Advances in Cleaner Production Network

Boosting Knowledge Exchange Seeking for Sustainability

The Circular Economy: The End of Linear Economy

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Learning Objectives

After attending this lecture, you should be able to understand:

- **The meaning of a linear economy.**
- **The meaning of circular economy.**
- **The potential benefits of the circular economy.**
- **The challenges related to the circular economy.**
- **The ReSOLVE model for managing circular business.**
- **To critically relate theory and practice.**

What does the notion of a ‘circular economy’ mean to you? And why?

"The goods of today are the resources of tomorrow at the resource prices of yesterday" (Stahel, 2016)

COMMENT

UMICORE

Workers at Umicore in Brussels separate out precious metals from electronic waste.

Circular economy

A new relationship with our goods and materials would save resources and energy and create local jobs, explains **Walter R. Stahel**.

When my battered 1969 Toyota car approached the age of 30, I decided that her body deserved to be remanufactured. After 2 months and 100 hours of work, she returned home in her original beauty. "I am so glad you finally bought a new car," my neighbour remarked. Quality is still associated with newness not with caring; long-term use as undesirable, not resourceful.

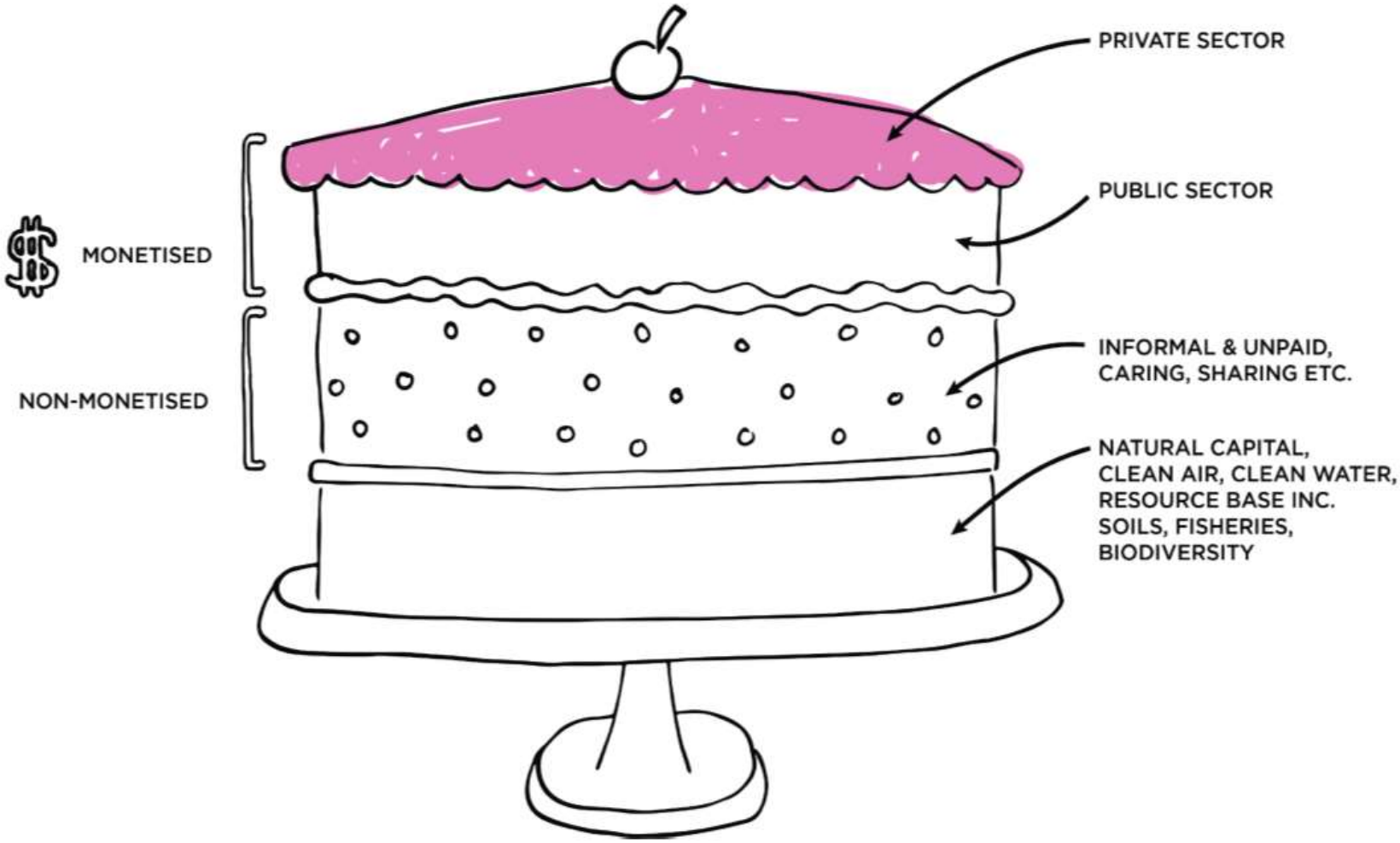
Cycles, such as of water and nutrients, abound in nature — discards become resources for others. Yet humans continue to 'make, use, dispose'. One-third of plastic waste globally is not collected or managed[1].

There is an alternative. A 'circular economy' would turn goods that are at the end of their service life into resources for others, closing loops in industrial ecosystems and minimizing waste (see 'Closing loops'). It would change economic logic because it replaces production with sufficiency: reuse what you can, recycle what cannot be reused, repair what is broken, remanufacture what cannot be repaired. A study of seven European nations found that a shift to a circular economy would reduce each nation's greenhouse-gas emissions by up to 70% and grow its workforce by about 4% — the ultimate low-carbon economy (see go.nature.com/biecsc).

The concept grew out of the idea of substituting manpower for energy, first described 40 years ago in a report[2] to the European Commission by me and Geneviève Reday-Mulvey while we were at the Battelle Research Centre in Geneva, Switzerland. The early 1970s saw rising energy prices and high unemployment. As an architect, I knew that it took more labour and fewer resources to refurbish buildings than to erect new ones. The principle is true for any stock or capital, from mobile phones to arable land and cultural heritage.

Circular-economy business models fall in two groups: those that foster reuse and extend service life through repair, remanufacture, upgrades and retrofits; and those that turn old goods into as-new resources by recycling the materials. People — of all ages and skills — are central to the model. Ownership gives way to stewardship; consumers become users and creators[3]. The remanufacturing and repair of old goods, buildings and infrastructure creates skilled jobs in local workshops. The experiences of ▶

The cake model



What's the use of a cake?

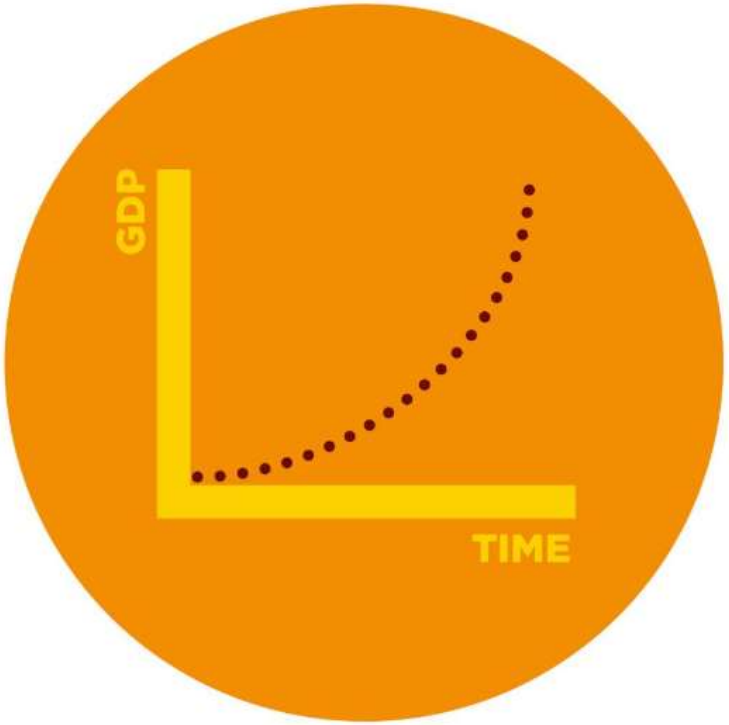
What are the main challenges of the current linear pattern of production and consumption?

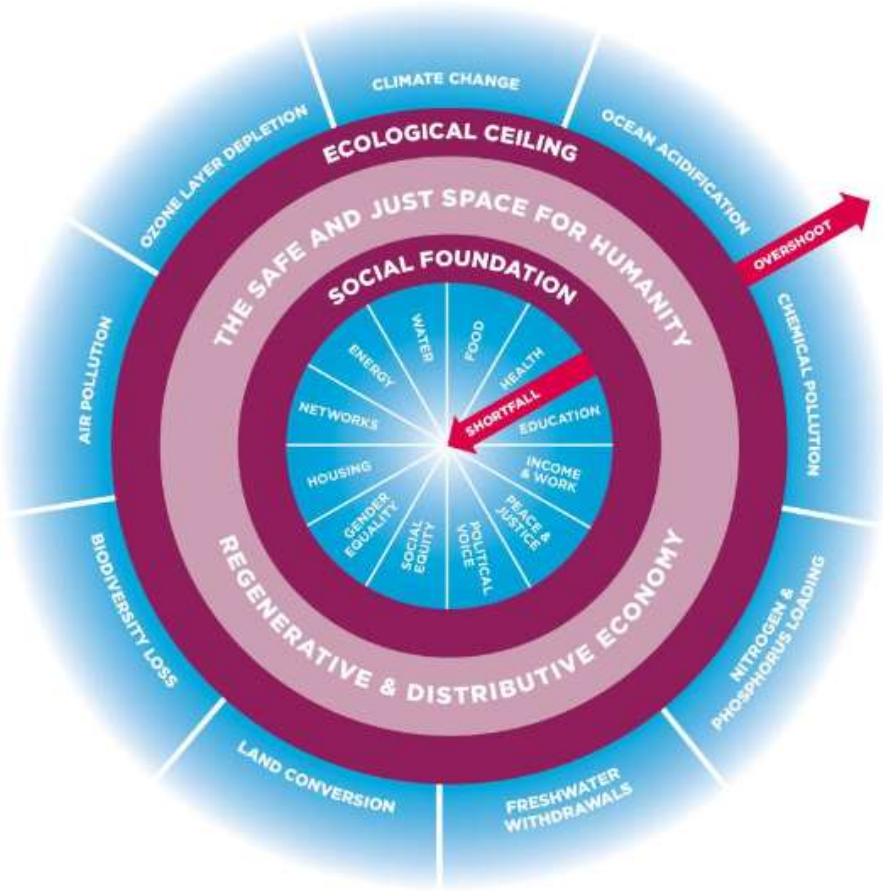
The main challenge

Economic thoughts:

20th versus 21st century

Change de Goal

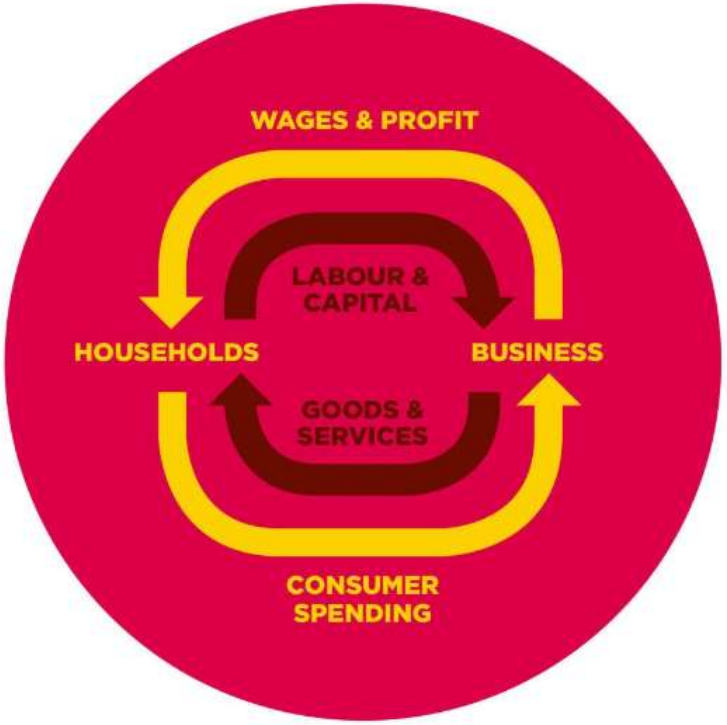


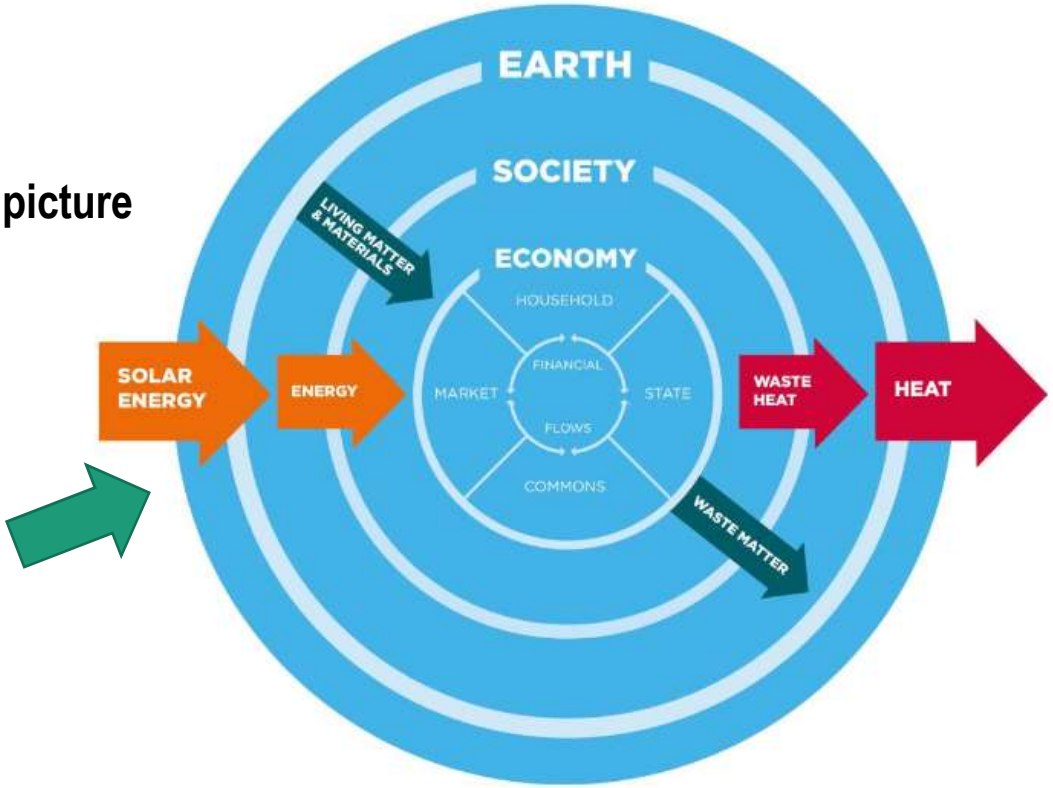


Economic thoughts:

20th versus 21st century

See de big picture

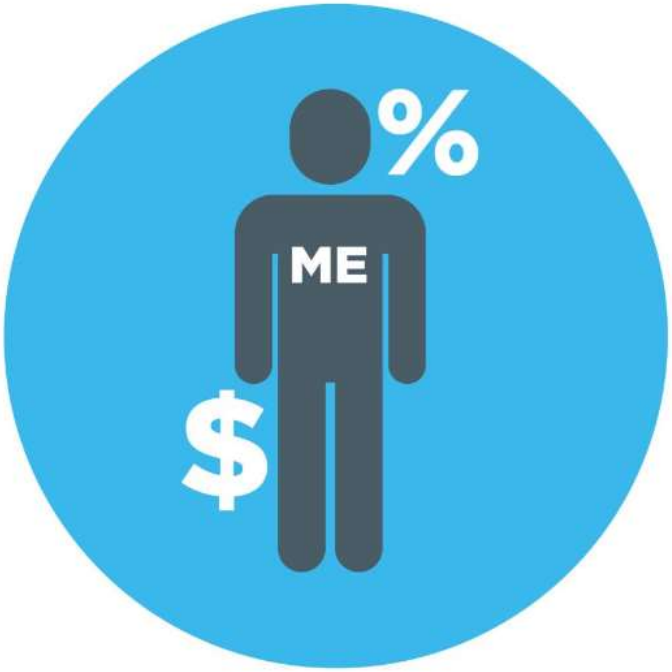




Economic thoughts:

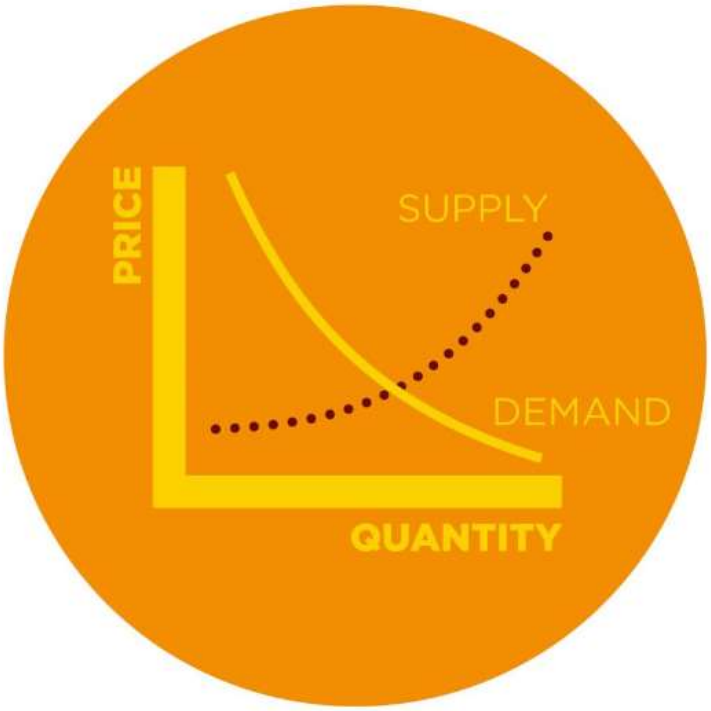
20th versus 21st century

Focus on collectivity



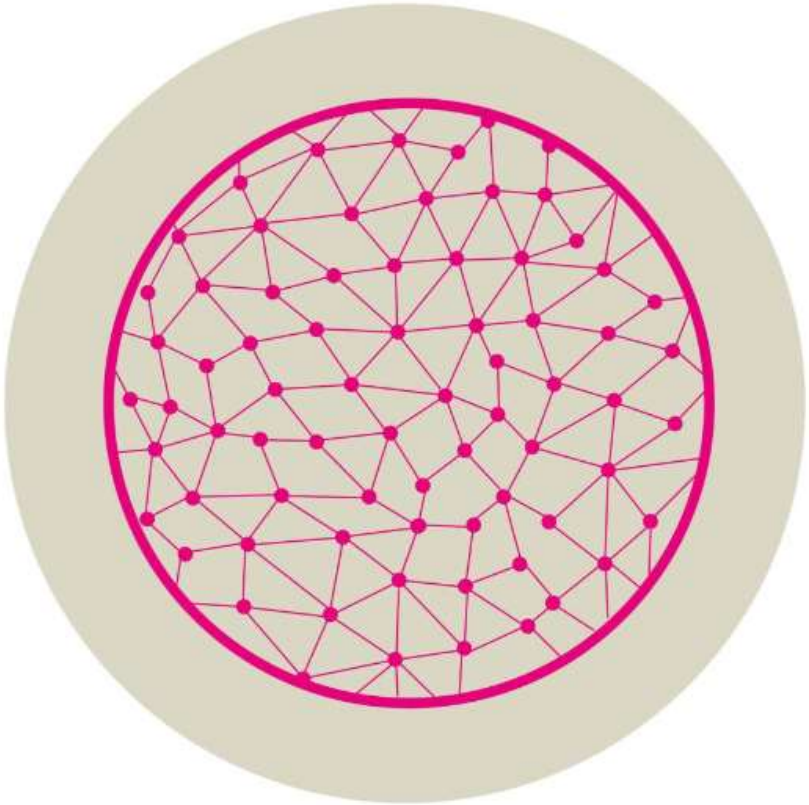
Economic thoughts:
20th versus 21st century

Consider the complexity



Economic thoughts:
20th versus 21st century

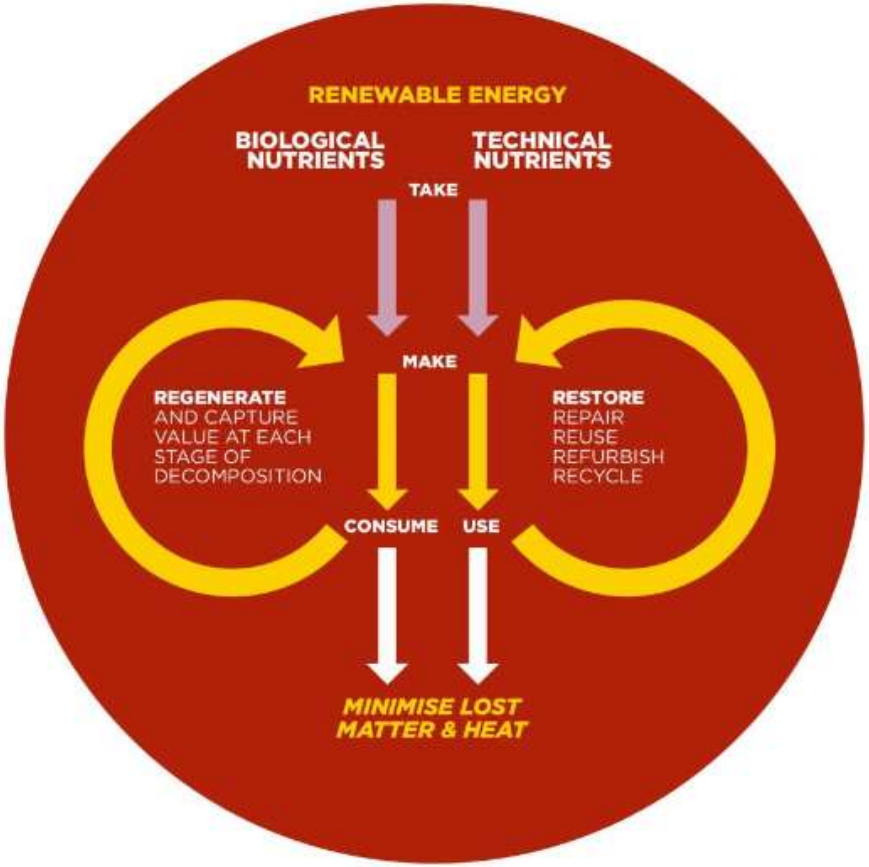
Design to distribute



Economic thoughts:

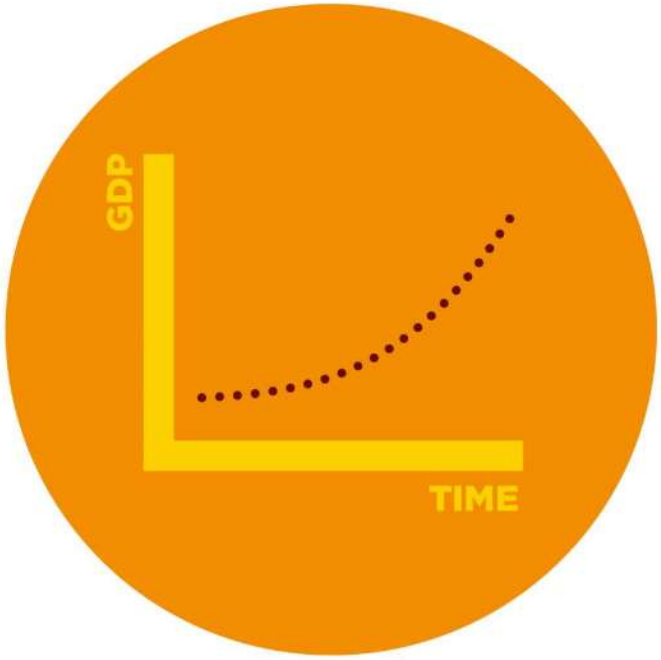
20th versus 21st century

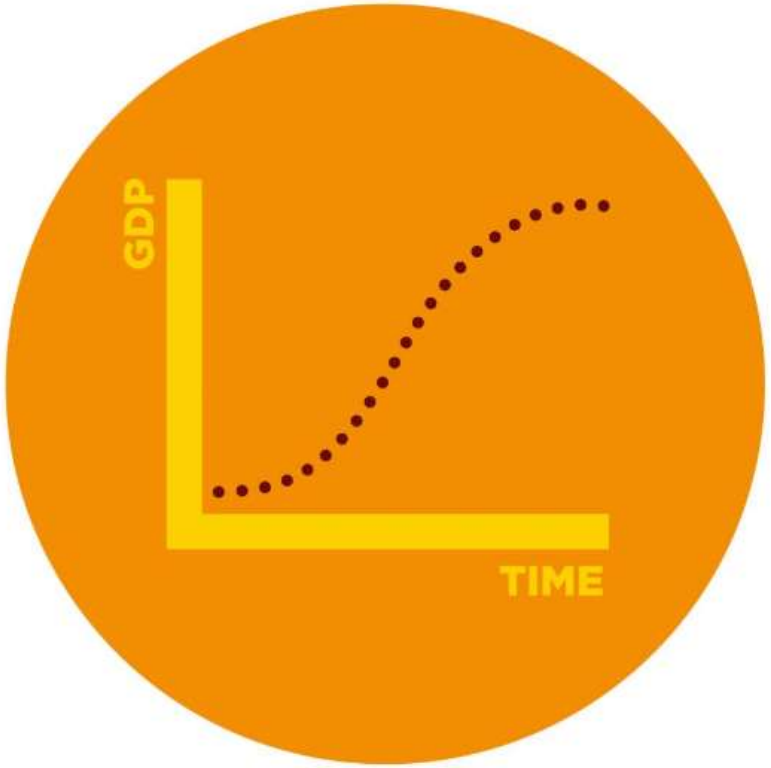
Regenerative design



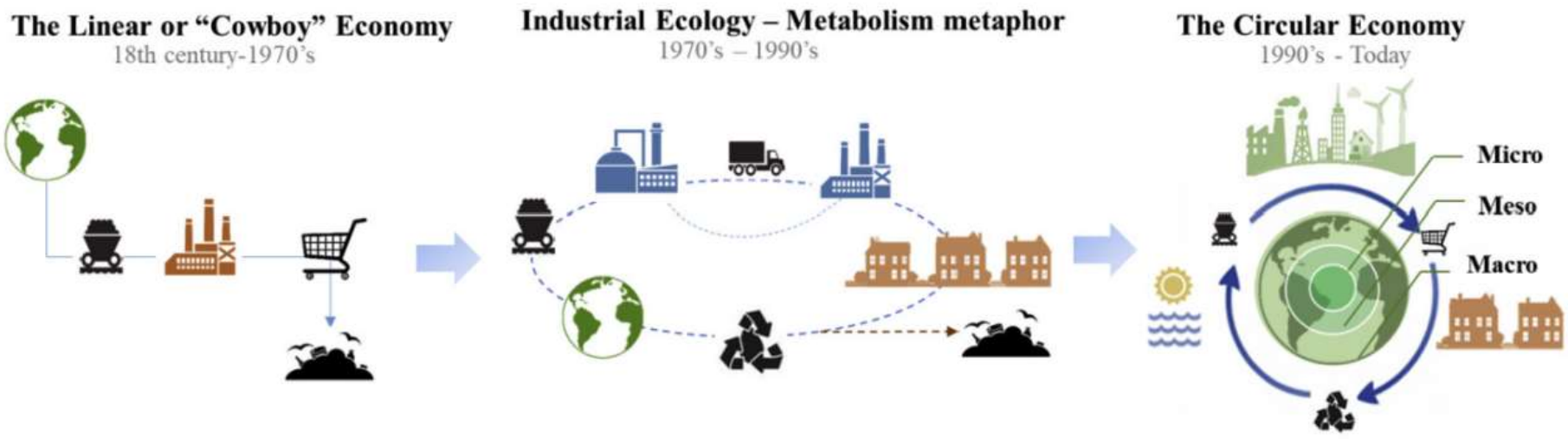
Economic thoughts:
20th versus 21st century

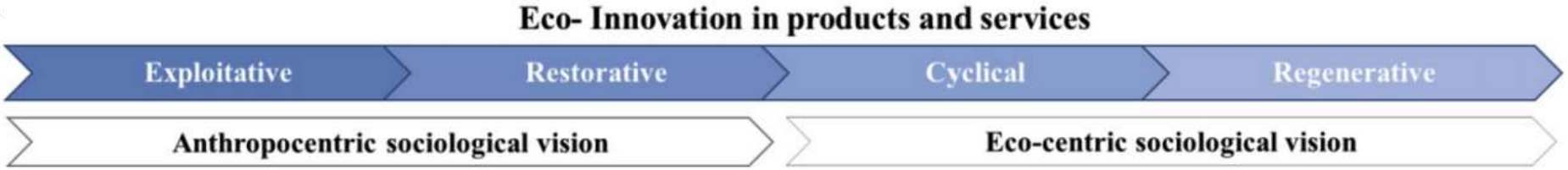
Eliminate growth addiction





Economy evolution





Linear economy

"Take, Make, Waste" system of production and consumption:

1) Extraction industries extract natural resources.

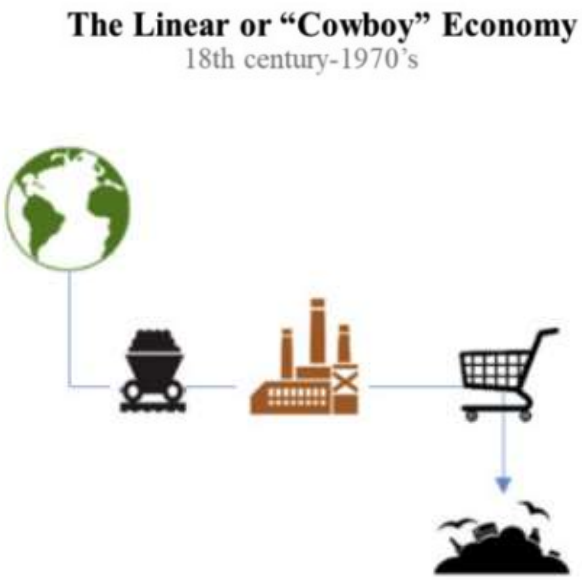
2) Manufacturers process natural resources into products and packaging.

3) Retailers sell the products.

4) Consumers (we) buy the products.

5) When we're finished with them, we put these materials into the trash.

6) Through our tax (council tax), we then pay to have the government to send our unwanted products and packaging to a landfill or waste incinerator.



Linear economy

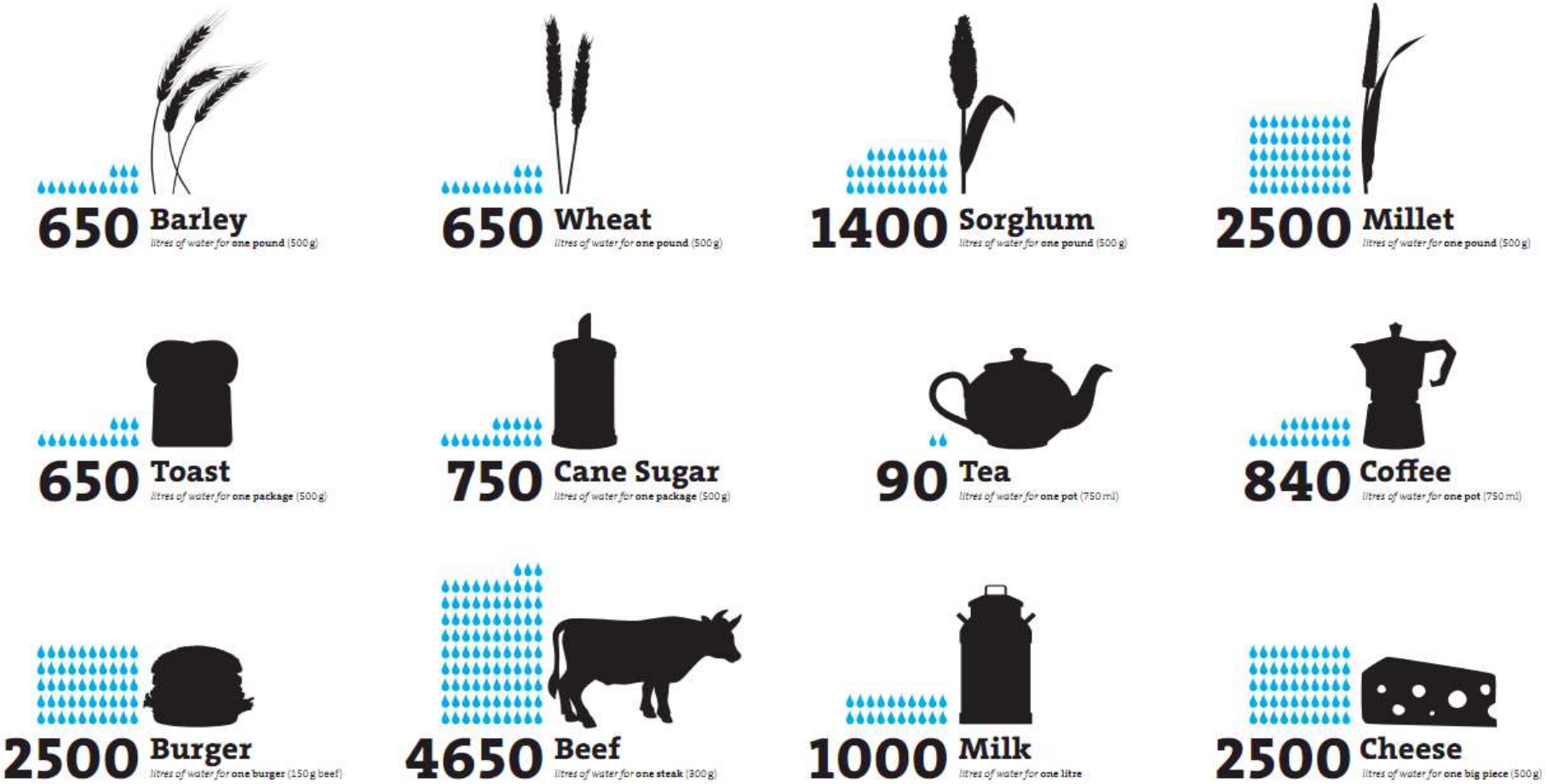
- **“A linear economy flows like a river”, turning natural resources into products for sale through a series of steps.**

- **At the point of sale, ownership, legal responsibilities and waste management pass to the buyer (who is now owner and user – “we”). The owner decides the future of the products.**

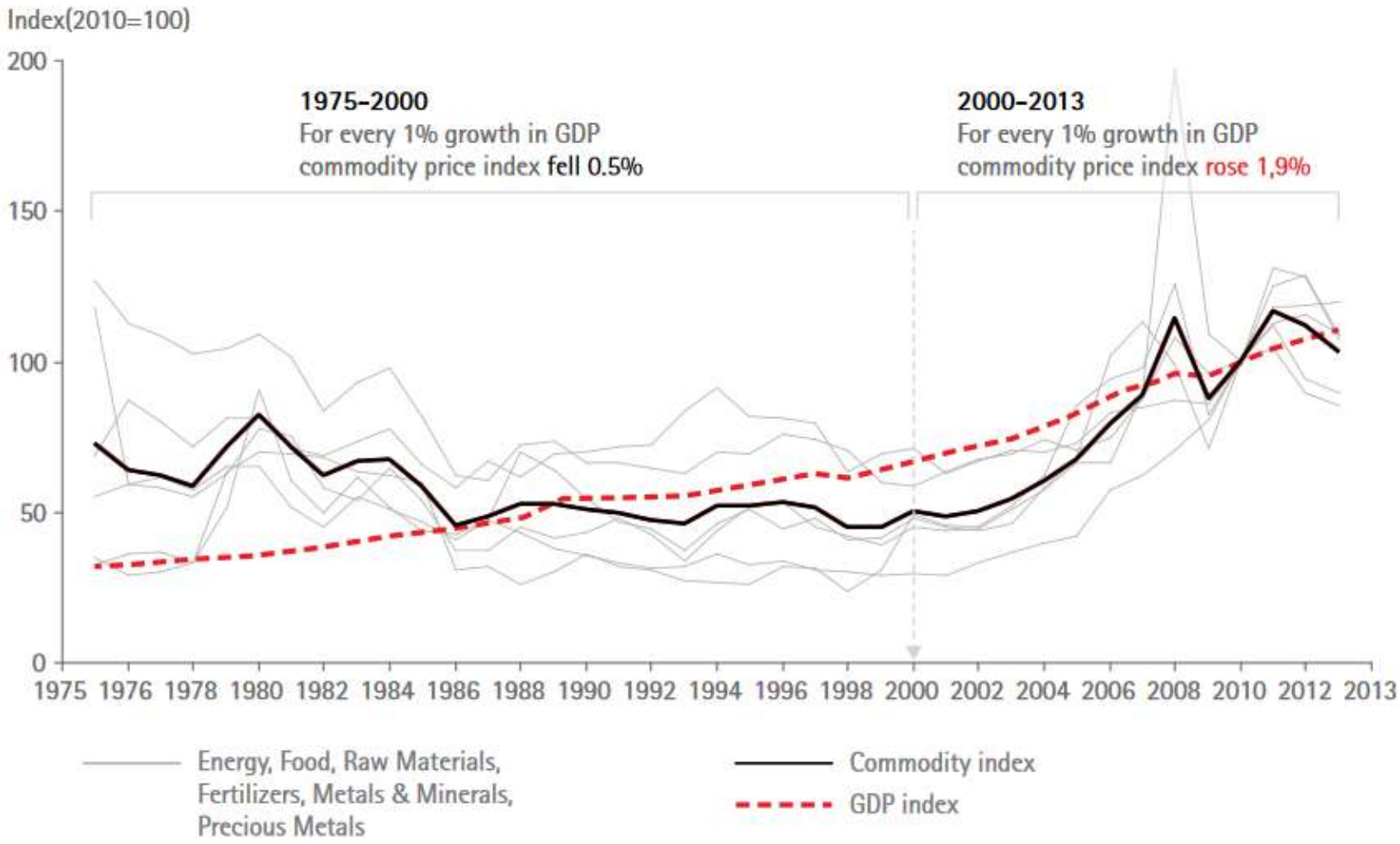
- **The linear economy is driven by 'bigger-better-faster-safer' syndrome.**
- **The linear economy is associated with a variety of externalities, waste and inefficiencies.**

“Linear economy is like a river” (Stahel, 2016)

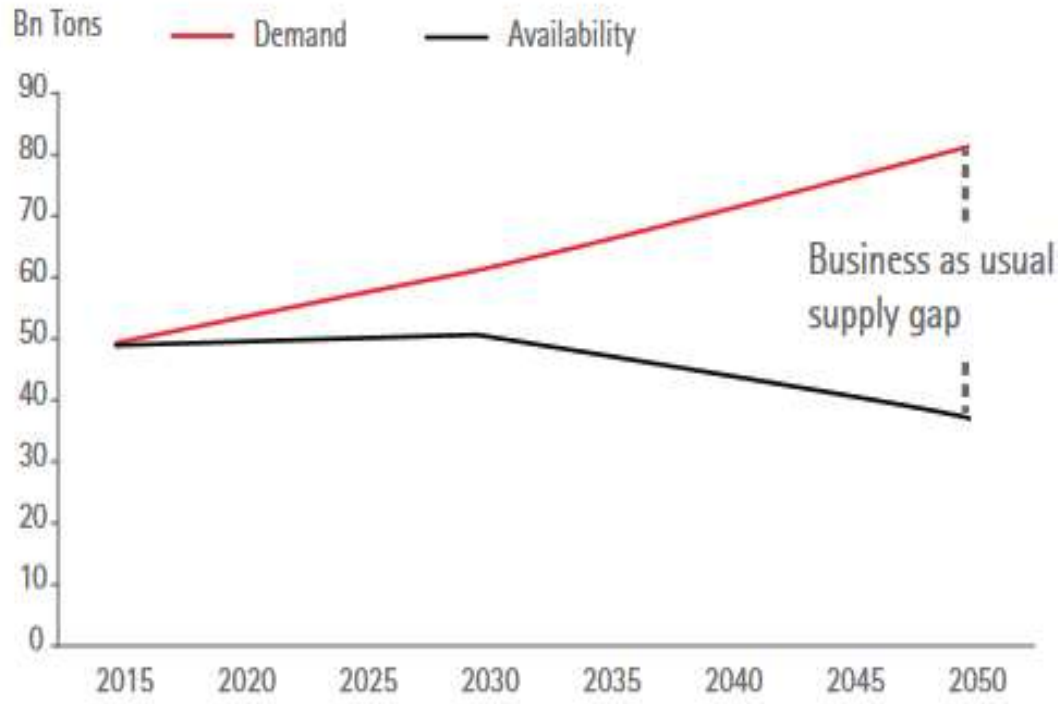
Consequences for the society: high hidden cost



Consequences for the society: commodities price increasingly unattractive to economic growth



Consequences for the society: future with impossibilities



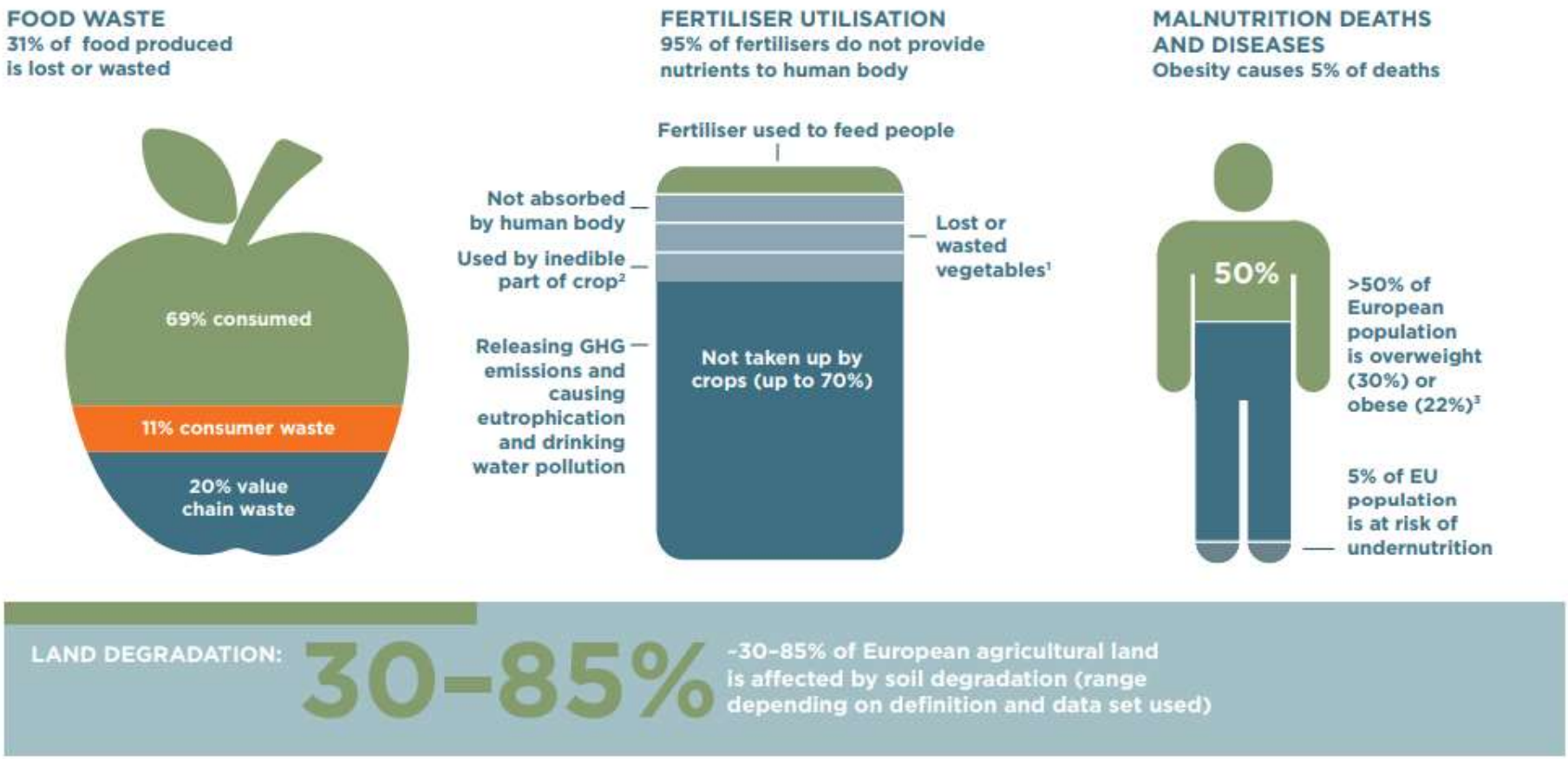
Rising costs for material, energy, land, water

Extreme volatility in commodity markets

Economic and social risk of supply disruptions

Scenarios include limited resource stocks only and therefore differ from total material consumption. Most notably exclude construction mineral volumes (e.g. sand and gravel) where scarcity is not an issue

Consequences for the society: inefficiency and external costs



1 In Europe ~46% of edible mass of fruit and vegetables is lost or wasted (FAO, Global food losses and food waste, 2011). 2 On average 23% of vegetable crops are not edible (peels, leaves, etc.). 3 BMI >25 (overweight) or >30 (obese).

Source: FAO, *Global food losses and food waste – Extent, Causes and Prevention*, 2011; MGI, *Overcoming obesity: An initial economic analysis*, 2014; WHO website obesity data; EEA, *Towards efficient use of water resources in Europe*, 2012; IFDC; Olle Ljungqvist and Frank de Man, *Under-nutrition – a major health problem in Europe*, 2009; Holly Gibbs and Meghan Salmon, *Mapping the world's degraded lands*, 2015.

The Circular Economy:
The End of Linear Economy

THE SCOTSMAN
SCOTLAND'S NATIONAL NEWSPAPER

News | Politics | Transport | Education | Environment | Health | UK | World | Odd

Scotland named one of world's top 'circular economy' nations

FINANCIAL TIMES LIVE — Home — Coming up

FT Circular Economy Summit

Accelerating a business model revolution

London | 25 May 2017

theguardian
website of the year

Guardian sustainable business

Circular economy could create half a million UK jobs

Circular economy

CNN | Regions | U.S. Politics | Money | Entertainment | Tech | Sport | Travel | Style | Health | Video — International Edition

Tokyo 2020 medals to be made from recycled mobile phones

Updated 1540 GMT (2340 HKT) February 1, 2017

ZERO WASTE SCOTLAND

Circular Economy Investment Fund

We are investing £18 million as grant funding to small and medium sized enterprises who are helping to create a more circular economy.

8th INTERNATIONAL WORKSHOP ADVANCES IN CLEANER PRODUCTION

Sanya - China - November 13rd to 15th 2019

COUPLING GREEN TO BLUE ECONOMIES

HOW ARE CLEANER PRODUCTION AND CITIES LEADING THE NEXT SUSTAINABLE DEVELOPMENT?

1st International Bay Area Circular Economy Conference

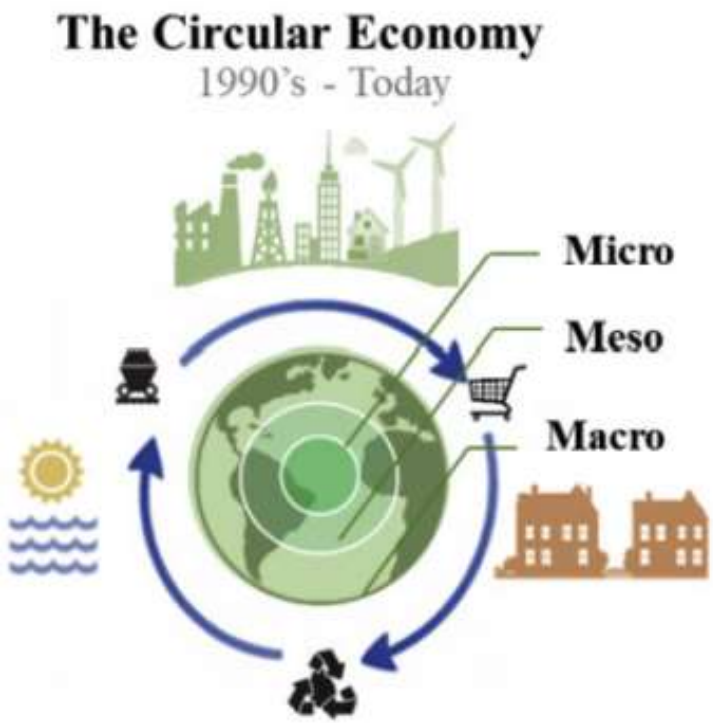
Success Stories and New Challenges: From "world factory" to "world-class green bay area"

Nov. 20-22, 2019 - Macao, China

More information in www.advancesincleanerproduction.net

Circular economy

- **A 'circular economy' would turn goods that are at the end of their life into resources for others, closing loops in industrial ecosystems and minimizing waste**
- The circular economy is defined as an economy that provides multiple value-creation mechanisms which are decoupled from the consumption of finite resources



Circular-economy business models fall in two groups:

Reduce, Reuse, Recycle, Recover: Reduce and reuse what you can, recycle what cannot be reused, repair what is broken, remanufacture what cannot be repaired.

Servicizing: as services through rent, lease and share business models. The manufacturer retains ownership of the product and its embodied resources and thus carries the responsibility for the costs of risks and waste. In addition to design and reuse, the performance economy focuses on solutions instead of products.

"A circular economy is like a lake" (Stahel, 2016)


CNBC

ELSEVIER

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The relation between industrial and ecological systems

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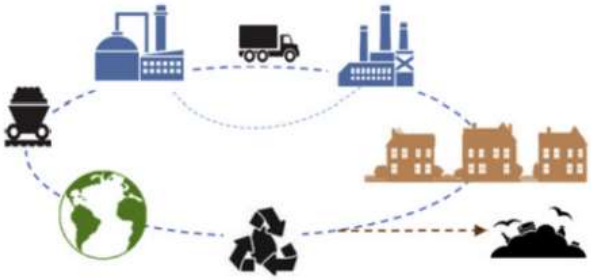
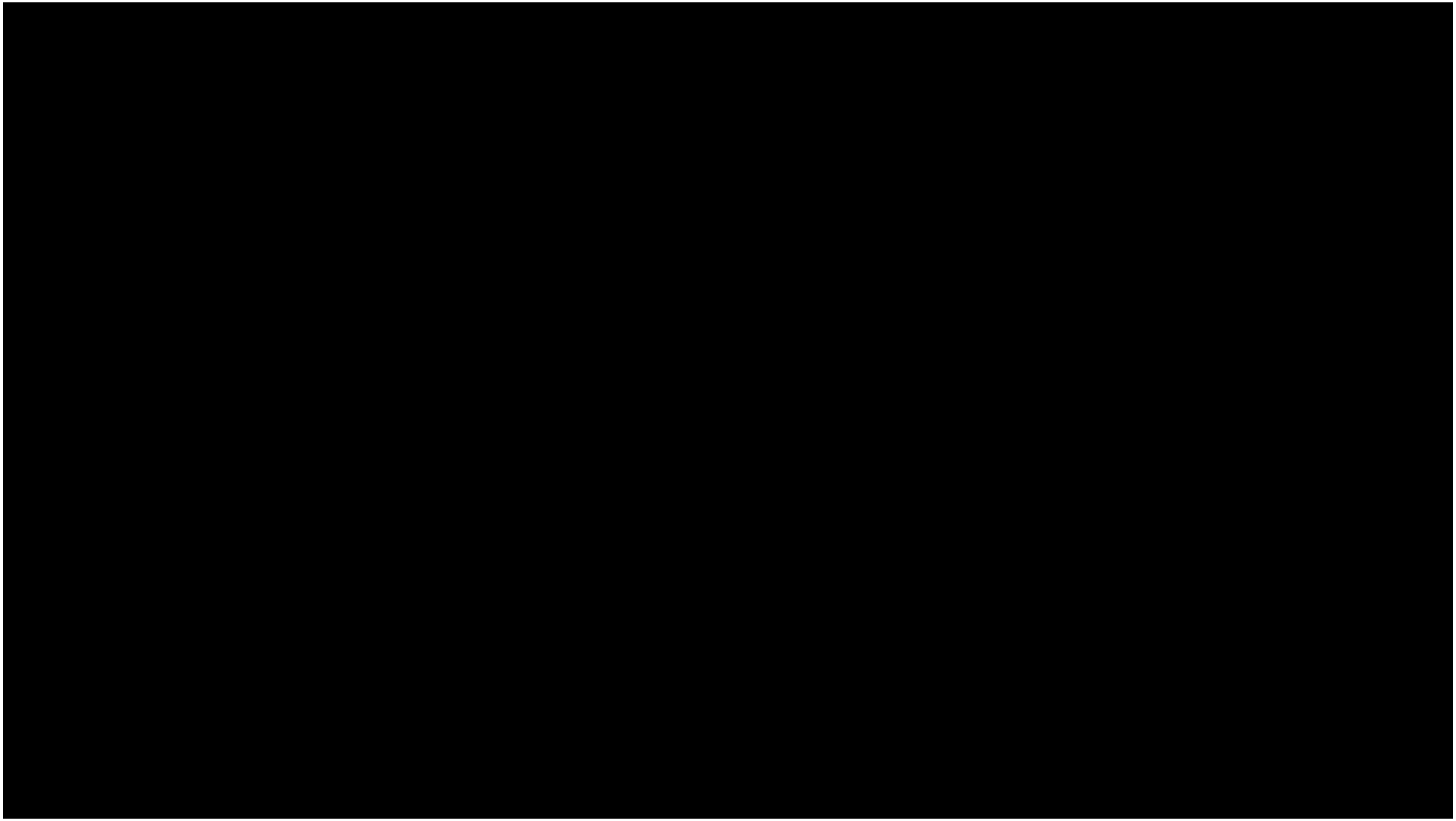
What is the relation between circular economy and ecological systems?

Industrial Ecology – Metabolism metaphor
1970's – 1990's



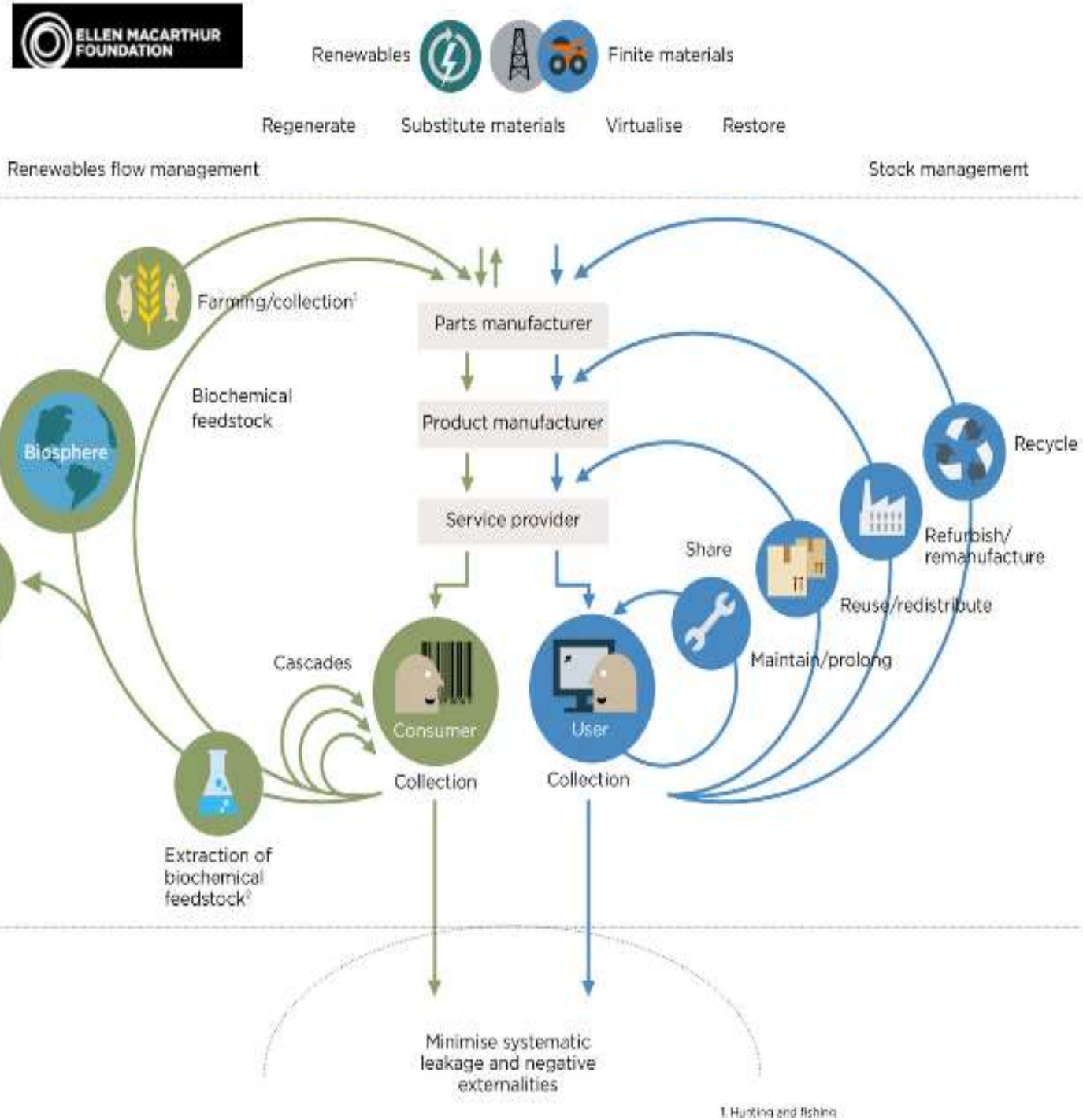
The Circular Economy
1990's - Today



1 PRINCIPLE

Preserve and enhance natural capital by controlling finite stocks and balancing renewable resource flows
ReSOLVE levers: regenerate, virtualise, exchange

ELLEN MACARTHUR FOUNDATION



PRINCIPLE **2**

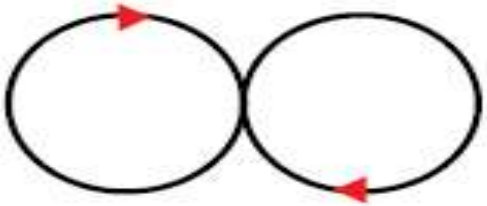
Optimise resource yields by circulating products, components and materials in use at the highest utility at all times in both technical and biological cycles
ReSOLVE levers: regenerate, share, optimise, loop

PRINCIPLE **3**

Foster system effectiveness by revealing and designing out negative externalities

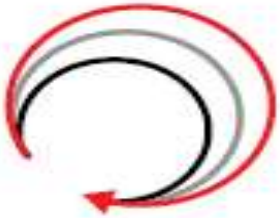
1. Hunting and fishing

Value creation and the circular economy

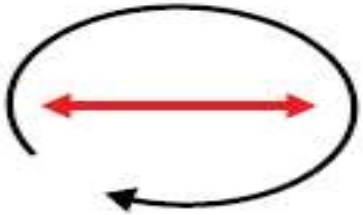


Lasting resources
Breaking the link between resource scarcity and economic activity by using only resources that can be continuously regenerated for productive use

Liquid markets
Eliminating idle time of products in the markets in order to grow the number of users that gain benefit from the same volume of goods



Linked value chains
Minimizing resource value destruction in a value chain by reclaiming and linking up waste outputs as useful inputs into a next life production process

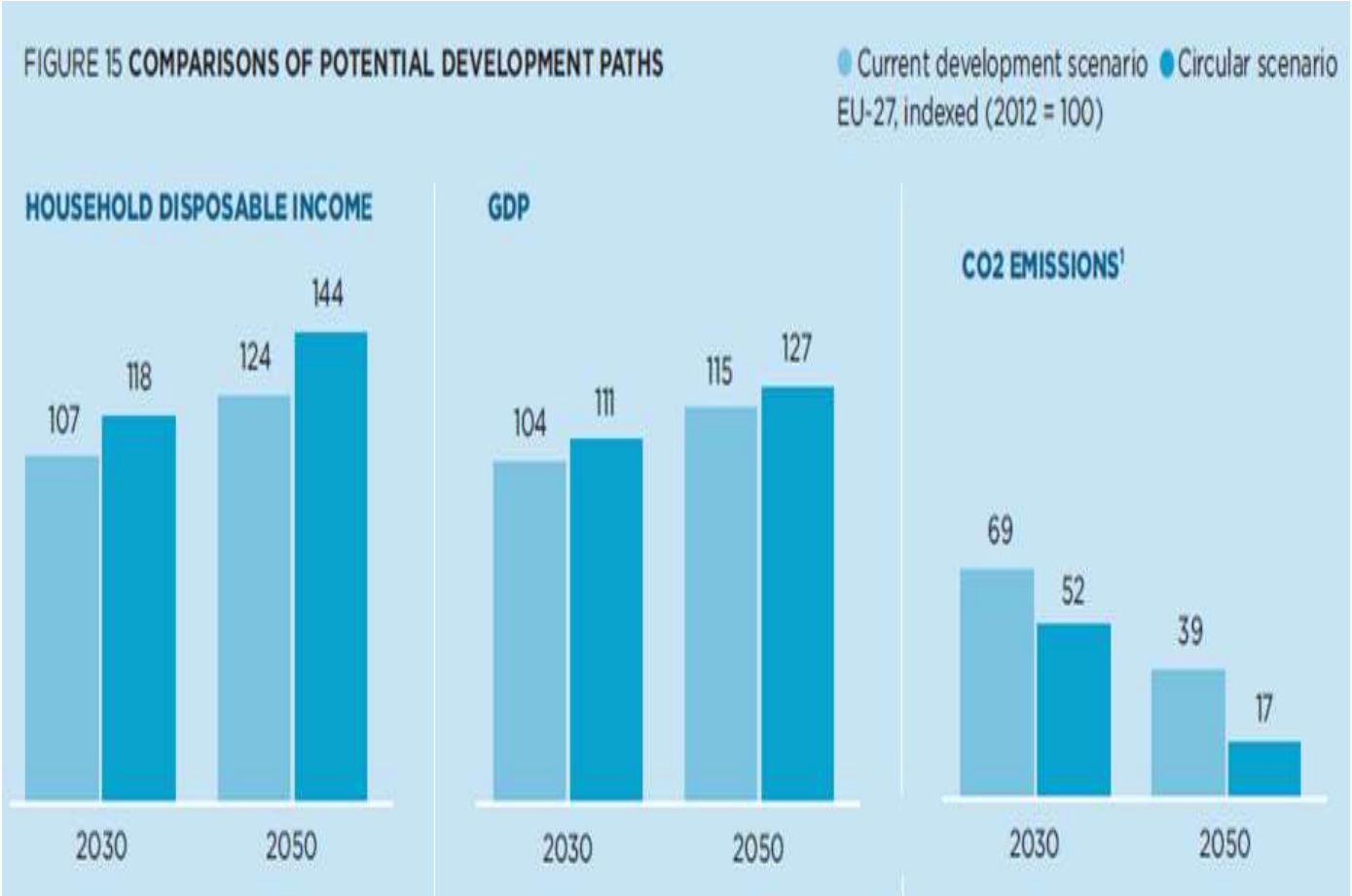


Longer life cycles
Keeping products in economic use for longer to satisfy a greater demand and provide more utility without needing additional natural resources

What are the potential benefits of a circular economy?

Circular economy: potential benefits

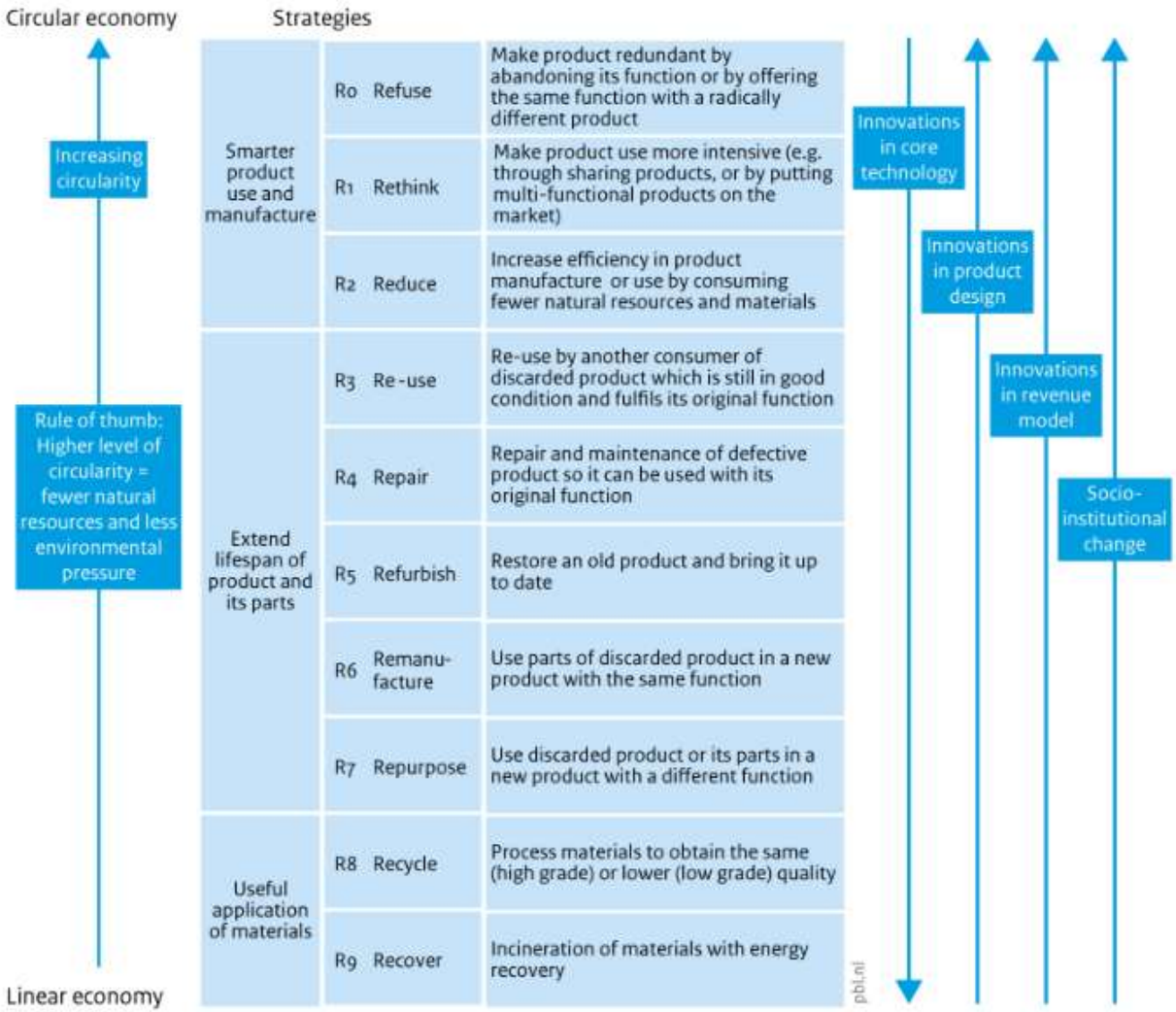
Circular economy can generate a variety of benefits for nations and companies



If you were a sustainability manager, which strategies of circular economy you would implement in a water purifier company and in a mall with a big food waste?

Talk to your colleague about this

Circularity strategies in order of priority



Circular economy:
re-think the business model

Brazil has exemplary solutions: Brastemp's water service

For more than 10 years, the company leased "filtered water" to homes and offices across the country.

The company converted a linear process – selling more filters – in a circular process – renting filtered water.

As a result, it changed its product line so that it lasted more and became easier to maintain, since responsibility for its proper functioning became the company's, and not the customer's anymore.

This is a example of circular economy as a business model.

Circular economy: Business model

EXAMPLE: BRASTEMP WATER PURIFIER

- **Business** - The Brastemp water purifier has a product-service system model, and is the result of a long innovation process which began in 2001 – business model based on product rental.
- **Profit** - Currently represents one of the most profitable areas in the company; it is a source of pride and an example for new projects to follow.
- **Sustainability –** Brastemp is responsible for the product's entire life cycle, from production to responsible disposal of its components. The purifier is 97% recyclable and recycled.
- **Convenience –** Installation services, maintenance and refill exchanges are included. Every 6 months Brastemp contacts the client and schedules a visit; the client does not have to do anything. There is much more practicality and attentiveness.

Circular economy: Management of food waste

EXAMPLE: ElDorado Mall

Numbers	
Stores	340
Area	164,734 m²
Parking capacity	3,500 cars
Movie theater	9
Movement	20 millions of people/yr

Circular economy:
Zero waste

EXAMPLE: ElDorado Mall

Shopping Eldorado Waste - Daily Numbers

10,000 meals served
1 ton of organic waste
1 ton of organic compost produced
5,000 liters of reused waste water

"Since the approval of the Solid Waste Act in 2010, we have been looking for a solution to the 30 tons produced monthly by nearly 70 food stores," says Sergio Nagai, the mall's superintendent.

The plan foresees goals and deadlines for the project stages - 2020 is the deadline to reach **zero waste** in the operation of the mall.

Circular economy:
Value creation

EXAMPLE: ElDorado Mall

Visits:
One time per week or virtual visit by Google Street View or using reality 3D

What is the ReSOLVE model for creating circular business models?

Managing circular business: "ReSOLVE"(*) model

(*) Ellen MacArthur Foundation

REgenerate. Shift to renewable energy and materials; reclaim, retain, and regenerate health of ecosystems; and return recovered biological resources to the biosphere.

Share. Keep product loop speed low and maximise utilisation of products by sharing them among users (peer-to-peer sharing of privately owned products or public sharing of a pool of products), reusing them throughout their technical lifetime (second-hand), and prolonging their life through maintenance, repair, and design for durability.

Optimise. Increase performance/efficiency of a product; remove waste in production and the supply chain (from sourcing and logistics to production, use, and end-of-use collection)

Loop. Keep components and materials in closed loops and prioritise inner loops. For finite materials, this means remanufacturing products or components and as a last resort recycling materials

Virtualise. Deliver utility virtually – books or music, online shopping, fleets of autonomous vehicles, and virtual offices.

Exchange. Replace old materials with advanced non-renewable materials; apply new technologies (e.g. 3D printing and electric engines); choose new products and services (e.g. multi-modal transport).

EXAMPLES

REGENERATE

- Shift to renewable energy and materials
- Reclaim, retain, and restore health of ecosystems
- Return recovered biological resources to the biosphere

SHARE

- Share assets (e.g. cars, rooms, appliances)
- Reuse/secondhand
- Prolong life through maintenance, design for durability, upgradability, etc.

OPTIMISE

- Increase performance/efficiency of product
- Remove waste in production and supply chain
- Leverage big data, automation, remote sensing and steering

LOOP

- Remanufacture products or components
- Recycle materials
- Digest anaerobically
- Extract biochemicals from organic waste

VIRTUALISE

- Books, music, travel, online shopping, autonomous vehicles etc.

EXCHANGE

- Replace old with advanced non-renewable materials
- Apply new technologies (e.g. 3D printing)
- Choose new product/service (e.g. multimodal transport)

Source: Company interviews; Web search. S. Heck and M. Rogers, *Resource revolution: How to capture the biggest business opportunity in a century*, 2014.

FIGURE 11 **POTENTIAL IMPACT OF ReSOLVE** ● High ● Middle ● Low

ECONOMIC ACTIVITIES	Regenerate	Share	Optimise	Loop	Virtualise	Exchange
Information & Communication services, media and telecommunications	Low	Middle	Middle	Low	High	Low
Scientific R&D, other professional, scientific & technical activities	Low	Middle	Middle	Low	High	Low
Education	Low	Middle	Middle	Low	High	Low
Human health and social work activities	Low	Middle	Middle	Low	High	Low
Administrative & support services	Low	Middle	Middle	Low	High	Low
Arts, entertainment and recreation	Low	Middle	Middle	Low	High	Low
Financial and insurance activities	Low	Middle	Middle	Low	High	Low
Legal & accounting head offices, consulting, architecture, TIC	Low	Middle	Middle	Low	High	Low
Distributive trades (incl. wholesale and retail trade)	High	High	Middle	Middle	High	Middle
Manufacture of wood and paper products, and printing	High	High	Middle	Low	High	Low
Public administration and defence; compulsory social security	Low	High	Middle	Middle	High	Middle
Real estate activities	Low	High	Middle	Low	Middle	Low
Manufacturing of textiles, apparel, leather and related products	High	High	Middle	Low	Middle	Middle
Construction	Low	High	Middle	High	Middle	Middle
Manufacturing of transport equipment	Low	High	Middle	High	High	Middle
Manufacturing of furniture	High	High	Middle	Middle	Low	Low
Water supply, waste & remediation	High	Middle	Middle	Low	Low	Middle
Manufacturing of elec. equipment, computer, electronic and optical products	Low	Middle	Middle	High	Middle	Middle
Manufacturing of machinery and equipment	Low	Middle	Middle	High	Middle	Middle
Manufacturing of rubber, plastics, basic and fabricated metal products	Middle	Middle	Middle	High	Low	High
Transportation and storage	Low	Middle	Middle	High	Low	High
Agriculture, forestry and fishing	High	Low	Middle	Low	Low	High
Manufacturing of food, beverages and tobacco products	High	Low	Middle	High	Low	High
Mining and quarrying	Low	Low	Middle	High	Low	High
Electricity, gas, steam and air-conditioning supply	High	Low	Middle	Middle	High	High
Manufacturing of coke, refined petroleum, chemicals products	Low	Low	Middle	Middle	Low	High
Manufacturing of pharmaceuticals, medicinal chemical, botanical	Middle	Low	Middle	Middle	Low	Middle
Accommodation and food service activities	Middle	High	Middle	Middle	Middle	Low

What are the potential dilemmas and limitations of a circular economy?

Benefits versus Dilemmas

- *Our society recognises "ownership", "possession". Is there a place for "disownership"?*
- *Effects of new business models*

http://www.resilience.org/

Limitations of the circular economy

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Circular Economy: The Concept and its Limitations

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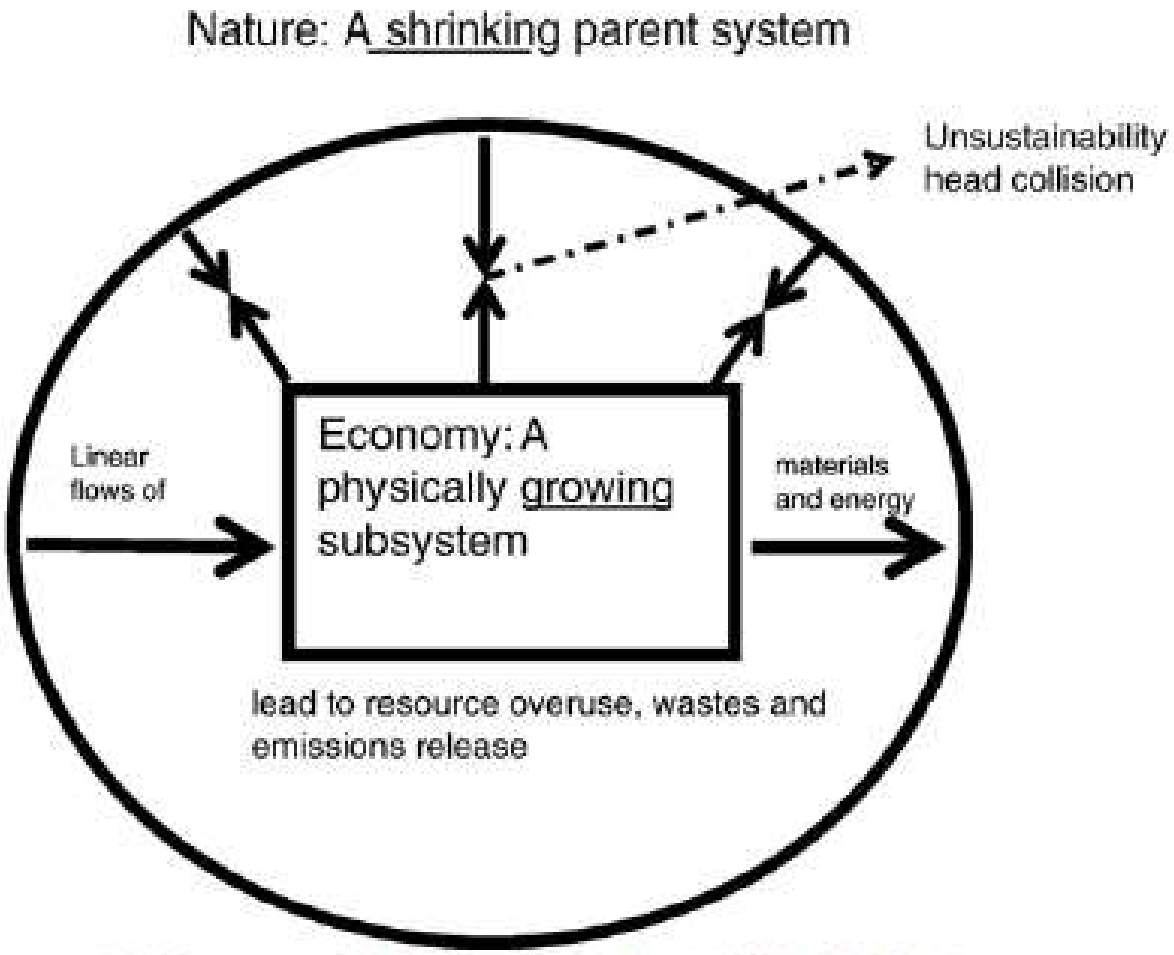
Scientific research
Global net sustainability
Thermodynamics
System boundaries
Six limitations

ABSTRACT

Circular economy (CE) is currently a popular concept promoted by the EU, by several national governments and by many businesses around the world. However, the scientific and research content of the CE concept is superficial and unorganized. CE seems to be a collection of vague and separate ideas from several fields and semi-scientific concepts. The objective of this article is to contribute to the scientific research on CE. First, we will define the concept of CE from the perspective of WCED sustainable development and sustainability science. Second, we will conduct a critical analysis of the concept from the perspective of environmental sustainability. The analysis identifies six challenges, for example those of thermodynamics and system boundaries, that need to be resolved for CE to be able to contribute to global net sustainability. These six challenges also serve as research themes and objectives for scholars interested in making progress in sustainable development through the usage of circular economy. CE is important for its power to attract both the business community and policy-making community to sustainability work, but it needs scientific research to secure that the actual environmental impacts of CE work toward sustainability.

Economy is growing faster than the parent system



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Six limits and challenges for the circular economy concept.

Thermodynamic limits
- Cyclical systems consume resources and create wastes and emissions
System boundary limits
- Spatial: problems are shifted along the product life cycle
- Temporal: short term non-renewables use can build long-term renewable infrastructure
Limits posed by physical scale of the economy
- Rebound effect, Jevon's paradox, boomerang effect
Limits posed by path-dependency and lock-in
- First technologies retain their market position despite of in-efficiency
Limits of governance and management
- Intra-organizational and intra-sectoral management of inter-organizational and inter-sectoral physical flows of materials and energy
Limits of social and cultural definitions
- The concept of waste has a strong influence on its handling, management and utilization
- The concept is culturally and socially constructed
- The concept of waste is always constructed in a certain cultural, social and temporal context and this context is dynamic and changing

Circular Economy Rebound

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Keywords:

circular economy
closed looprecycling
economics
industrial ecology
reuse
rebound effect

Summary

The so-called circular economy—the concept of closing material loops to preserve products, parts, and materials in the industrial system and extract their maximum utility—has recently started gaining momentum. The idea of substituting lower-impact secondary production for environmentally intensive primary production gives the circular economy a strong intuitive environmental appeal. However, proponents of the circular economy have tended to look at the world purely as an engineering system and have overlooked the economic part of the circular *economy*. Recent research has started to question the core of the circular economy—namely, whether closing material and product loops does, in fact, prevent primary production. In this article, we argue that circular economy activities can increase overall production, which can partially or fully offset their benefits. Because there is a strong parallel in this respect to energy efficiency rebound, we have termed this effect "circular economy rebound." Circular economy rebound occurs when circular economy activities, which have lower per-unit-production impacts, also cause increased levels of production, reducing their benefit. We describe the mechanisms that cause circular economy rebound, which include the limited ability of secondary products to substitute for primary products, and price effects. We then offer some potential strategies for avoiding circular economy rebound. However, these strategies are unlikely to be attractive to for-profit firms, so we caution that simply encouraging private firms to find profitable opportunities in the circular economy is likely to cause rebound and lower or eliminate the potential environmental benefits.

Rebound typology

Four typology of rebound, describing the nature and scope of the effect:

(1) **direct rebound**, which is the immediate increase in consumer demand attributed to lower prices from increased efficiency;

(2) **secondary effects**, which are the increases in demand of other goods attributed to consumers spending some of the energy savings elsewhere;

(3) **economy-wide effects**, which refer to larger, largely unpredictable effects that increased efficiency has on prices and demand of other goods; and

(4) **transformational effects**, referring to the potential of energy efficiency increases to change consumer preferences, societal institutions, technological advances, regulation, or other large-scale effects.

Originally, rebound referred to production-side efficiency improvements that lowered production costs and therefore prices, but has been expanded to include efficiency upgrades by the end-use consumer.

		Change in production impacts	
		$e_r < e_p$	$e_r > e_p$
Change in production quantities	$\Delta Prod > 0$	**Q1: Circular Economy Rebound** Video on demand, recycling, service-based floor covering, recoverable rocketry, refurbished phones	**Q2: Higher net impact**
	$\Delta Prod \leq 0$	**Q4: Lower net impact** Smartphone parking meter Product lifetime extension (*ceteris paribus*)	**Q3: Potential shortfall** Reusable bottle Reusable grocery bag

Figure 2 Framework of potential environmental outcomes of circular economy activities based on changes production quantities and differences in production impacts. Activities in Q1 represent circular economy rebound.

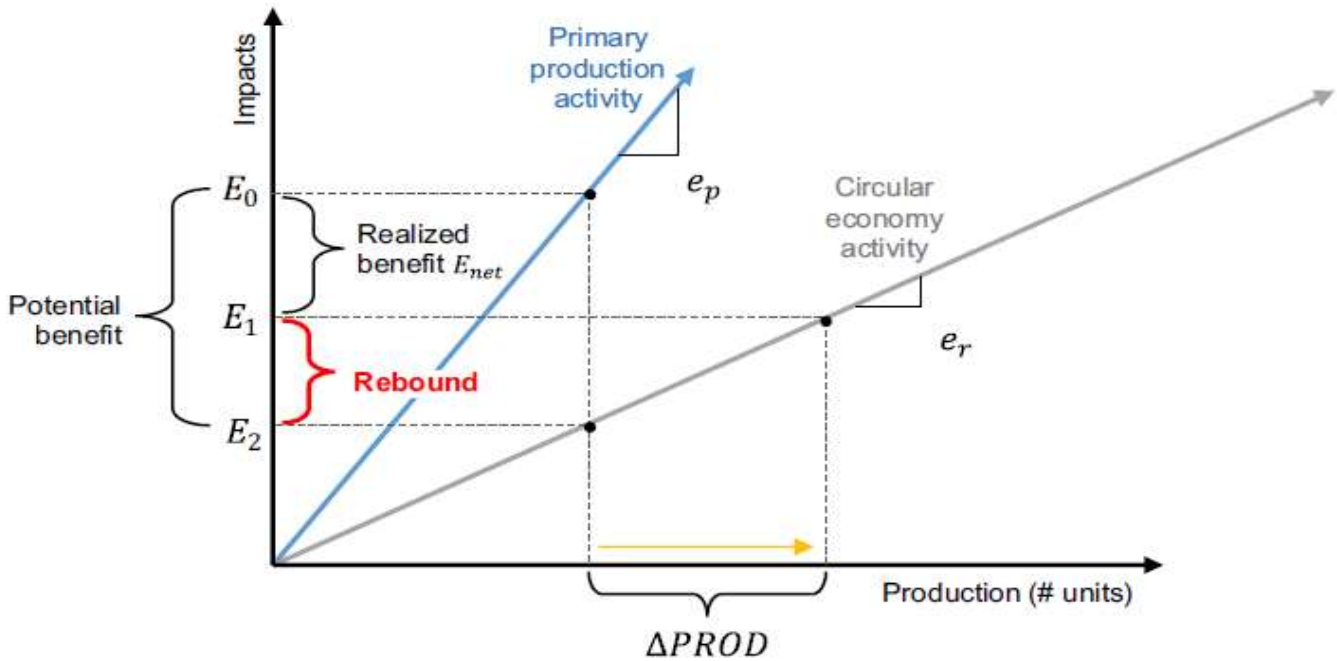

Figure 3 Circular economy rebound attributed to increased production. If no rebound occurs, the potential benefit is realized and impacts fall from E_0 to E_2. However, $\Delta Prod > 0$ reduces the net benefit by $E_1 - E_2$, termed circular economy rebound. If rebound is sufficiently large, the benefit is eliminated entirely (i.e., $E_0 - E_2 = 0$), or backfire can occur (i.e., $E_0 - E_2 < 0$).

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Assessment of the potential of a circular economy in open economies – Case of Belgium

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ABSTRACT

Interest from the research and policy community in the circular economy (CE) is growing. This research describes how the potential for a circular economy in open economies can be estimated by using different assessment methods. Methods and indicators have been selected that have a relevance for one or more of the public policy objectives for circular economy: Openness Index, economic structure, Balassa Index, value chain analysis, substitution potential of Sustainable Materials Management (SMM) strategies, waste treatment scenarios based on physical and hybrid Input-Output (IO) analysis. These methods differ in scope and degrees of complexity and are used at different assessment levels. The potential for a circular economy in this paper is assessed by evaluating the contribution to the public policy objectives for CE: resource efficiency, reduction of dependency on materials, competitiveness, creation of domestic jobs, reduced Greenhouse Gas (GHG) emissions. Results obtained by these methods are shown for Belgium and, in some cases, compared to the results of other countries to illustrate the differences between economies. CE activities (in response to public policy objectives) will enhance the ongoing trend of reducing the share of primary sectors in economies. The openness of an economy is expressed as the ratio of sum of import and export and Gross Domestic Product (GDP). Imported products add to the potential of domestic closed-loop circular initiatives like re-use, repair, remanufacture, recycling, but this will require knowledge about composition and spare part availability. Exported products are no longer available for these domestic CE initiatives, reducing the domestic potential for CE and the domestic export activity is vulnerable to CE activities abroad. Especially the increasing geographical distance in trade complicates the practical and legal barriers to close the loop. In open economies, both global and domestic substitution effects due to new circular economy policy initiatives are important to consider.

Circular economy in open economies

- The paper shows that an open economy should take its trade relations with other countries into account when developing a domestic Circular Economy policy and assessing the impacts from Circular Economy activities either domestic or abroad.

- For open economies, new Circular Economy activities (domestic or abroad) will create **winners and losers** both domestically and abroad.

- To make a better assessment of the macro Circular Economy potential it is recommended to develop more dynamic models, avoid double counting and can take rebound effects into account.

- A generic challenge remains to accurately estimate the new Circular Economy activity (investments, running costs, competitivity, jobs generated, GHG emissions generated), whereas it is easier to estimate what existing economic activity may be substituted.

SUSTAINABLE DEVELOPMENT GOALS

The Relevance of Circular Economy Practices to the Sustainable Development Goals

Patrick Schroeder,[1] *Kartika Anggraeni*,[2] *and Uwe Weber*[2]

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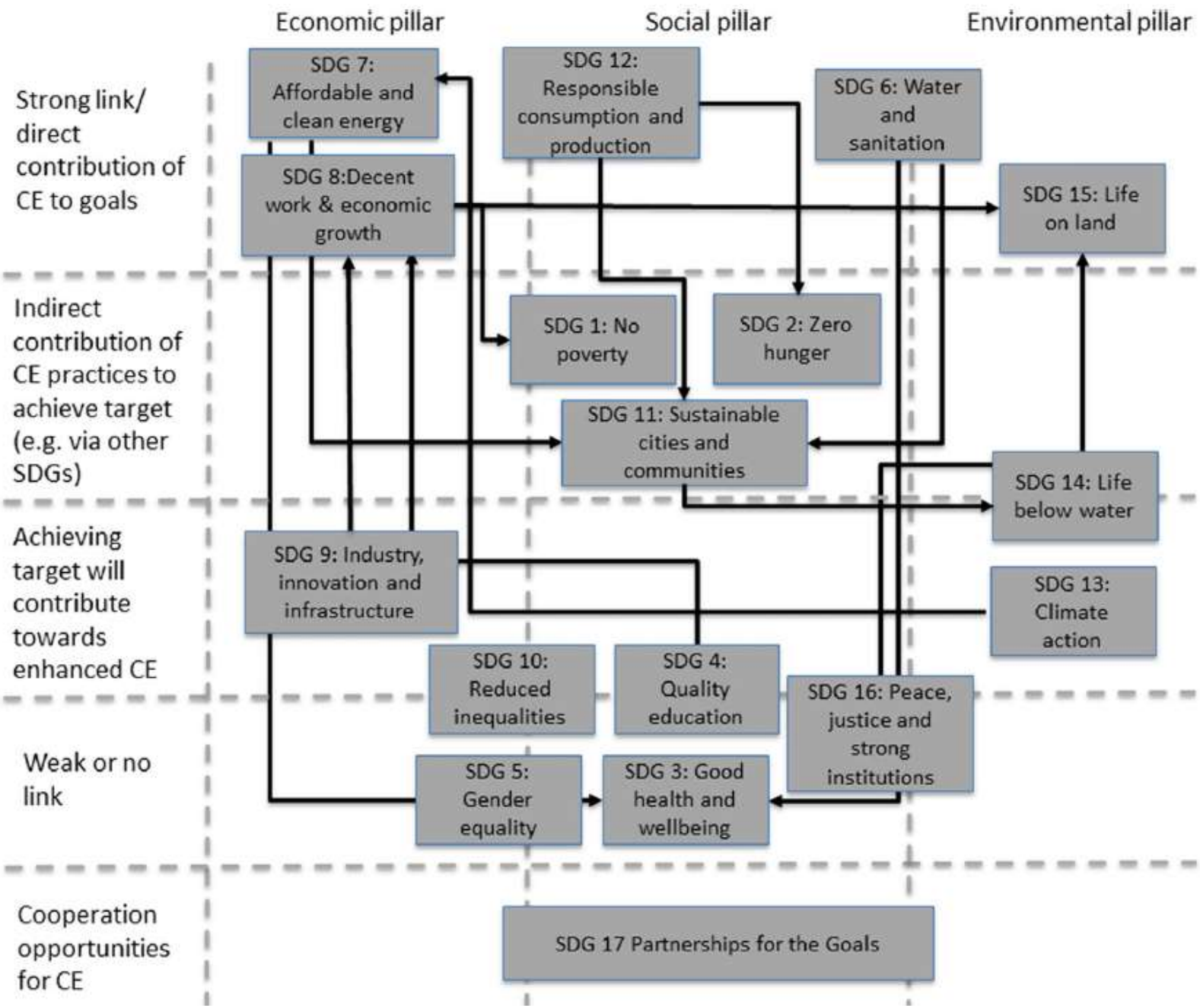
Keywords:

circular economy
developing countries
industrial ecology
recycling
SDG implementation
sustainable development goals

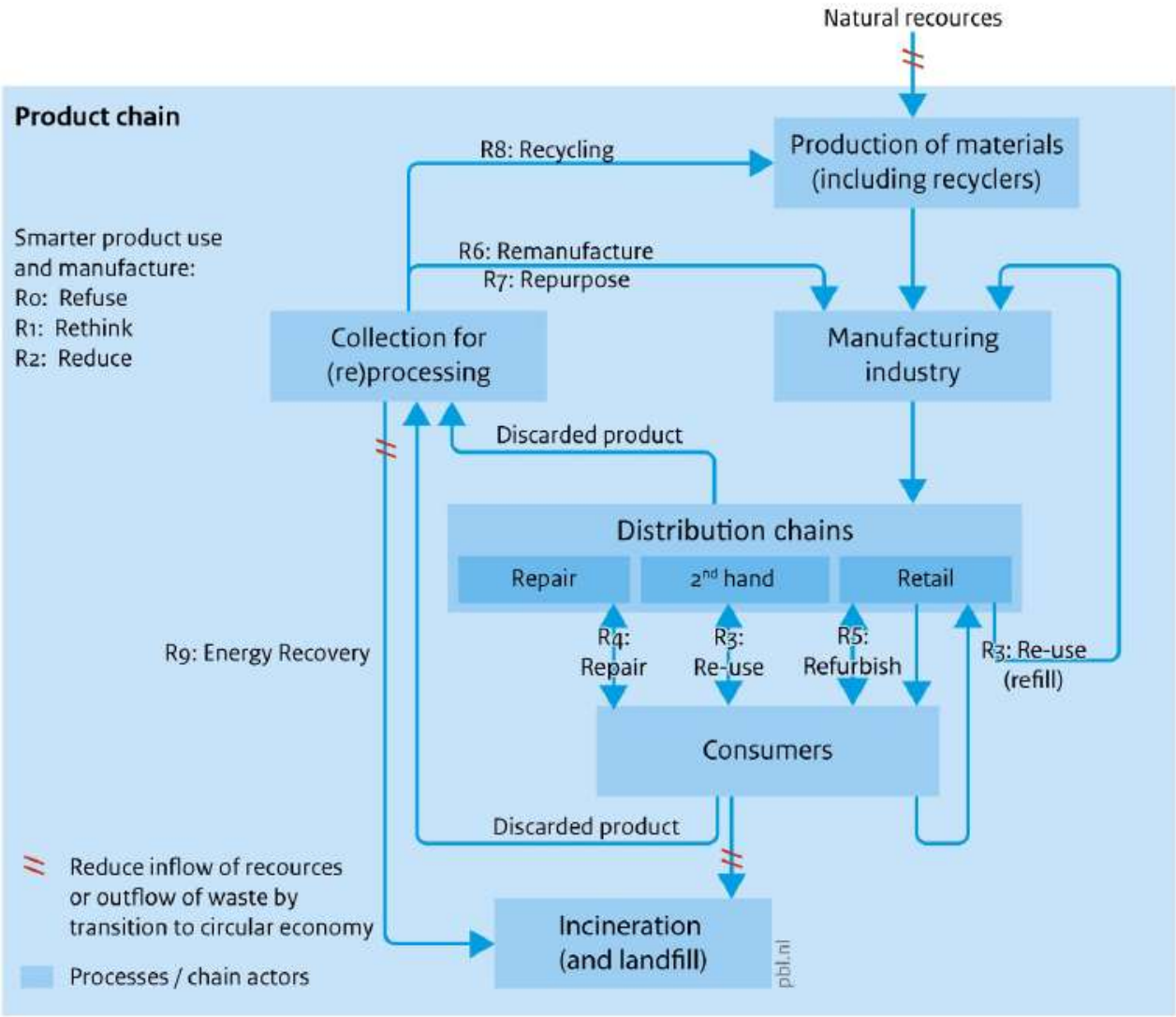
Supporting information is linked to this article on the *JIE* website

Summary

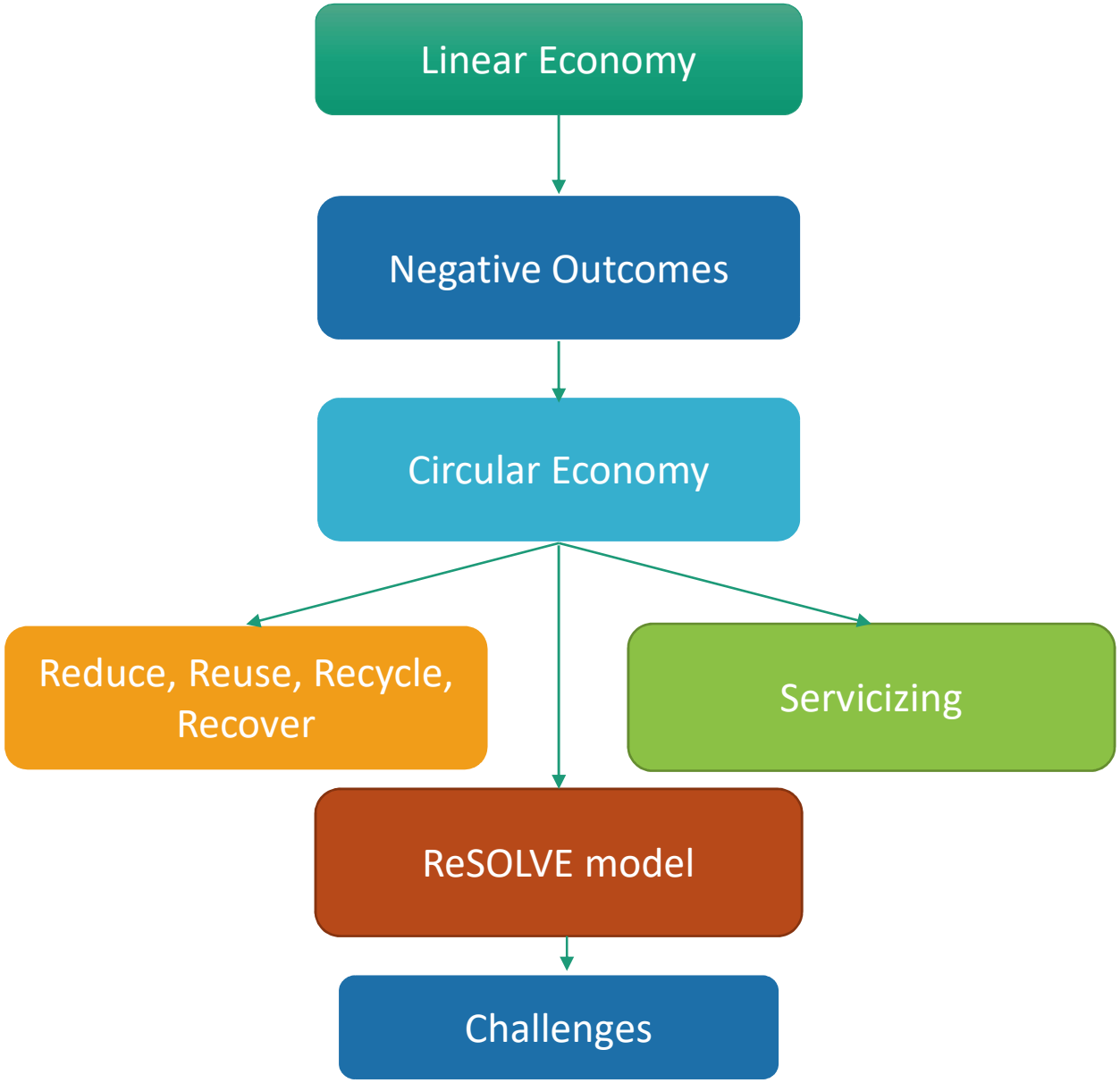
This paper identifies the extent to which circular economy (CE) practices are relevant for the implementation of the Sustainable Development Goals (SDGs). The results of a literature review and a matching exercise to determine the relationship between CE practices and SDG targets show that CE practices, potentially, can contribute directly to achieving a significant number of SDG targets. The strongest relationships exist between CE practices and the targets of SDG 6 (Clean Water and Sanitation), SDG 7 (Affordable and Clean Energy), SDG 8 (Decent Work and Economic Growth), SDG 12 (Responsible Consumption and Production), and SDG 15 (Life on Land). The paper also explores synergies that can be created through CE practices among several of the SDG targets. Furthermore, it identifies several potential trade-offs between targets for decent work, safe working environments, human health and current CE practices relating to recycling of municipal waste, e-waste and wastewater, and provides suggestions how these can be overcome. The paper concludes that CE practices can be applied as a "toolbox" and specific implementation approaches for achieving a sizeable number of SDG targets. Further empirical research is necessary to determine which specific types of partnerships and means of implementation are required to apply CE practices in the SDG context.


Economic pillar
Social pillar
Environmental pillar
Strong link/ direct contribution of CE to goals
Indirect contribution of CE practices to achieve target (e.g. via other SDGs)
Achieving target will contribute towards enhanced CE
Weak or no link
Cooperation opportunities for CE
SDG 7: Affordable and clean energy
SDG 12: Responsible consumption and production
SDG 6: Water and sanitation
SDG 8:Decent work & economic growth
SDG 15: Life on land
SDG 1: No poverty
SDG 2: Zero hunger
SDG 11: Sustainable cities and communities
SDG 14: Life below water
SDG 9: Industry, innovation and infrastructure
SDG 13: Climate action
SDG 10: Reduced inequalities
SDG 4: Quality education
SDG 16: Peace, justice and strong institutions
SDG 5: Gender equality
SDG 3: Good health and wellbeing
SDG 17 Partnerships for the Goals

Who is in charge?
We need circularity strategies



Map of key-concepts



Which statement do you identify with the most?

Planned obsolescence

"The consequences of planned obsolescence are restricting for the users, not enabling them to use the product optimally. Therefore, planned obsolescence does not fit in a circular economy."

Or

"If planned obsolescence became defined use periods, it empowers companies to keep products in more effective loops, in a more manageable way. Therefore, these defined use periods fit in a circular economy."

! *Planned obsolescence means that a product is designed deliberately with a limited useful lifespan*

Access over ownership

"First priority in access models are the rights of the user."

Or

"First priority in access models are the rights of the owner."

! *What is the balance between rights and obligations when it comes to the purchase of access to products as services?*

A circular economy as part of a worldview

Should we see a circular economy as a shift in how we view the world? In other words: part of a worldview?

Or

Can a circular economy operate independently from how we view the world?

The social dimensions

"Having a circular economy work on all levels in society is the most important for me."

Or

"The first priority of a circular economy is economic growth and prosperity which also spins off social and environmental benefits."

Efficiency and effectiveness

"A circular economy only means an economy that slows down resource consumption, because there is always material leakage."

Or

"A circular economy is a regenerative economy that behaves like a forest: to feed itself, it feeds the individual tree which, in turn, feeds the forest."

Closing the loop

"The main aim of a circular economy is about recovering material and making new use out of it."

Or

"The main aim of a circular economy is to rebuild natural and social capital."

Logistics in a circular economy

"I believe that humanity will be able to redesign global logistics in a way that generates much less impact."

Or

"I believe that true answers lie in localising production and eliminating the increasing need for transportation."

! *The cycling of products, components and materials could cause an increase in transport and other logistics*

Design from waste(*)

(*) regarding design initiatives that use waste materials and transform these into new designer products

"Designs from waste fit in a circular economy because they slow down the rate of waste creation."

Or

"Designs from waste do not fit in a circular economy because they are ultimately downcycled."

The role of digital technology

"Digital technology re-energises business models around the recovery of materials and promotes products of service."

Or

"Digital technology is boosting the efficiency of materials and allows the production of more with less."

Recycling

"Increasing recycling is a high priority in any circular economy."

Or

"Recycling is less important than maintaining products and components at a high value, at all times."

References/Suggested reading

Circular economy

A new relationship with our goods and materials would save resources and energy and create local jobs, explains Walter R. Stahel.

facture, upgrades and retrofits; and those that turn old goods into as-new resources by recycling the materials. People — of all ages and skills — are central to the model. Ownership gives way to stewardship; consumers become users and creators[3]. The remanufacturing and repair of old goods, buildings and infrastructure creates skilled jobs in local workshops. The experiences of

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The relation between industrial and ecological systems

Barry Commoner

Center for the Biology of Natural Systems, Queens College, CUNY, Flushing, NY 11367, USA

References/Suggested reading

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Circular Economy: The Concept and its Limitations

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RESEARCH AND ANALYSIS

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RESEARCH AND ANALYSIS

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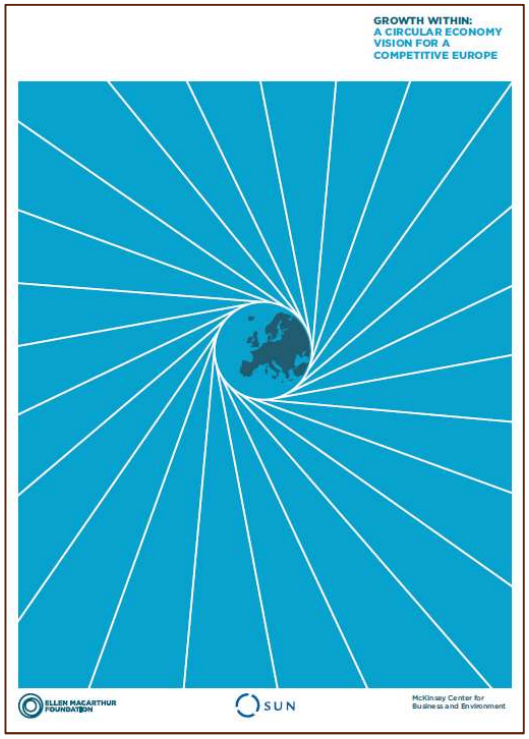

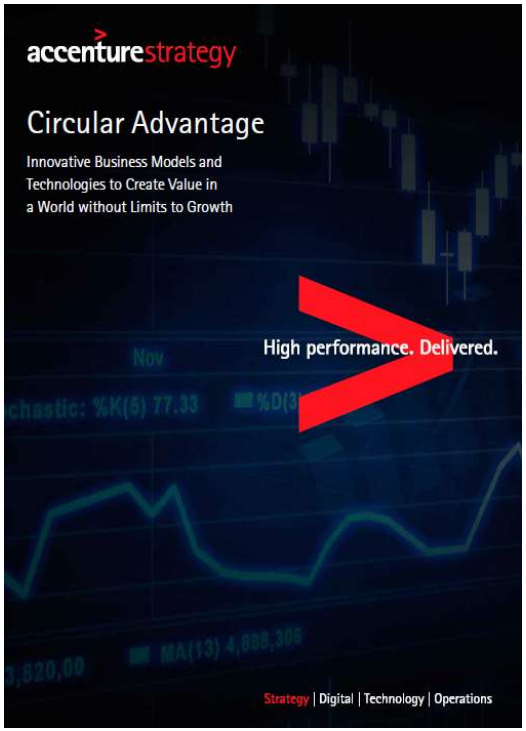

Advances in Cleaner Production Network

Boosting Knowledge Exchange Seeking for Sustainability

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