

The Circular Economy

S&D group event - LA TRICOTIERE

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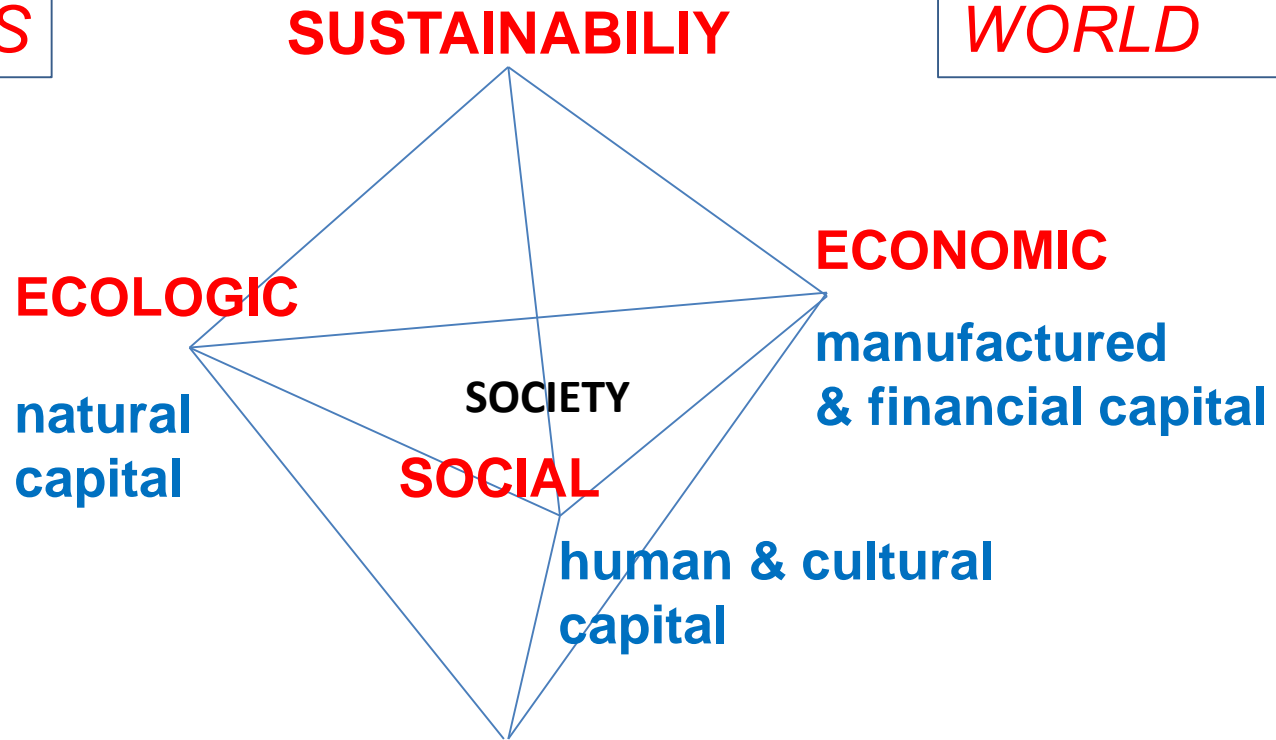
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**OBJECTIF:
HAPPINESS**

**QUALITATIVE
WORLD**



**OBJECTIF
MANAGING
CAPITALS**

**PHYSICAL
WORLD**

CIRCULAR ECONOMY AND SUSTAINABLE DEVELOPMENT ARE TWINS

Example: *Celebrating Christmas*

and building a circular economy:

- preventing waste (*all waste is man-made*)
- maintaining value
- managing resource stocks
- *Let us look at Christmas trees*



Waste management solution: incineration.

- economic value lost,
- resource stock lost,
- small labour input,
- some waste produced (ashes and heat)

If burnt in a co-gen heat and power plant, some energy may be recovered.



Value preservation solution: reuse of goods and materials

Christmas tree dismantled for 'reuse'

- highest value preservation,
- labour intensive,
- zero waste, high resource security.

whose decision? whose investment?

whose liability? whose risk? whose profit?



Sharing economy



rent-a-tree
serial
economy

Photo Rent-a-Christmas-tree San Francisco

Sharing society



- . sharing the
- . event,
- . trees,
- . candles,
- . people,
- . emotions,
- . music

Photo cvjm hochdorf.de

Who
takes the
decision?

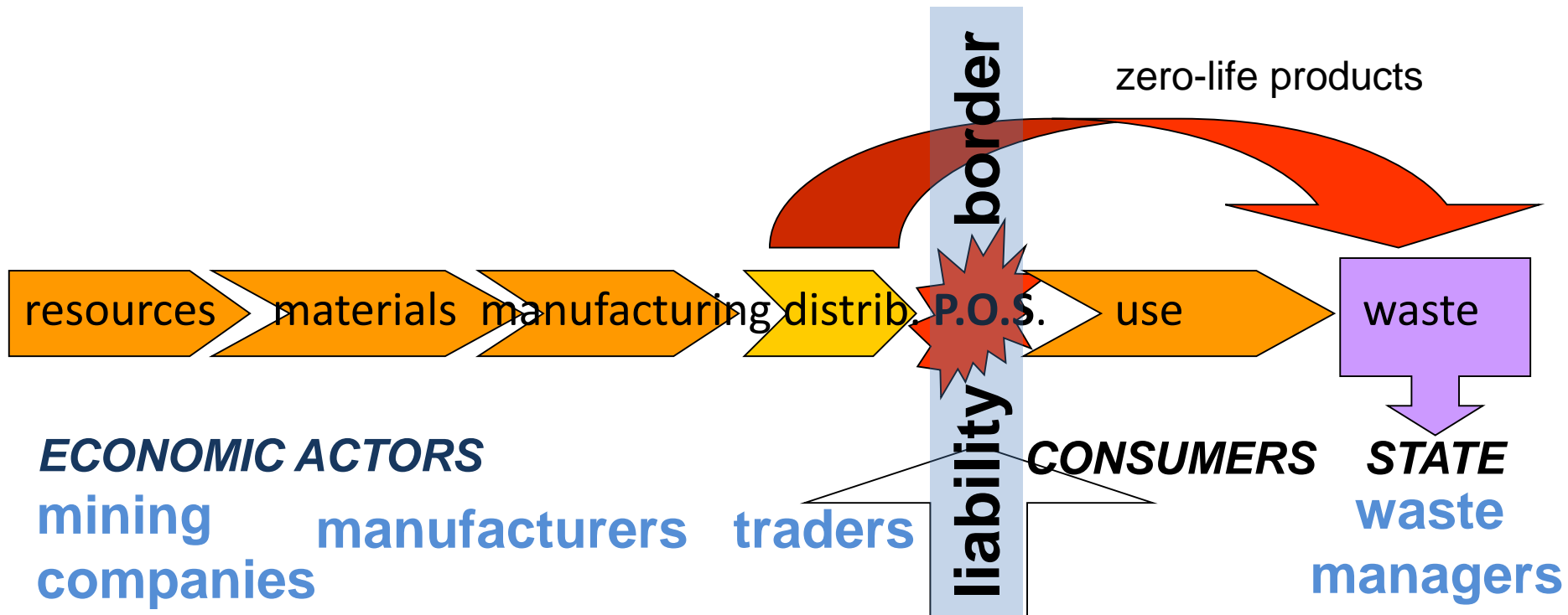


The Linear Industrial Economy is

- efficient to overcome scarcities,
- focused on manufacturing & man. quality,
- a continuous flow / throughput process,
- a series of value added steps,
- driven by **economy of scale**, **emotions**, fashion, progress, depreciated value,
- measured as flow (GDP),
- *neglecting **diseconomy of risk**.*

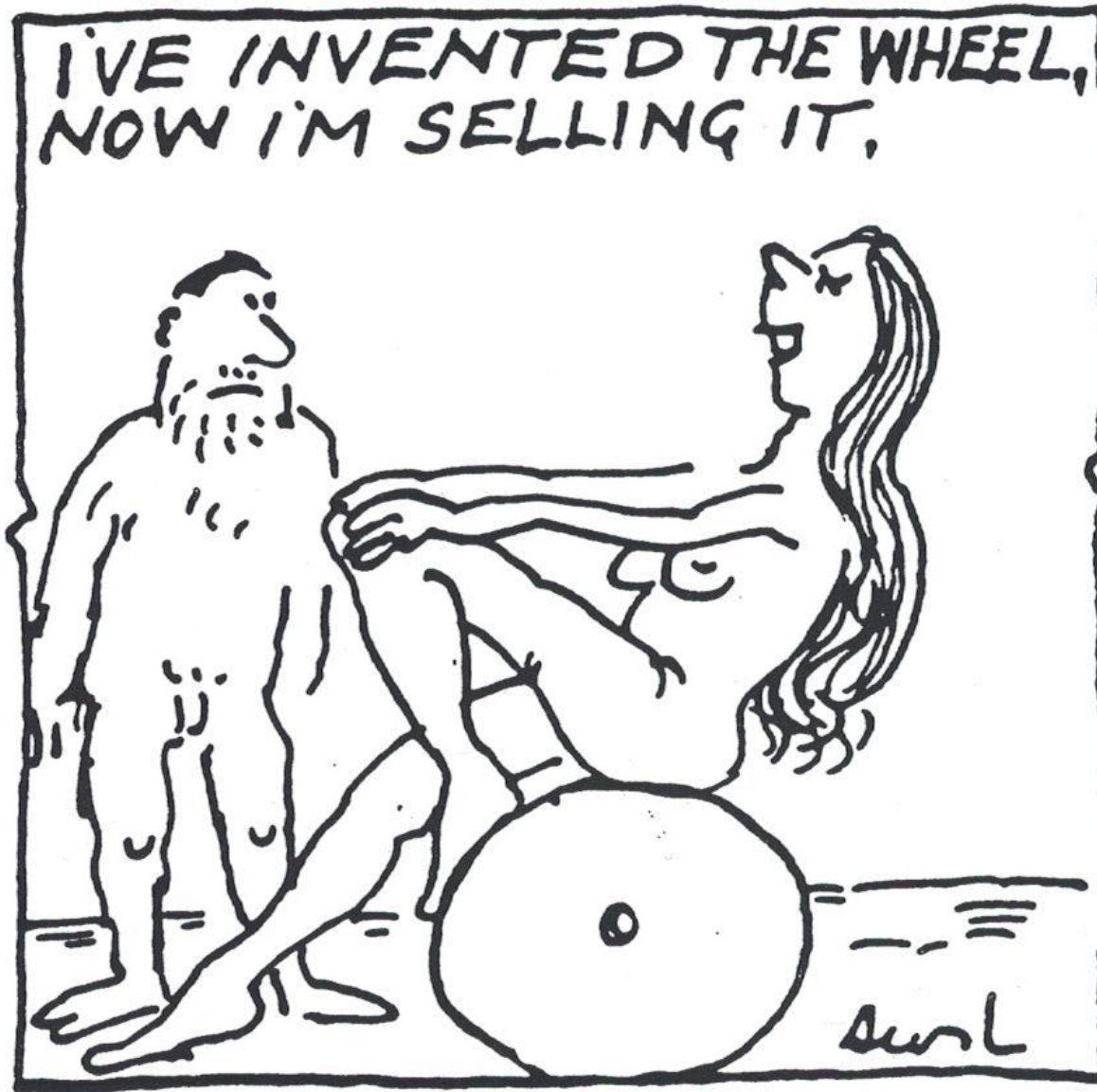


The Linear Industrial Economy: *growth means more throughput*



Property and liability are transferred to the CONSUMER (risk) and the State (waste).
The manufacturer's liability for industrial goods concerns the manufacturing quality.

The visible part of the Point of Sale



global supply chains



global branding



**Container ports, ships, trains
pipelines**



**Logistics- centres,
shopping malls,
exhibition halls**

**packaging
publicity**



**Warehouse on wheels
trucks at the Brenner**



Delivery drones ?

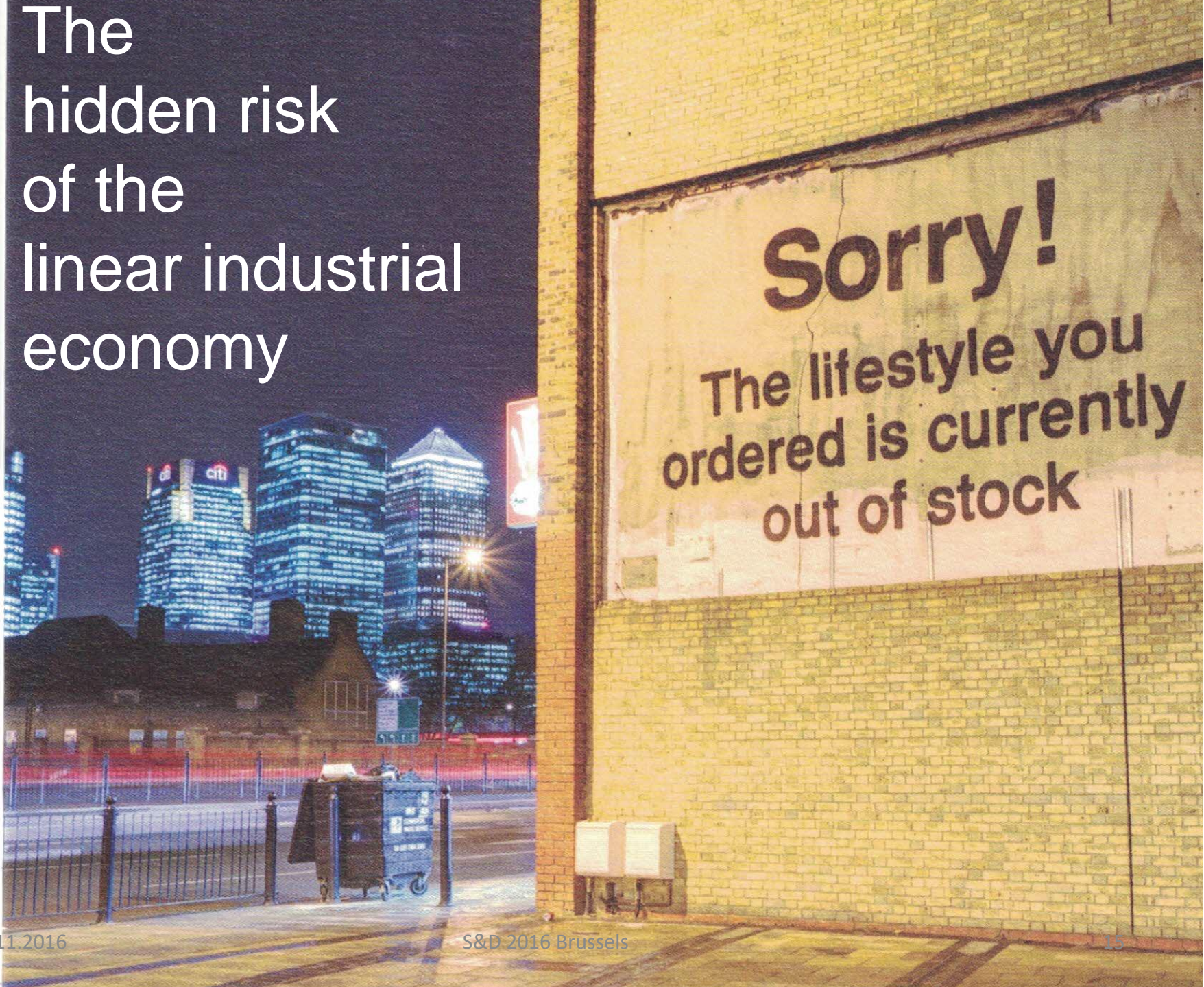
Depreciated value – a pillar of the linear economy

An insurance agent went to a museum and accidentally hit a statue.



Museum guard: *That is a 500 year old statue you have broken!*
Insurance agent: ***Thank God. I feared it was a new one.***

The hidden risk of the linear industrial economy



The Circular Industrial Economy

- enables to re-industrialize regions,
- consists of 'loops' and 'lakes';
- maintains values and manages stocks by focusing on use / utilisation,
- is (so far) driven by environmental issues,
- *is measured in quality & quantity of stocks.*

The C.I.E. compliments the Linear Industrial Economy, which produces quantum leap innovation, in e.g. information-, bio- and nano-technologies to upgrade & renew the stocks.

research

The Circular Economy is local and ecologic



Com ports, ships, trains



Logistics and Shopping Centers



Warehouse on wheels, trucks at the Brenner

little global distribution logistics necessary in the CE
little packaging, little publicity



Delivery drohnes ?

The Circular Economy is about managing **manufactured stock** (physical capital) and preserving its **embodied resources** (e,m,H₂O) but also natural, human, cultural, financial capital.

Infrastructure, buildings, equipment, (durable) goods, catalytic goods (lub oils, solvents) through

- **Reuse and remarketing**
e.g. 2nd hand markets, eBay, rent-a-wreck,
- **Repair, remanufacturing and re-refining**
e.g. NASA's space shuttle, catalytic goods,
- **Technologic and fashion upgrading**
e.g. reprogrammable microchips

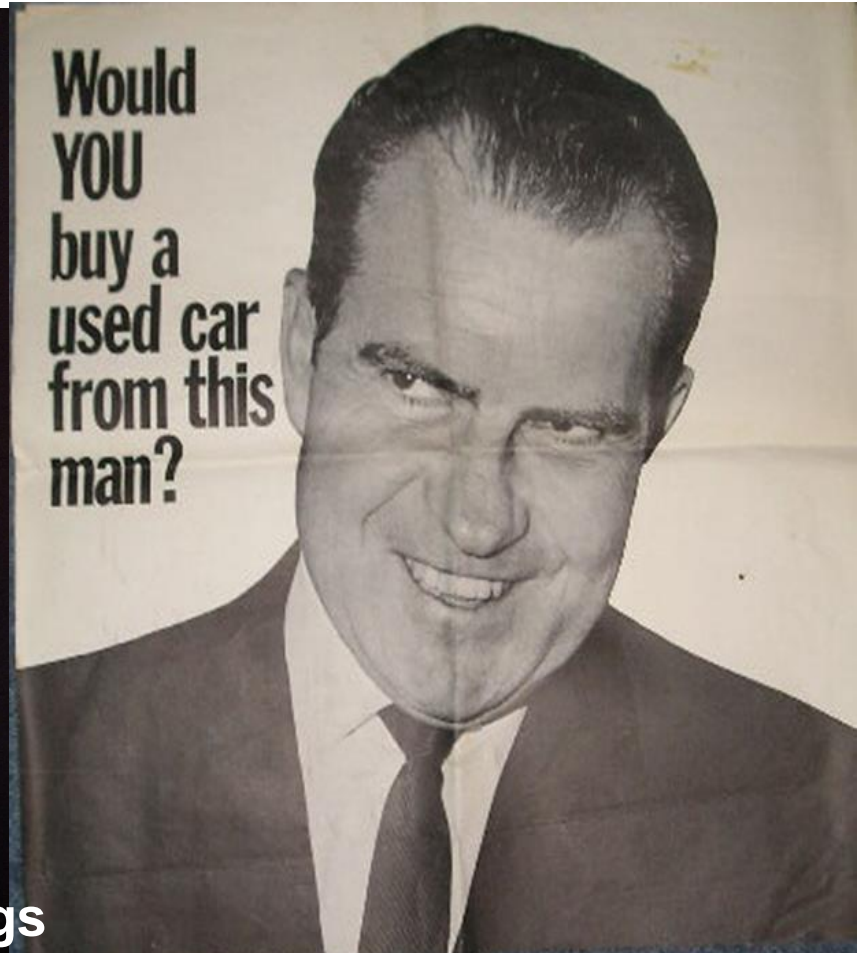
**Engineering
innovation**

Trust for value and quality is the foundation of reuse and second-hand

Probably the most reused objects world-wide



Dirty, contaminated with bacteria and drugs



Societal benefits of the Circular Economy

(macro-economic) in comparison to the present economy

I/O Study by Skanberg-Wijkman 2016, France (7 countries)

	circular scenario	energy efficiency	material	combined scenario
reduced GHG	— 50,1%	— 28%	— 5%	— 66%
additional jobs	+ 100'000	+ 200'000	+>300'000	+>500'000
impact on trade balance	+ 0.4% of GDP	+ 0.4% of GDP	+ 0,2% of GDP	+ 0,25% of GDP

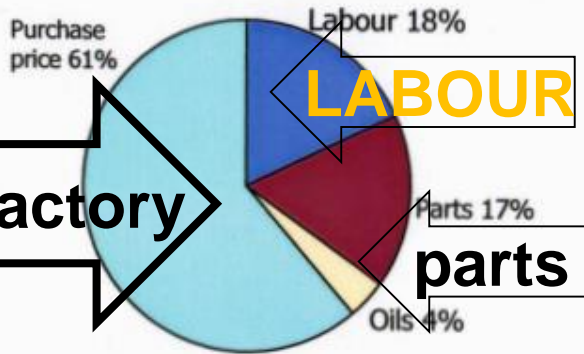
Source: <http://www.clubofrome.org/>

Societal benefits of the Circular Economy (micro-eco):
 product-life extension is a strategy to create
**local jobs, substitute manpower for energy
 & material and prevent waste**

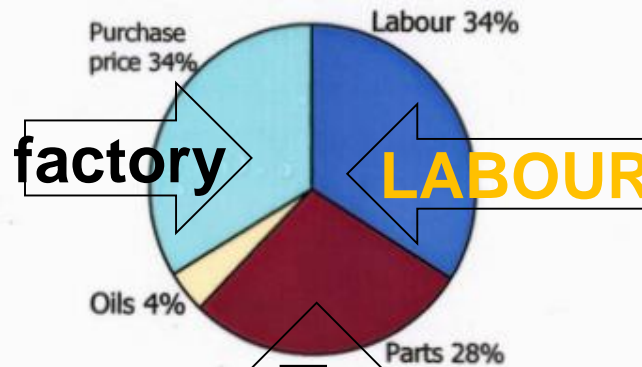
**Analysis of the running costs of a 30 year old
 automobile: Toyota Corona Mk II 1969**



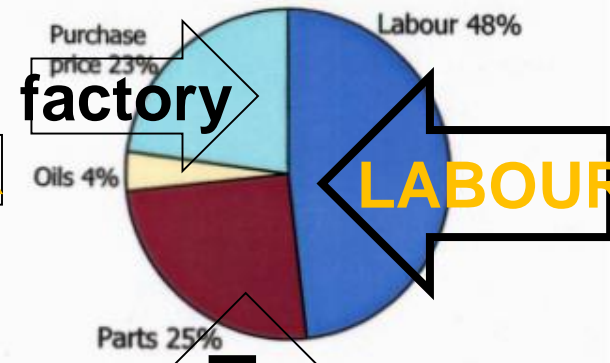
10 years



20 years



30 years



Source: Stahel, Walter 1982

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Public procurement

Cheap & green: ICE1 Redesign

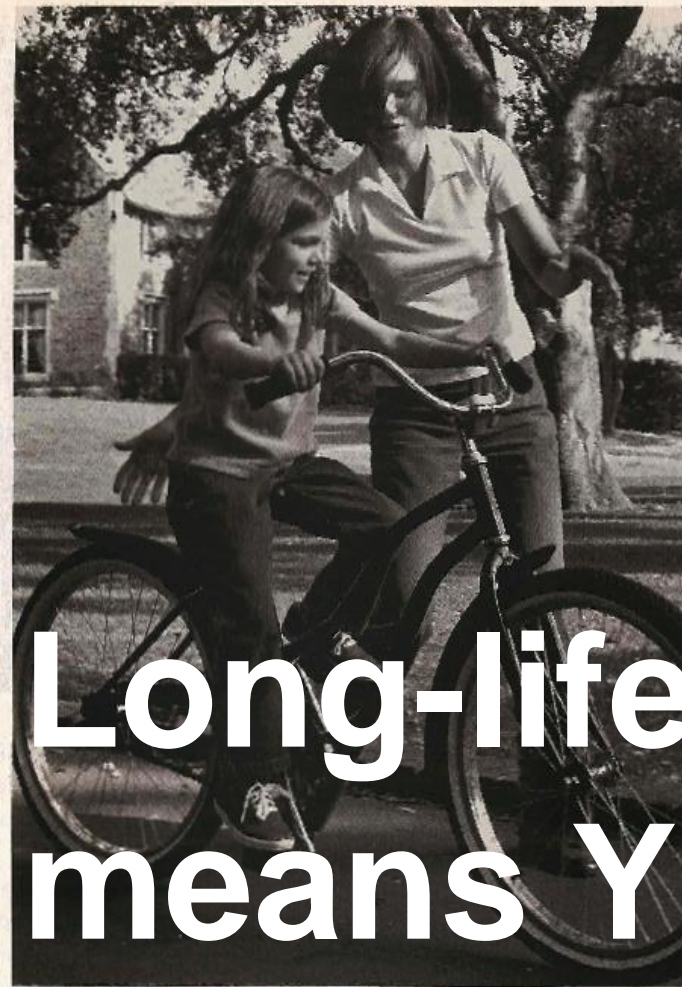
In 1995, the 59 trains of German Rail had been in service for 15 years, covering 15 million km each.

- Redesign costs were **€ 3 million per train**, versus **€ 25 million** for a similar new train.
- Redesign **preserved 80% of resources** -- 16'500 tons of steel, 1180 tons of copper -- **prevented 35'000 tons of CO₂ emissions & 500'000 tons of mining waste per train.**

The Redesign included a technological upgrading of the rolling stock, and allowed to add more seats.

Consumer drivers
are **CARING**,
a stewardship with
goods = **VALUE**
collectors' items.

and also groups:
repair cafés,
barter trades, *eBay*,
lending & sharing

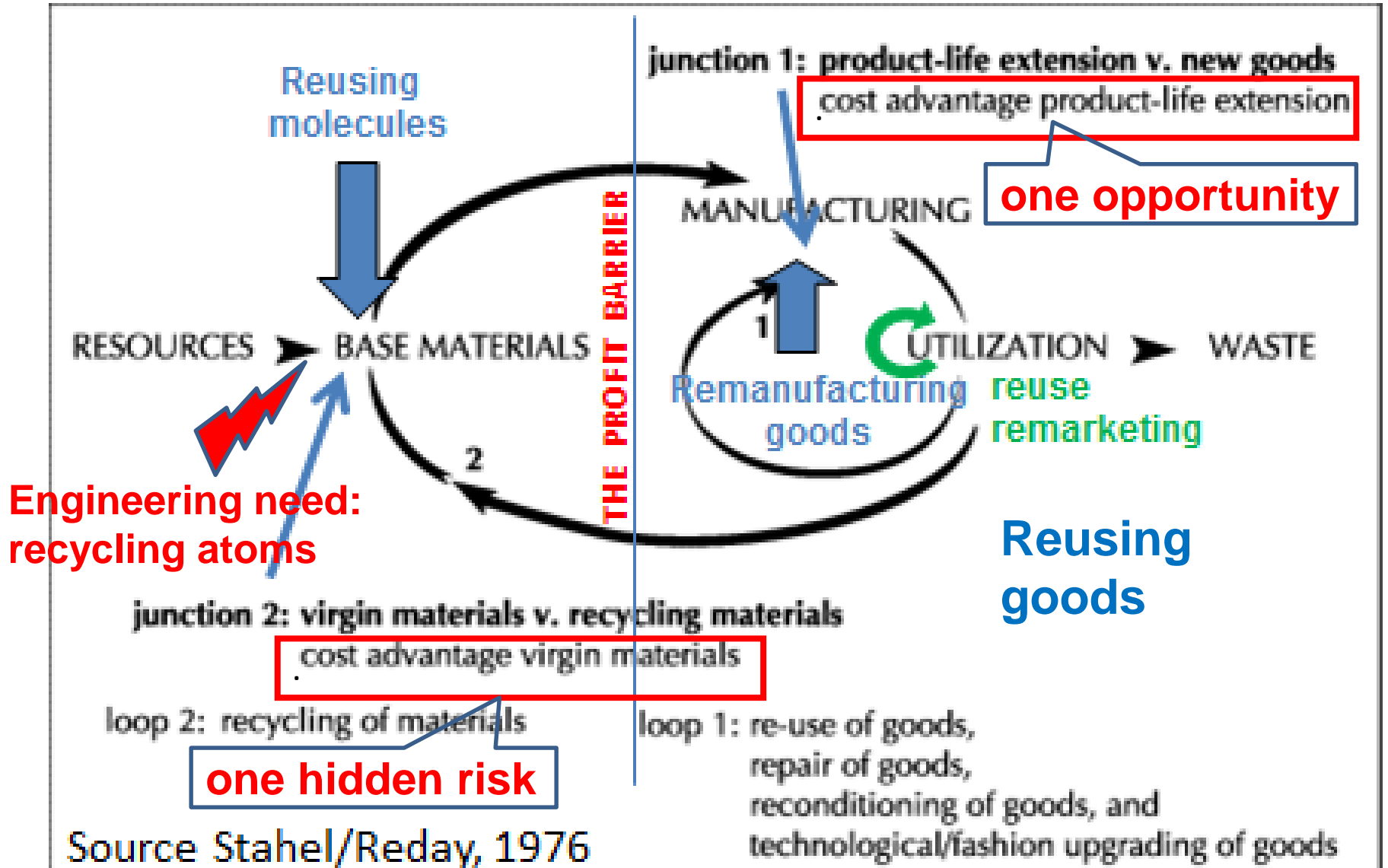


Long-life
means YOU!

You never
actually own a Patek Philippe.
You merely look after it for the next
generation. *The new ladies' Travel Time with dual*
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hour hands. One local time. The other, home.



The Circular Economy – two types of loops to manage materials and goods over time



CE -- two loops with different impacts

Recycling materials

- looses most embodied energy (GHG) and water,
- reduces waste volum
- has fixed-cost and purity disadvantages,
- is a flow process,
- is capital intensive,
- trend to globalisation

Reusing goods

- maintains most embodied energy (GHG), material and water,
- prevents waste,
- has cost (quality) advantage over new,
- is stock management
- is labour intensive,
- trend regional, SMEs

Rapid recycling = resources lost

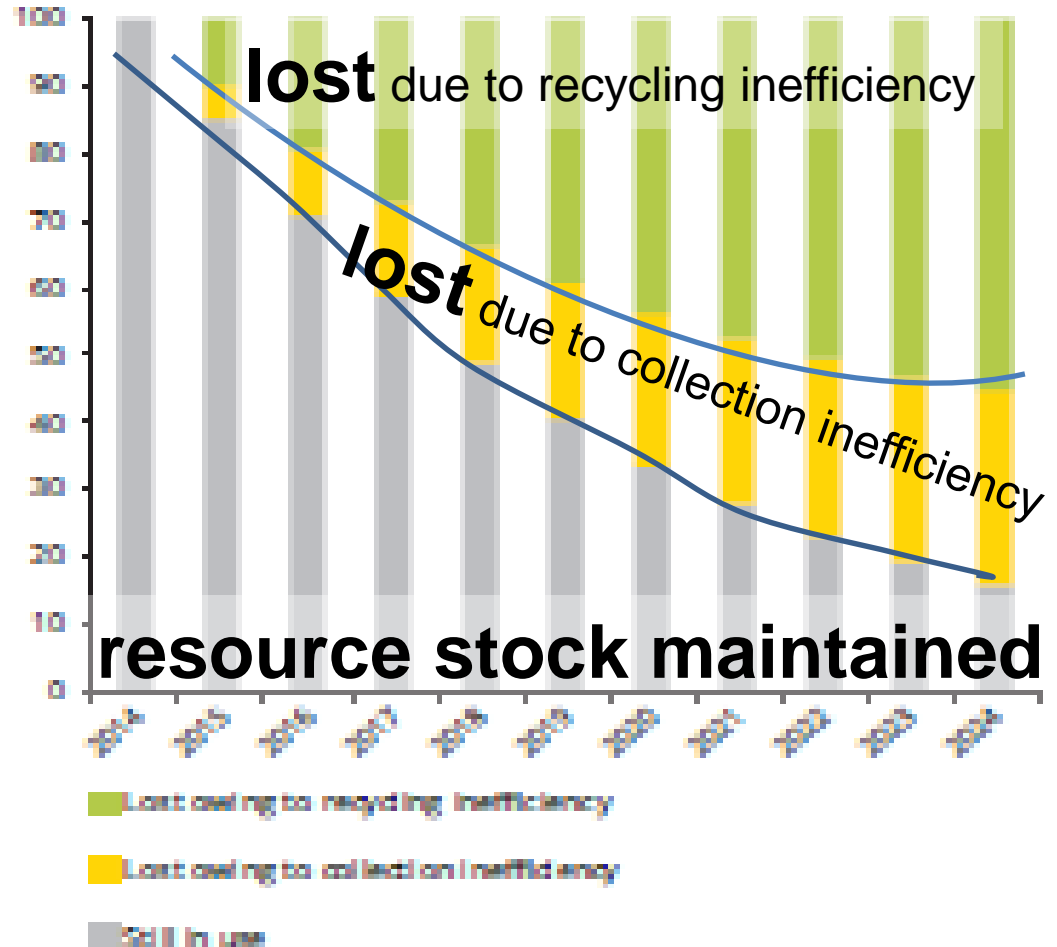
The cumulative loss of aluminium from the hard packaging cycle in Flanders, 2004 - 2014

Source: modelled by VITO, based on data from OVAM. Quoted in EEA report, p.25



Figure 3.2 The cumulative loss of aluminium from the hard packaging cycle in Flanders over time

Aluminium put on the market in 2014 (%)



Source: Modelled by VITO, based on data from OVAM (forthcoming).

Goods made of non-recyclable material = **resources lost**

Quo vadis Eco-Design ?
novel technologies cannot
use secondary resources
and cannot be recycled!



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 **Engineering
challenges**

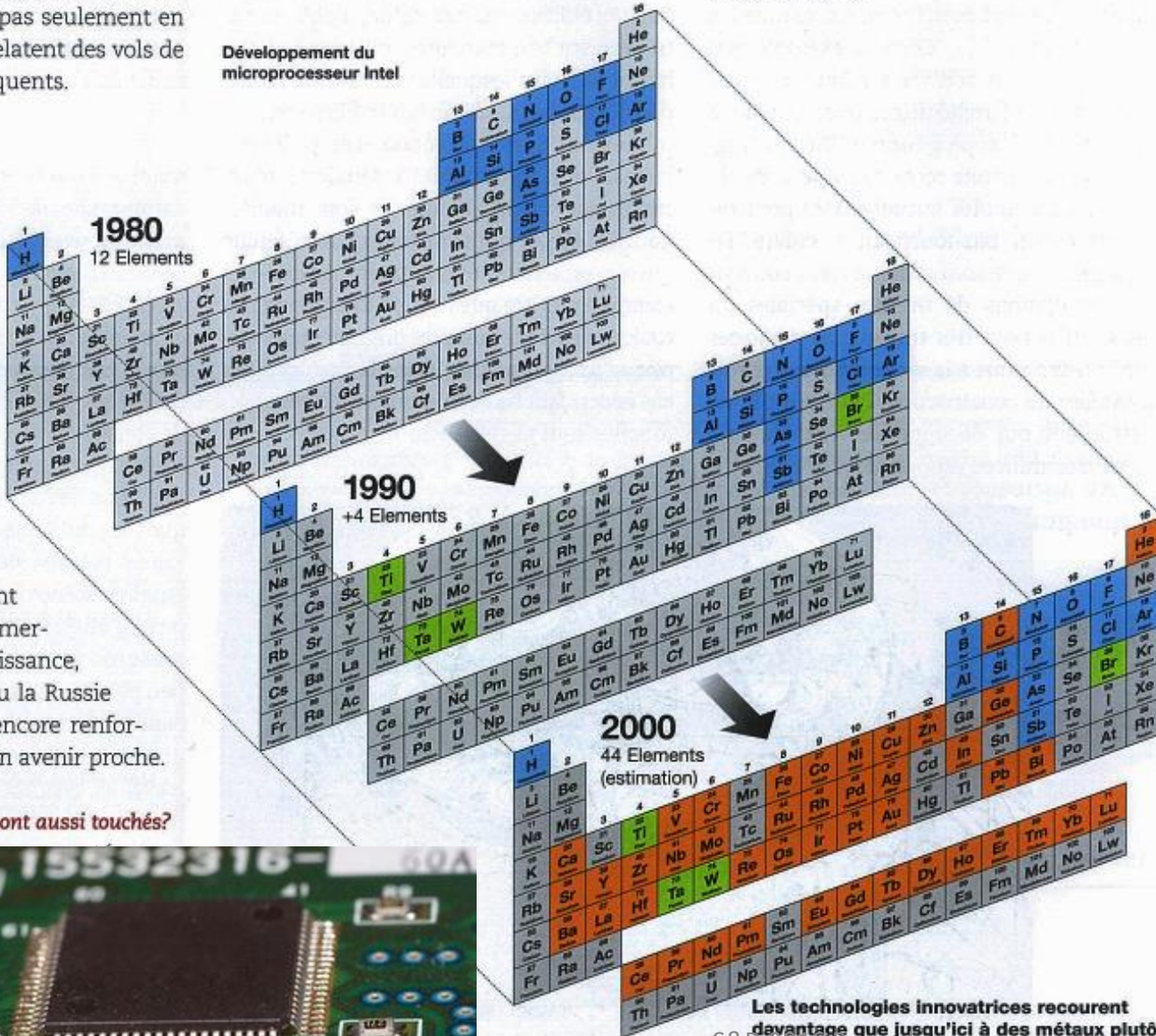
high-tech waste from:
IT nanotechnology,
photovoltaic panels,
carbon-fibre laminates:
- windmill blades,
- aircraft fuselages,
- automobile body parts,
Nuclear waste (medical)

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Re-programme or recycle? Living with complexity

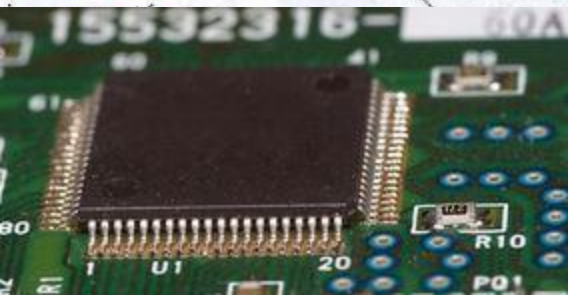
st pas seulement en
relatent des vols de
équents.

Développement du
microprocesseur Intel



e
ment
émer-
croissance,
ou la Russie
t encore renfor-
un avenir proche.

x sont aussi touchés?



- the number of elements in an INTEL microchip has increased from 12 in 1980, to 16 in 1990, to 44 in 2000.

- **Resources are lost in recycling**

- *Reprogrammable microchips*

Engineering innovation

Les technologies innovatrices recourent davantage que jusqu'ici à des métaux plutôt «exotiques» (graphique tirée de Johnson et al. dans «Science Technology»)

S&D - Al. G. Brusse

Technology quantum leaps are a driver for, and a risk to, the Circular Economy



*The Two Teams Project reduces
water and energy use in paper
making by 80% - jeopardizing
recycling ?*

<http://www.unfoldthefuture.eu/>



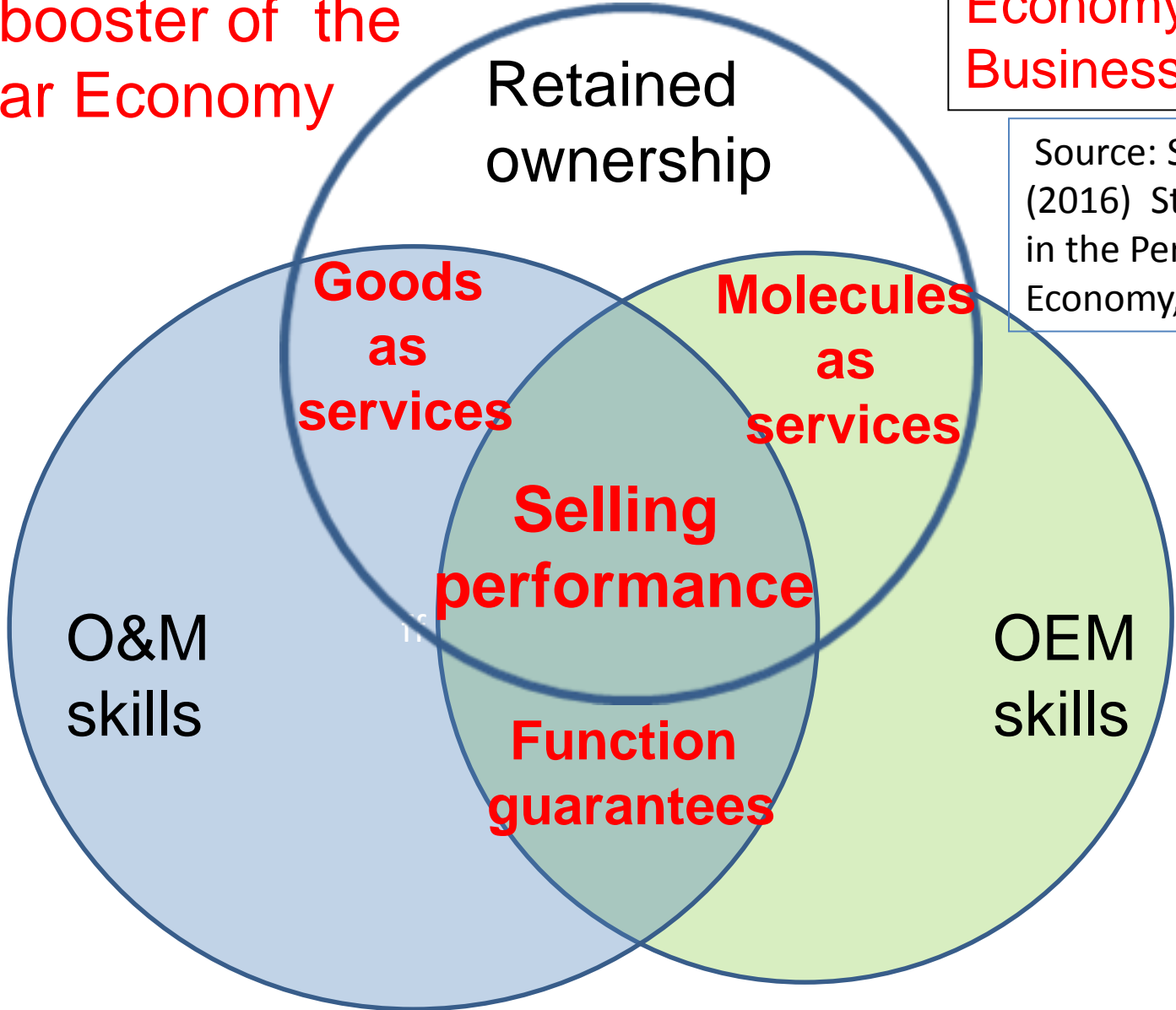
Falcon,
Space X's
reusable
rocket

Commercial quantum leaps

are a booster of the
Circular Economy

Performance
Economy
Business Models

Source: Stahel and Clift
(2016) Stocks and Flows
in the Performance
Economy, Springer

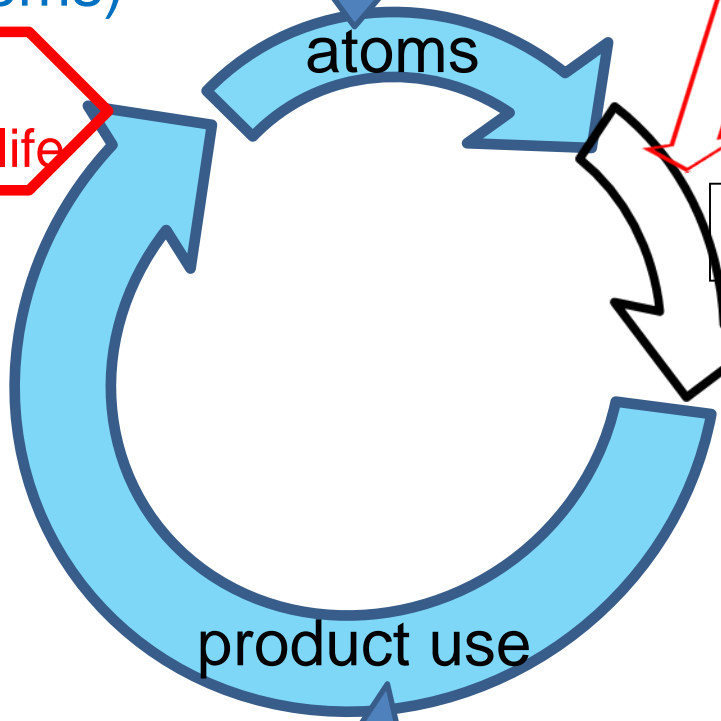


backcasting view from a mature CE

from end-of-life to as-pure-as-new resources (atoms)

the era of 'D'

end-of-service-life



innovative materials. components

production

Point of Sale

the circular user economy maintaining value, quality & quantity of stock

The challenges: innovation and spreading the knowledge

The era of 'R': techno-commercial strategies to reuse, repair, remarket, remanufacture, re-refine, recycle, reprogramme goods.

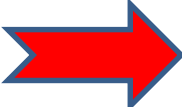
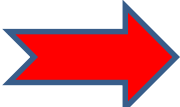
The era of 'D': technologies and policies to de-polymerize, de-alloy, de-laminate, de-vulcanize, de-coat materials, de-construct.

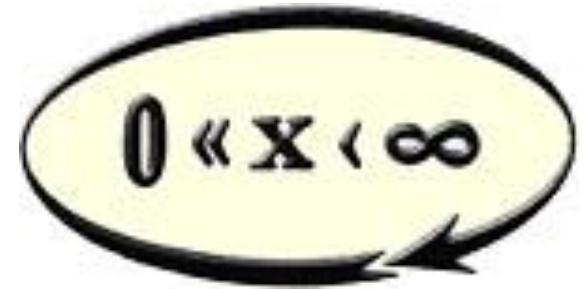
Spreading the CE knowledge – technical and economic – to class- and boardrooms, to academia & technical training institutions

R&D
challenges

education
challenge

The Circular Economy

- is focused on use (*not production*),
- is ecologic, social and economic,
- manages resource stocks (*not flows*),
- maintains values  do not levy VAT!
- substitutes manpower for energy (GHG), water, materials  do not tax labour!
- is counterintuitive to economists.



Thank you for listening

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