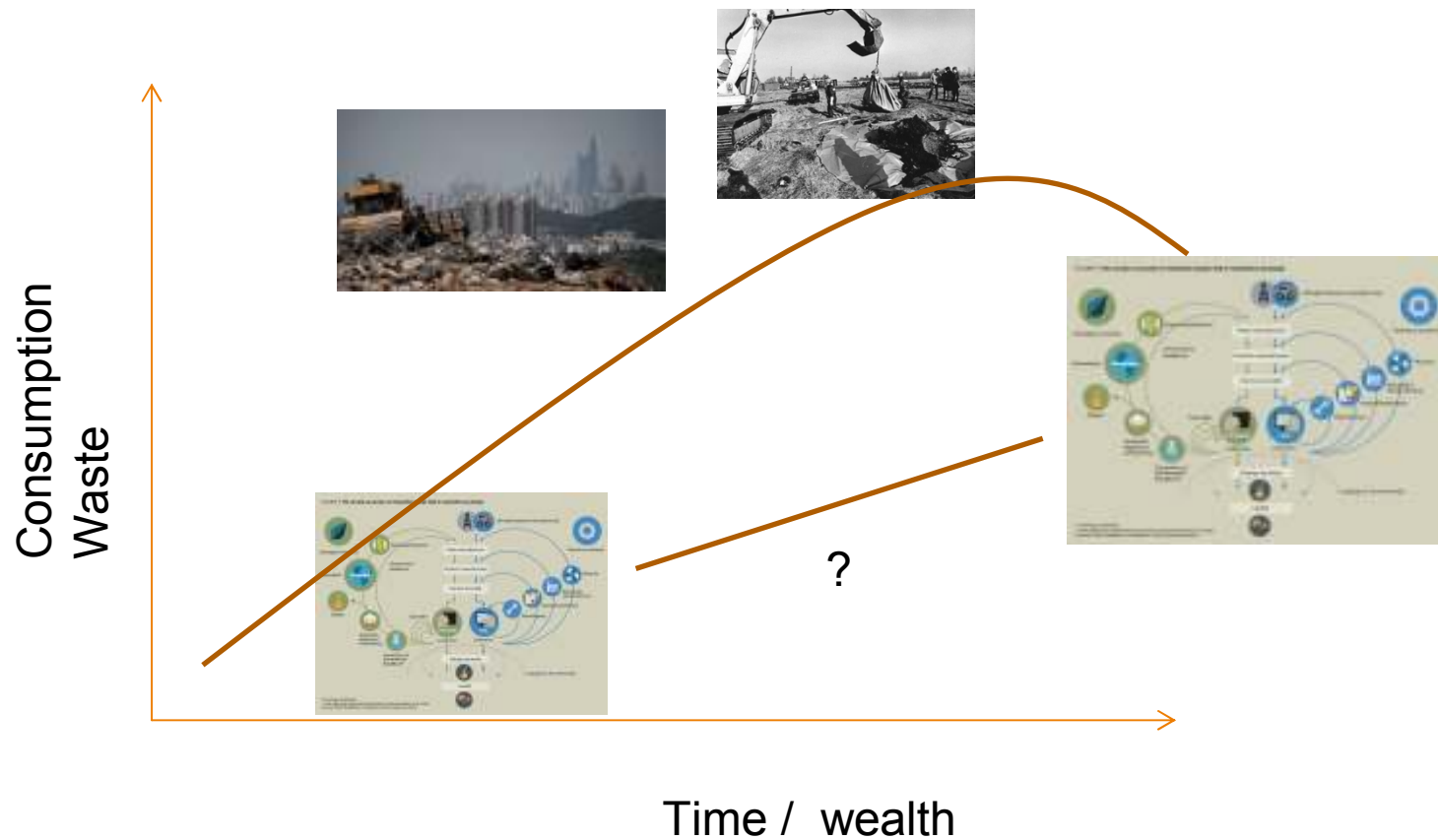


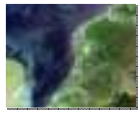
maximum transition





We forget our circular habits when income increases



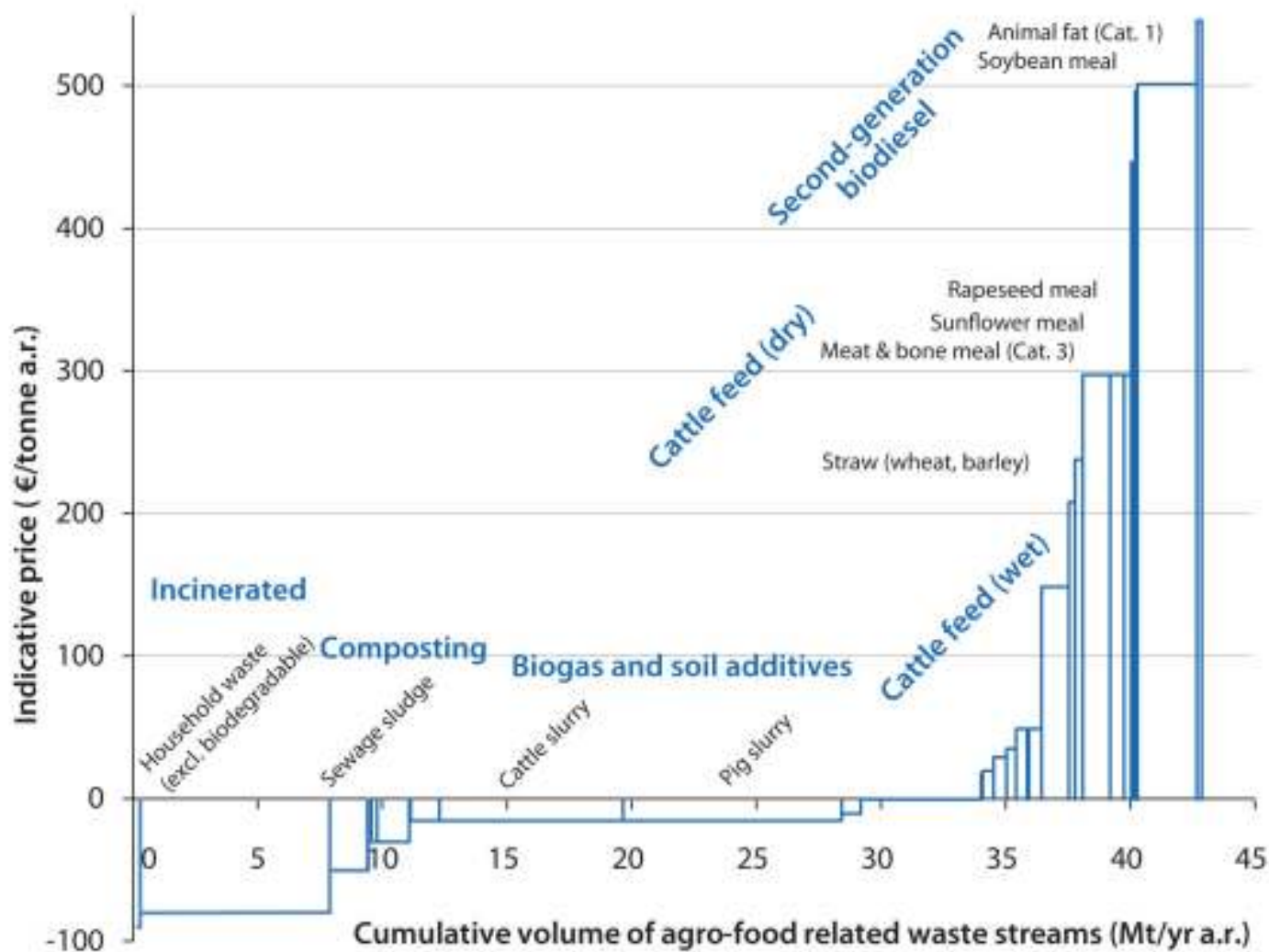


Many 'circular' opportunities have already been seized:



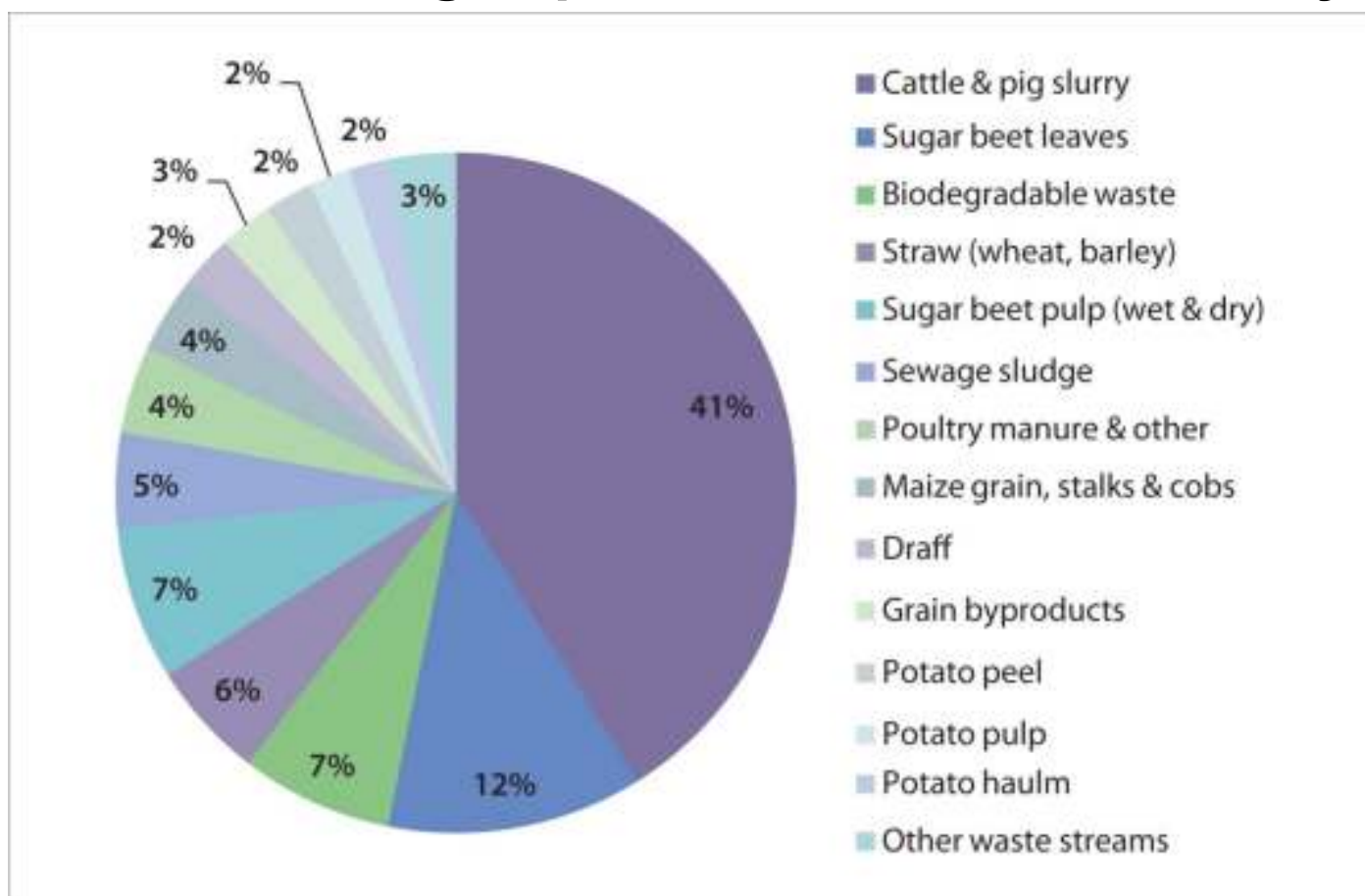


From current 'recycling' bio-waste: 3,5 billion EUR



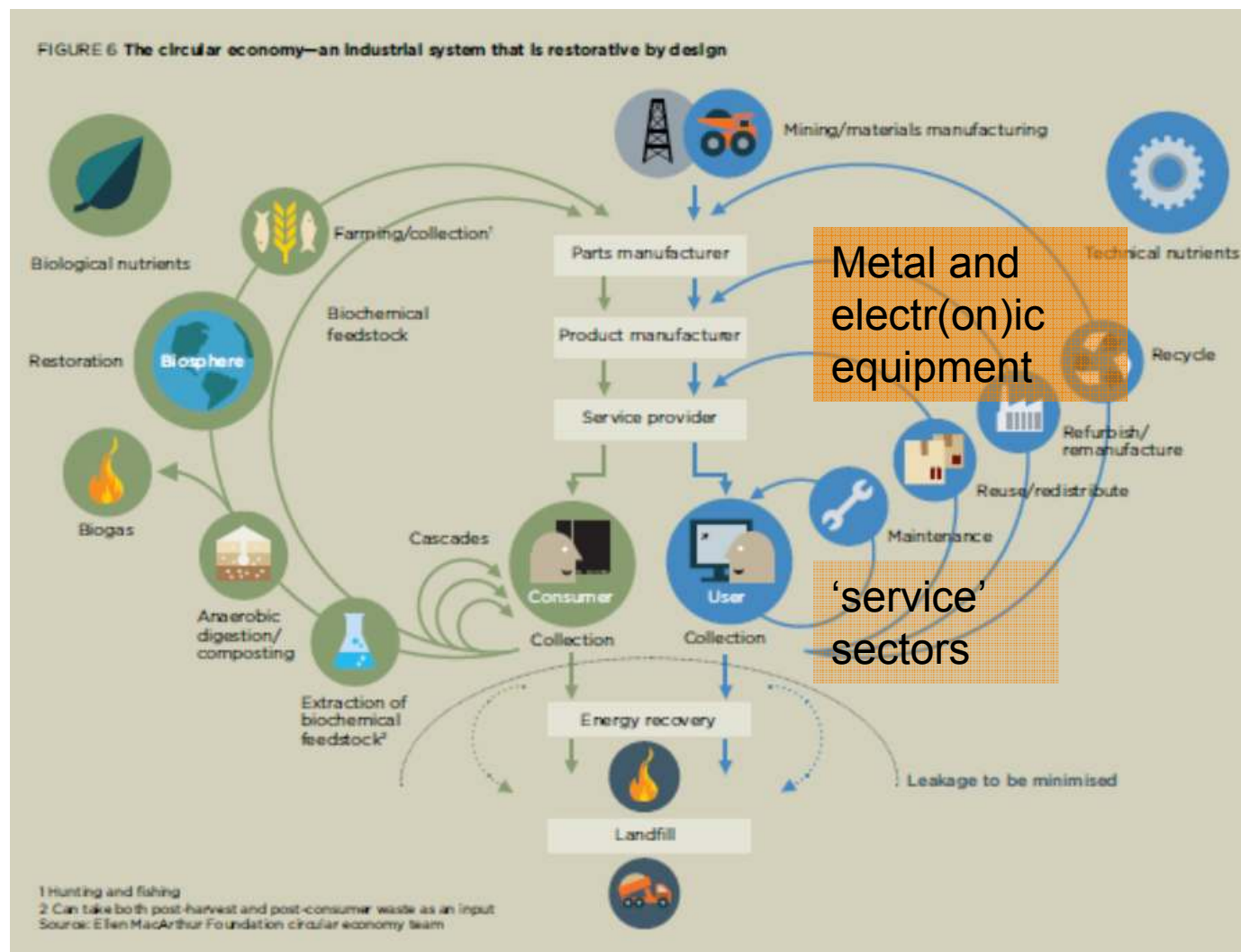


...to a potential growth with 1 billion EUR on the basis of enhanced biogas production and biorefinery



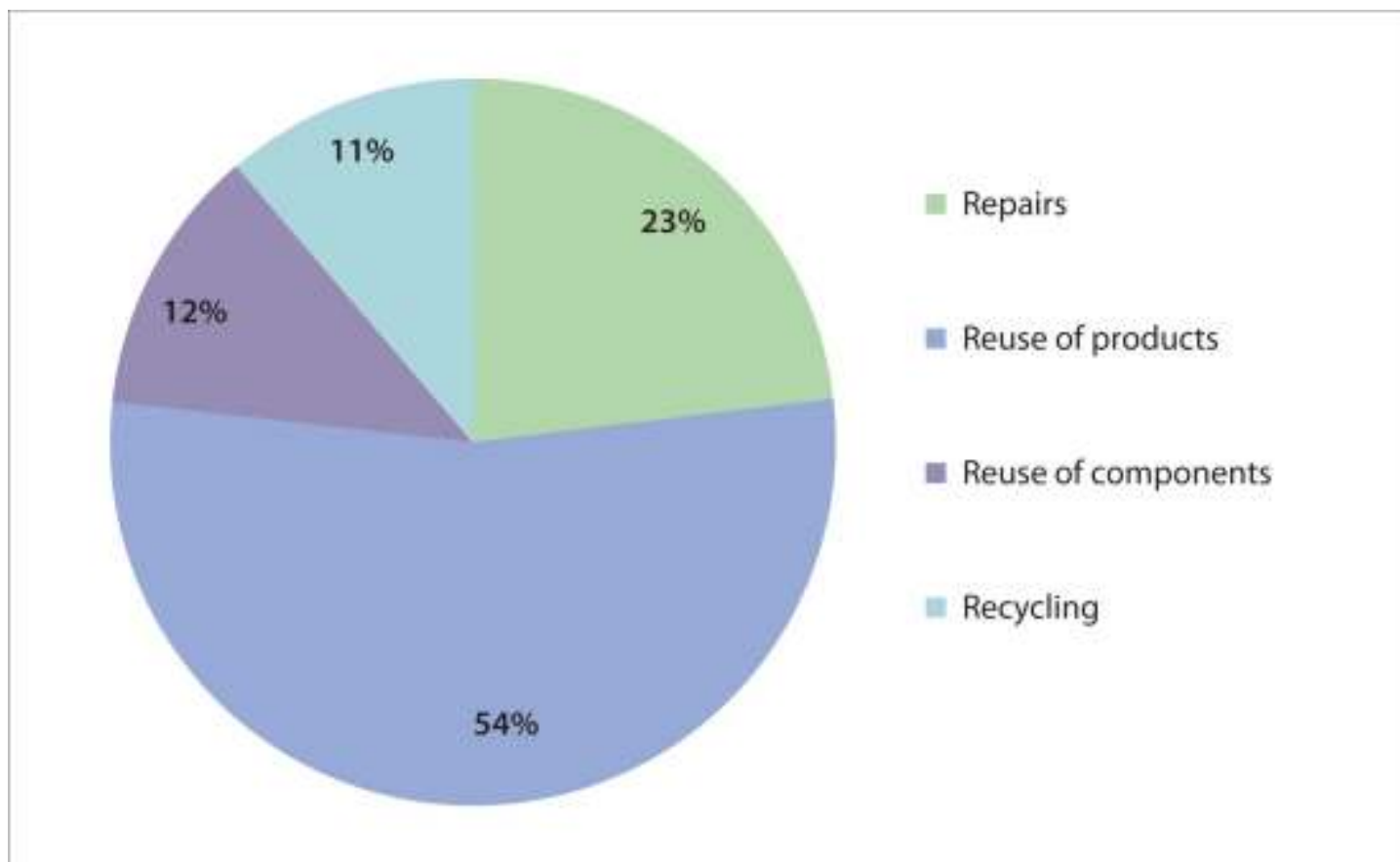


Quantification of the Circular Economy: the case for metal-electro sector





The current value of the metal-electro circular economy: 3.3 billion EUR



... can grow with 0.6 billion EUR



How can the 'circular value' grow ? The case for additional repairs, re-use, shared use

- › Changing attitudes towards possession
 - › Further development of product-service systems

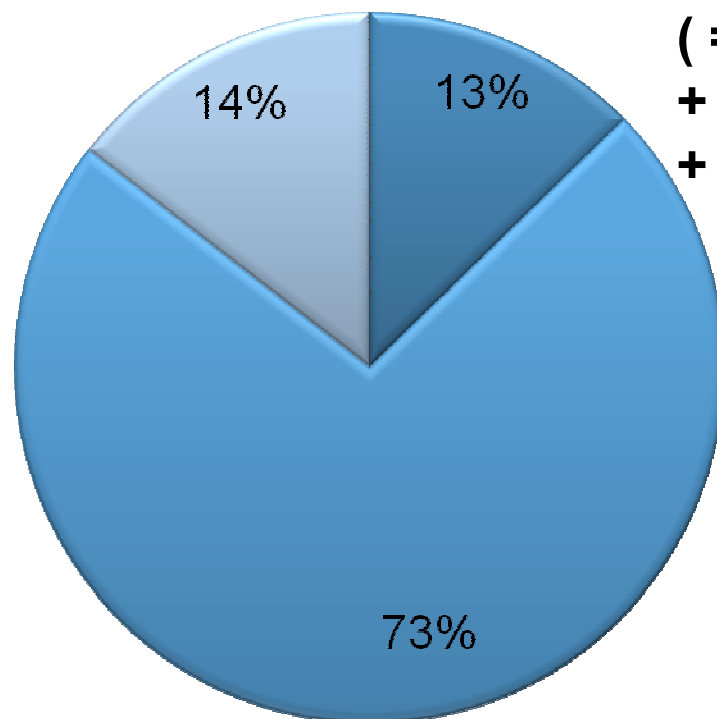
- › Collective insurance to cover repair beyond current periods
- › Reduced VAT on circular services
- › Lowering taxation on labour

- › Maintain skills for repair

- › ICT-enabled sharing systems
- › ICT-enabled maintenance schemes



Extrapolation to Dutch economy



**+ 7,3 billion EUR
(= 1.2% GDP)
+ 54.000 jobs
+ Clear emission benefits**

■ Agriculture
■ Industry
■ Services

- BUT: benefit strongly depends on economic structure
- Services 'win', manufacturers and retail 'loose'



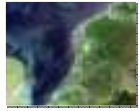
Dutch policy has embraced the circular economy: From Waste To Resources

- › Ambition:
 - › **50% reduction of waste-to-incineration**
 - › Through more recycling and more sustainable products and consumption
 - › but: remain as European incineration hub
 - › **Up to 75% waste sorting and separation at the source**
 - › **Remove barriers for entrepreneurs**
 - › Identify (and solve) legal barriers: end-of-waste criteria
- › **Current status:**
 - › main sectors and value chains identified for concrete action



Dutch policy approach

- › **Promote circular design**
 - › Design for recycling as eco-design guideline
 - › New packaging rules
 - › Raw materials label (passport) feasibility
- › **Enabling sustainable consumption**
 - › Study into changing consumer behaviour
 - › Strengthening role of repair and re-use
 - › Act as launching customer
- › Circular Economy requires a global approach:
 - › **Clean & Circular Delta Challenge Rio de Janeiro**
 - › Clean-up efforts, including modelling
 - › Waste water treatment
 - › Inspiring solid waste management



Cities increasingly embrace the circular economy

- › What is their driver?:
 - › Solving the waste issue
 - › Jobs
 - › Reputation – environmental impact
 - › Improving living environment
 - › Attracting newcomers
 - › Attracting innovative businesses and focus
 - › Inspiring working spirit

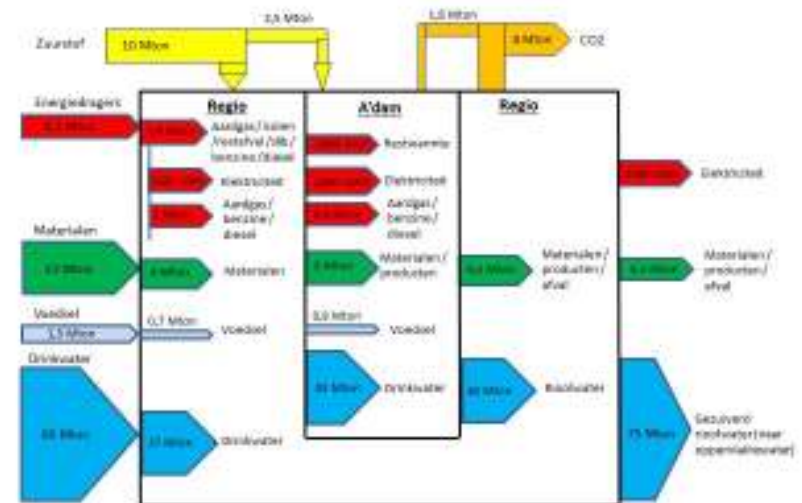
 - › How to start: quantify and prioritize your actions
 - › Materials flow analysis
 - › Impact on economy and ecology – LCA
 - › Improvement potential
- } Urban metabolism



Urban metabolism: knowing what happens in cities

- › Material Flow Analysis (MFA) of entire metropolitan areas, cities or small neighbourhoods:
 - › Energy
 - › Materials (e.g. consumer goods)
 - › Water
 - › Food
 - › Waste

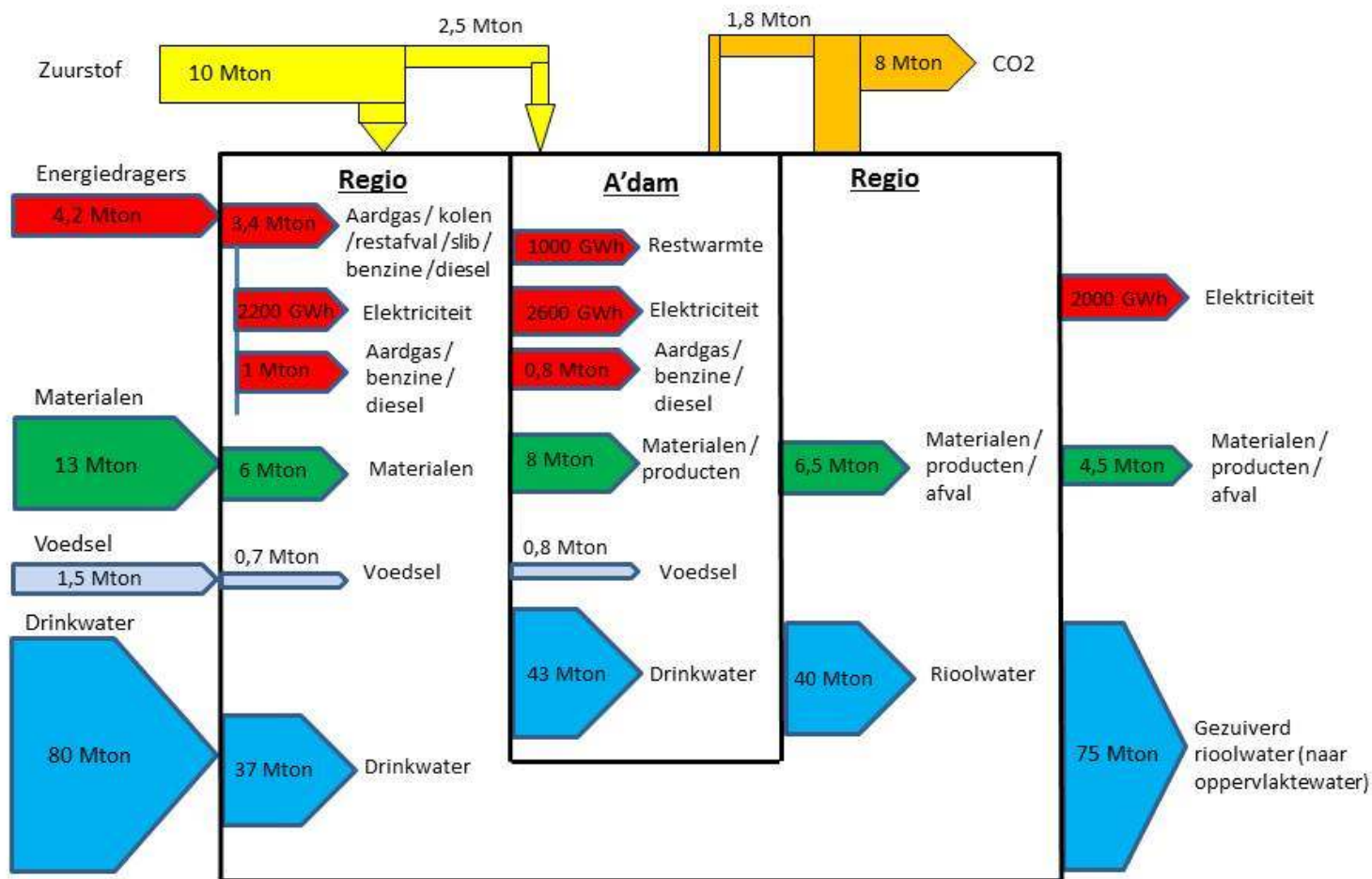
- › Delivers rough estimates to inspire urban policy, urban design and industrial engineering



MFA of the city of Amsterdam (TNO, 2013)



Urban metabolism: knowing what happens in cities



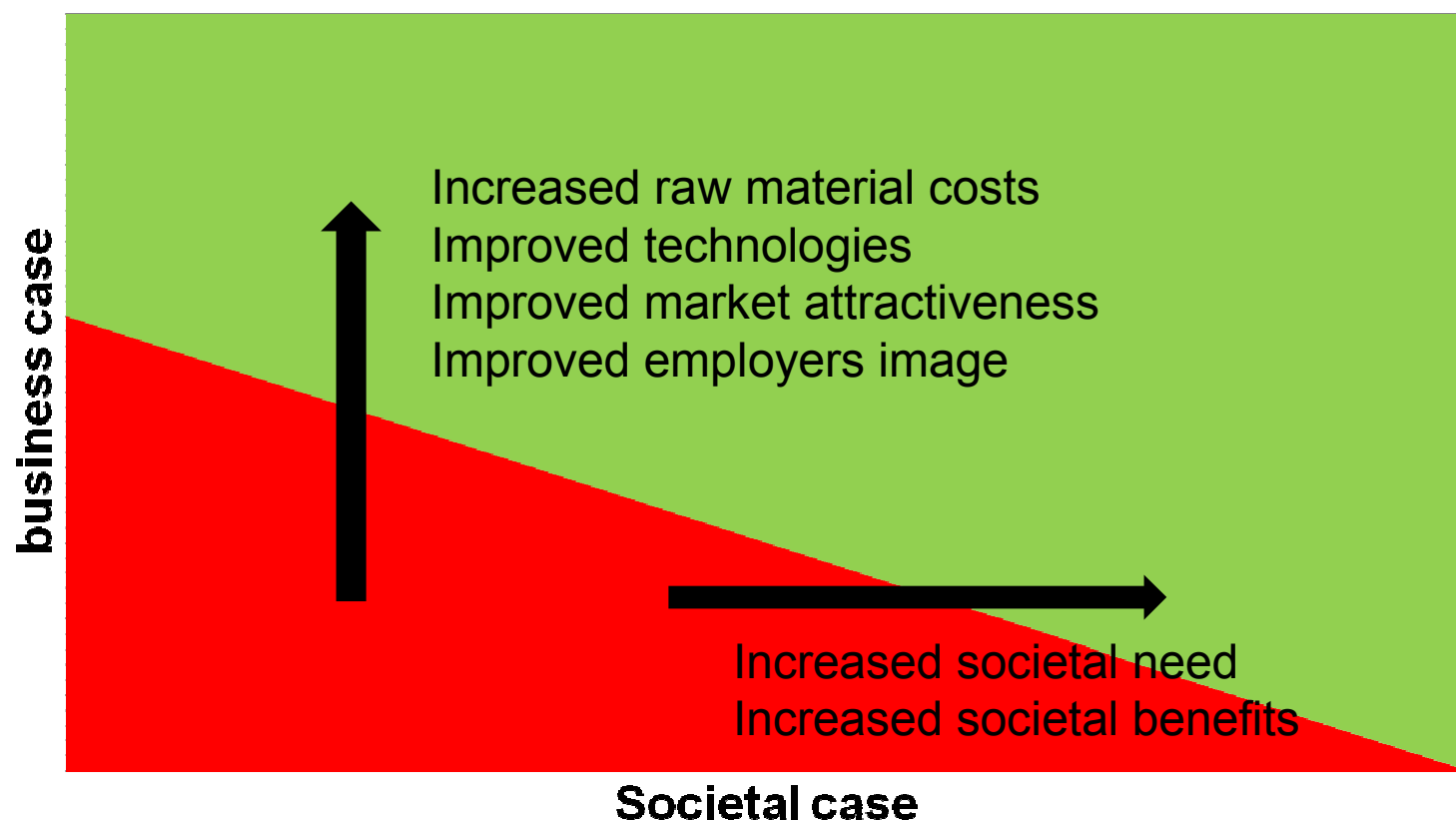


Final statements

- › Circular economy potential has been recognized
- › There is no low hanging fruit
- › Never waste a good crisis
- › Systemic eco-system approach is required
 - › A system change requires:
 - › Societal pressure/benefits in order to change the rules of the game
 - › Adding additional benefits for business and government
 - › Introducing disruptive technologies, such as ICT
 - › Field-labs: evolutionary experimenting with real stakeholders



Changes occur when business sense is achieved

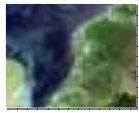




Thanks for your attention

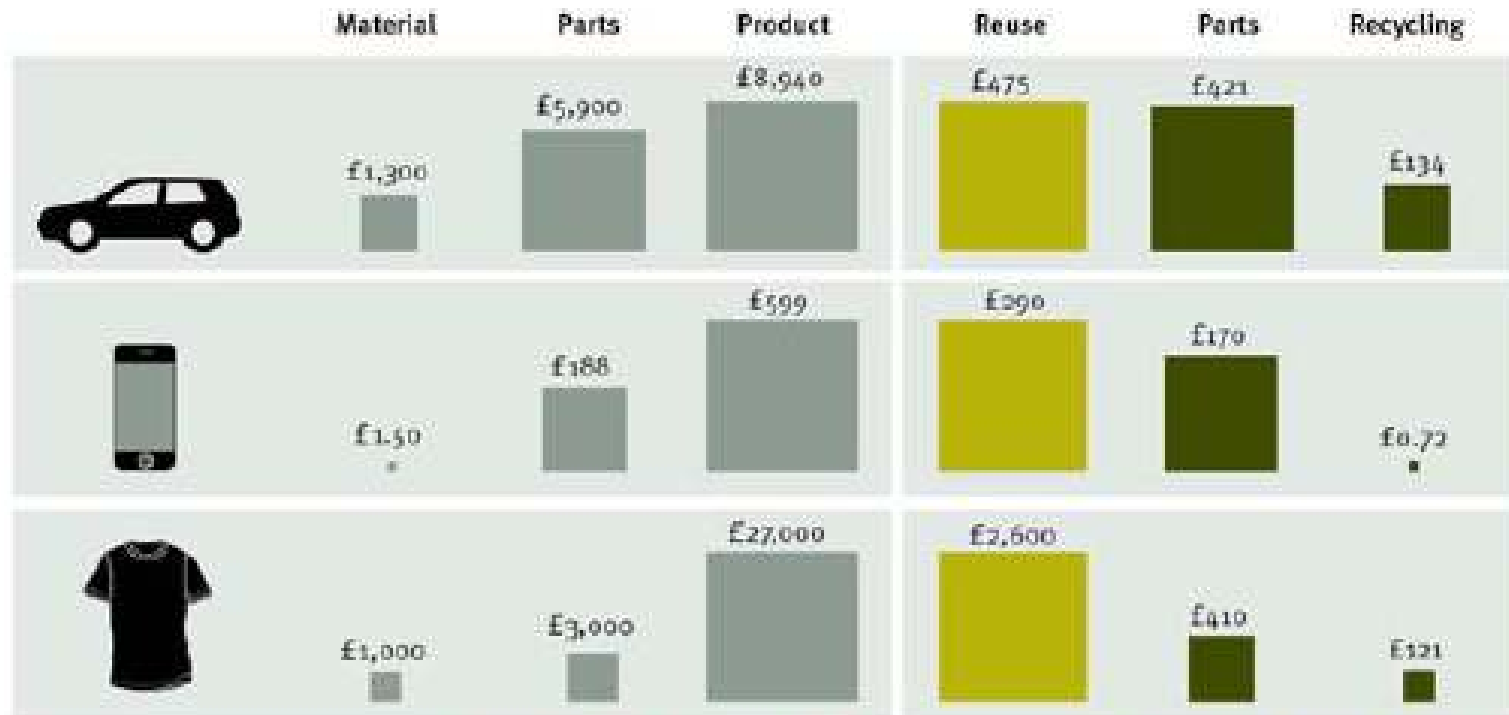
<http://www.rijksoverheid.nl/documenten-en-publicaties/rapporten/2013/06/20/tno-rapport-kansen-voor-de-circulaire-economie-in-nederland.html>





How can circular economy grow: Recycling does not necessarily add much value

Reuse is where the money is



Finished products are worth much more than the raw materials inside them

Value is lost by breaking products back down into components and materials