TOO4TO

SUSTAINABLE MANAGEMENT: TOOLS FOR TOMORROW

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TOO4TO MODULE

Circular Economy, Economics & Sustainability, Sustainable Production

Part 3: Shared Resources and Cooperation

PART 3 CONTENTS

SHARING ECONOMY

Background; Definition; Typical elements; Business model; Positive and Negative Impacts

SHARING ECONOMY: BACKGROUND

- The roots of sharing economy can be traced back to a primitive economy where goods were bartered.
- **Collaborative consumption** was coined by Felson and Spaeth in 1978.
- The rise of the Internet in the 1990s initiated the establishment of websites such as Amazon and eBay where goods were recirculated.
- Sharing economy platforms expanded rapidly after the Millennium into areas such as car rental (Zipcar), bike rental (Call a bike), and accommodation (CouchSurfing).
- The term **sharing economy** was first used in 2007 by Lawrence Lessig at Harvard Law School.
- The great depression stimulated the establishment of platforms such as Airbnb and Uber.
- Sharing economy is used interchangeably with the term **collaborative economy.**

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SHARING ECONOMY: DEFINITION

“[**Sharing economy** is] an economic system in which people can share possessions, services, etc., usually by means of the internet” – Oxford dictionary (link)

“… the term **"collaborative economy“** refers to business models where activities are facilitated by collaborative platforms that create an open marketplace for the temporary usage of goods or services often provided by private individuals. The collaborative economy involves three categories of actors: (i) service providers who share assets, resources, time and/or skills — these can be private individuals offering services on an occasional basis (‘peers’) or service providers acting in their professional capacity ("professional services providers"); (ii) users of these; and (iii) intermediaries that connect —via an online platform —providers with users and that facilitate transactions between them (‘collaborative platforms’). Collaborative economy transactions generally do not involve a change of ownership and can be carried out for profit or not-for-profit” – European Commission (2016, link)

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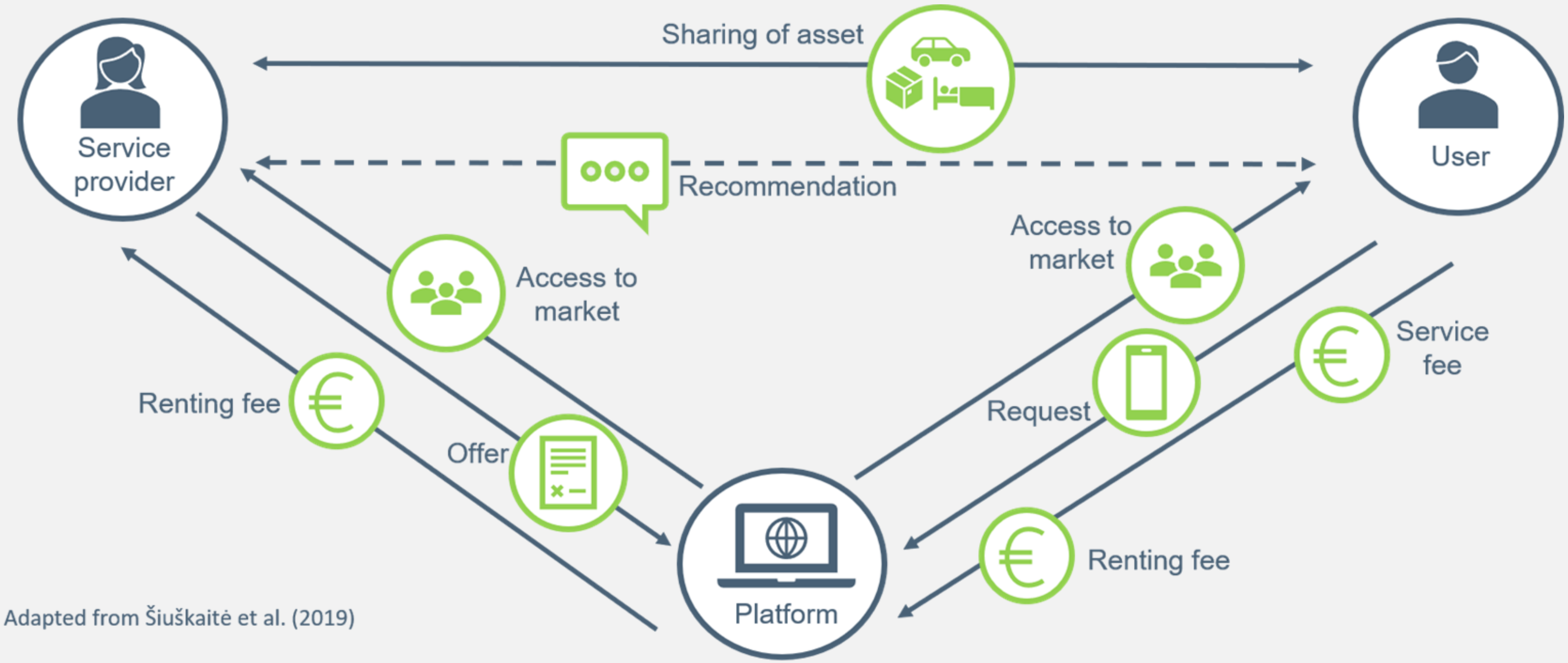
SHARING ECONOMY: TYPICAL ELEMENTS

- Platforms for collaboration, bringing together service providers and users seeking sustainable consumption.
- Under-utilised resources is a feature of nearly all sharing economy initiatives that vary from physical objects such as premises, vehicles, and household appliances to intangible assets like professional services.
- Peer-to-peer (P2P) interaction, which usually takes place via the Internet or mobile apps.
- Collaborative governance like an inclusion of consumers in value creation, decision making and benefits.
- Mission-driven: usually not only profit-driven but promote various social and environmental goals.
- Alternative funding, such as crowdsourcing, plays a role in many sharing economy based initiatives.
- Technology reliance: ICTs facilitate more efficient transactions between peers.

Munoz & Cohen (2017 in Šiuškaitė et al. 2019)

SHARING ECONOMY: BUSINESS MODEL (1/3)



Adapted from Šiuškaitė et al. (2019)

SHARING ECONOMY: BUSINESS MODEL (2/3)

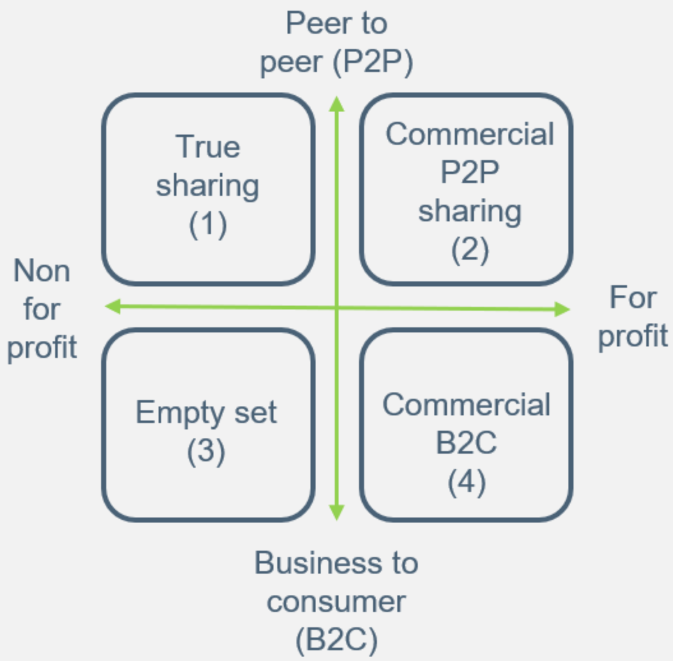
Sharing platforms can be mapped on a simple 2-dimensional matrix where **market orientation** dimension classifies platforms into for- and non-for-profit activities and **market structure** dimension into B2C versus P2P axis, forming 4 quadrants:

(1) True sharing platforms satisfy some societal needs but do not seek profit maximization. Examples include time banks where a community or network members exchange skills based on individual strengths or needs.

(2) Commercial P2P sharing platforms connect individual persons willing to earn by employing their assets like in Airbnb and Uber.

(3) Empty set is an oxymoron as businesses are by definition for-profit, although they may also support social or other philanthropic causes.

(4) Commercial B2C quadrant consists of commercial enterprises that provide various services for a certain fee. They are referred to as sharing platforms but, in reality, are no different from other online B2C activities and are regulated as such.



Adapted from Codagnone & Martens (2016)

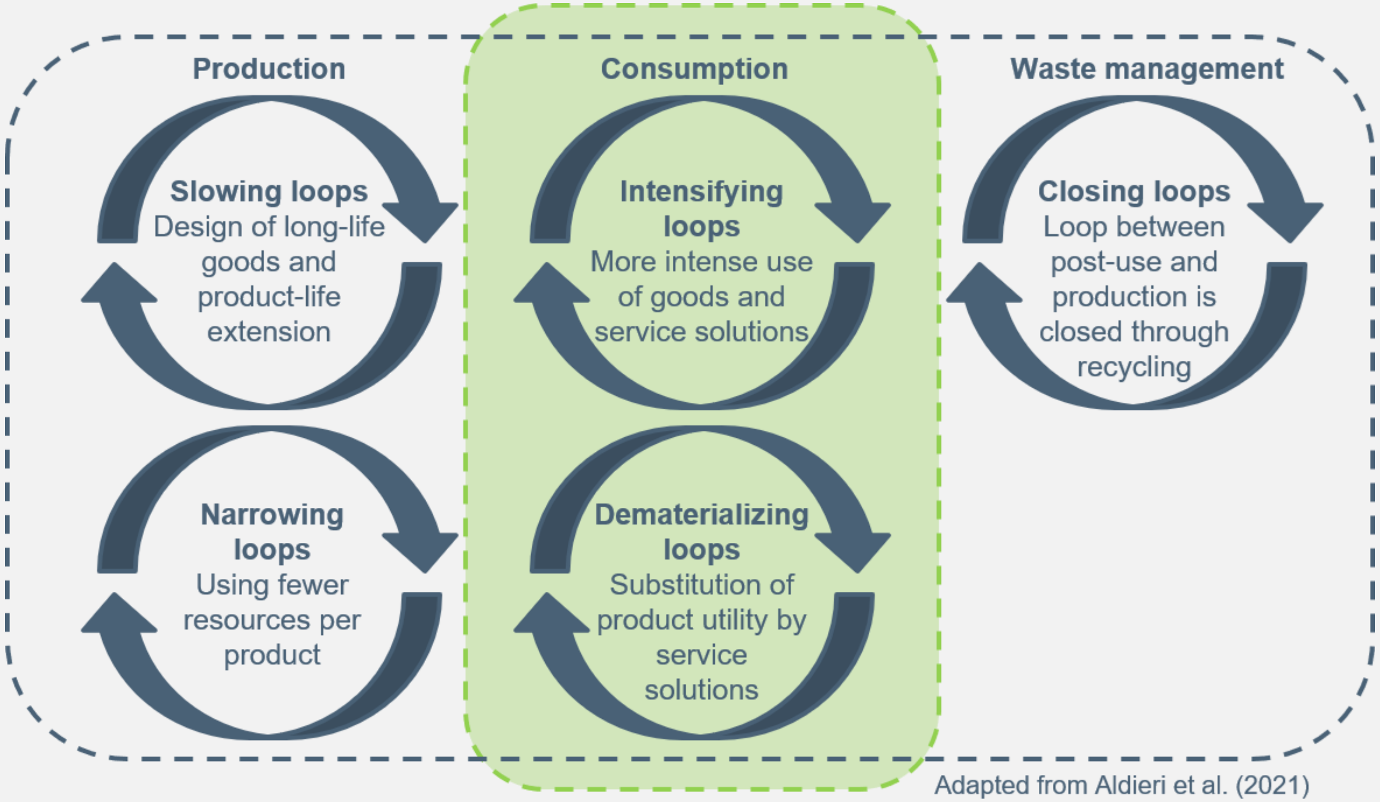
SHARING ECONOMY: BUSINESS MODEL (3/3)

Where does the sharing business models overlap with circular business models?

Production phase and the waste management areas identify actions on loops linked to circular business models.

Circular and sharing business models overlap in the central area that concerns consumption and dematerialising loops.

(Aldieri et al., 2021)



Adapted from Aldieri et al. (2021)

SHARING ECONOMY: POSITIVE IMPACTS

- **Environmental impacts** include more sustainable forms of consumption that enable more efficient use of underutilised resources; Lower volumes of consumption and waste, and; Reduced ecological footprint.
- **Social impacts** include social bonding and collaboration: Rebirth of communities; Development of social and communicative skills and; Increased social inclusion and opportunities for social mobility.
- **Economical impacts** include a business model that can decentralises and disrupt the traditional ways of doing business; Additional income; Lower prices and wider choices of goods and services; Development of personal innovation and entrepreneurship; Flexible working arrangements.

(Šiuškaitė et al. 2019)

SHARING ECONOMY: NEGATIVE IMPACTS

- **The rebound effect,** where the increased choice may change consumer behaviour that promotes even greater consumption.
- **Economic activities are prioritised,** when initiatives are only nominally declared socially or environmentally friendly.
- **Danger to employees** rights exist if some businesses fail to provide stable and good working conditions; When there are problems with working licenses, employee accountability, and lack of transparency, and low wages.

Verboven and Vanherck (in Šiuškaitė et al. 2019)

REVERSE LOGISTICS

Background; Definition; Supply chain; Why, What and How?

REVERSE LOGISTICS: BACKGROUND

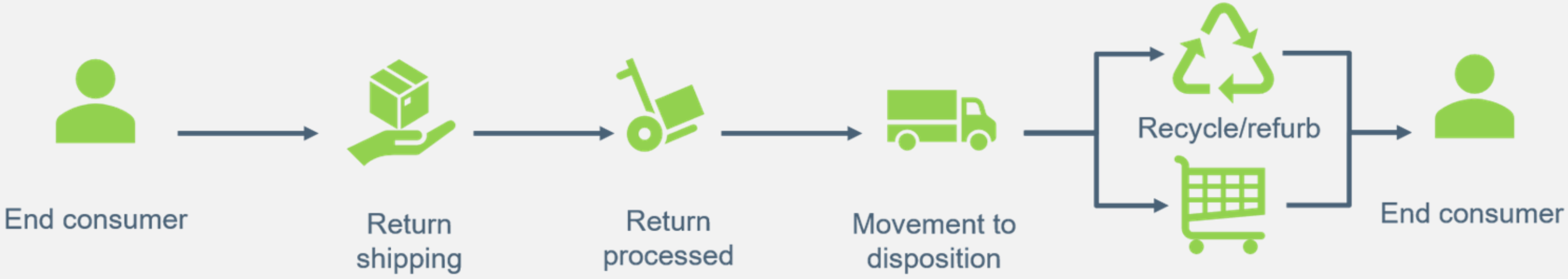
- Material recapture or (partial) reuse of items is a very old practice, motivated by a scarcity of resources.
- The emergence of cheap materials and advanced technology resulted in Western societies' mass consumption and disposal of materials. Societies started paying attention to limits of growth after the 1970s, which sprouted terms like recycling, reuse, resource reduction etc.
- Since the mid-1990s, governments began imposing legal enforcement on material recovery and proper disposal, especially in Europe. Also, landfill tolls became more expensive in the US, along with restrictions on cross-state transportation of waste.
- Recovery activities are not only made in the name of sustainability but also for profitability and value-creation (de Brito & Dekker, 2002).

REVERSE LOGISTICS: DEFINITION

The Council of Logistics Management published the first known definition of Reverse Logistics in the early 1990s:

"…the term often used to refer to the role of logistics in recycling, waste disposal, and management of hazardous materials; a broader perspective includes all relating to logistics activities carried out in source reduction, recycling, substitution, reuse of materials and disposal." (in Brito & Dekker, 2002)

In simple terms, reverse logistics is a type of supply chain management that involves moving goods from customers back to the sellers or manufacturers. Processes such as returns or recycling require reverse logistics



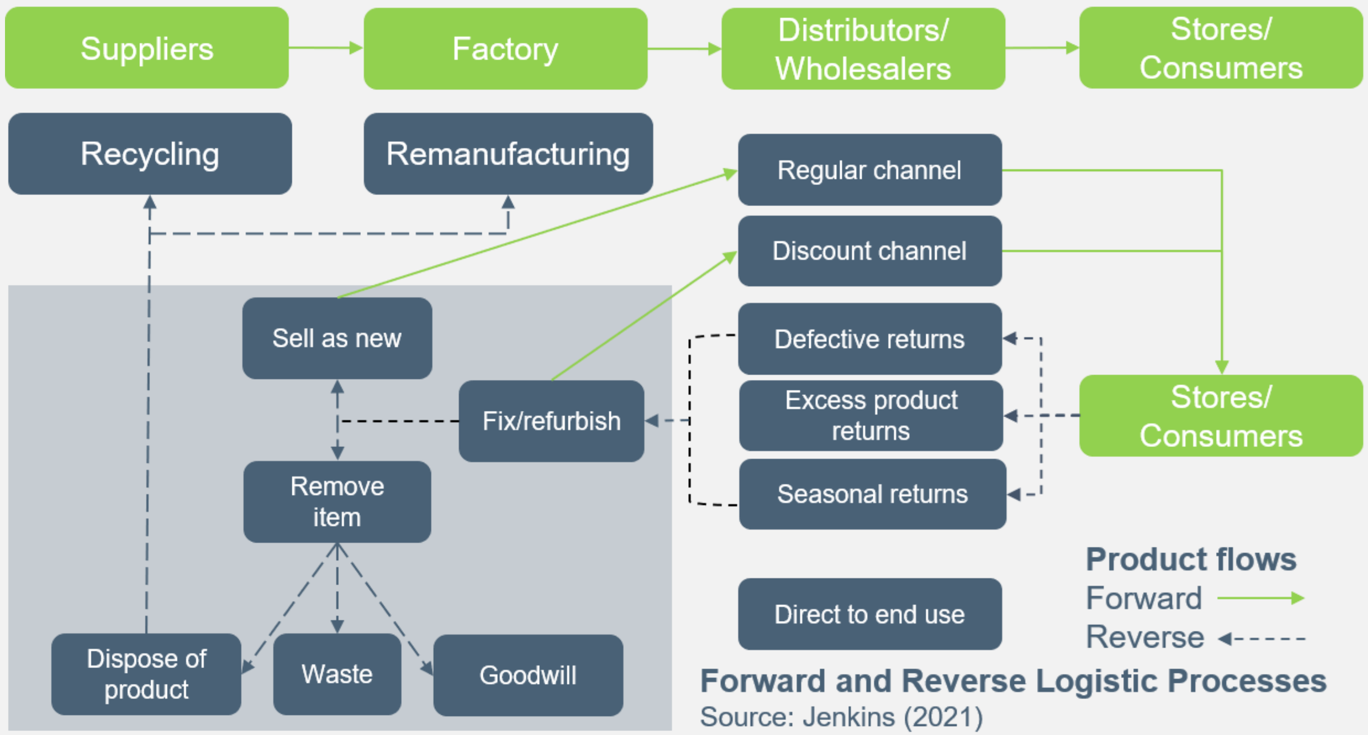
Adapted from Jenkins (2021)

REVERSE LOGISTICS: SUPPLY CHAIN

The European Working Group on Reverse Logistics (1998-) incorporates more flows into the definition of **reverse logistics:**

"the process of planning, implementing and controlling flows of raw materials, in process inventory, and finished goods, from a manufacturing, distribution or use point to a point of recovery or point of proper disposal".

Forward logistics, which refers to activities on "virgin" materials and products is often incorporated into the process of reverse logistics: e.g. new glass can be made using a blend of old glass. (de Brito & Dekker, 2002).



Forward and Reverse Logistic Processes
Source: Jenkins (2021)

REVERSE LOGISTICS: WHY? (1/3)

Economics, legislation, and **extended responsibility** are driving forces for companies and other organisations to be involved in reverse logistics.

Economics include *direct benefits* or *indirect benefits:*

- Indirect benefits concern abating costs, dwindling of materials, obtaining spare parts.
- Indirect costs concern improved image through marketing, strategic move in the face of impending legislation, or competitive advantage by preventing competitors from getting certain technology or entering a certain market.

Legislation includes any jurisdiction that requires a company to recover its products or accept them back (for example, packaging recycling quotas in Europe).

Extended responsibility stands for a set of values or principles that urge an organisation to become responsibly engaged with reverse logistics. (de Brito & Dekker, 2002)

REVERSE LOGISTICS: WHY? (2/3)

Return reasons can be divided into **manufacturing returns**, **distribution returns**, **customer returns**, **end-of-use returns** and **end-of-life returns.**

Manufacturing returns refer to all those cases where components or products have to be recovered in the production phase because of one or more of the following reasons: *material surplus*; *quality-control returns*; *production leftovers.*

Distribution returns are initiated by a supply chain actor because of *product recalls*, *commercial returns*, *stock adjustment* or *functional returns*:

- *Product recalls* are initiated by the manufacturer or supplier for health & safety reasons.
- *Commercial returns* refer to, for example, unsold items or wrong/damaged delivery, where the buyer has a contractual option to return products to the seller.
- *Stock adjustments* concern situations where an actor in the chain redistributes stock, for instance, among warehouses or shops.
- *Functional returns* concern products whose function makes them go back and forward in the chain, such as pallets. (de Brito & Dekker, 2002)

REVERSE LOGISTICS: WHY? (3/3)

Customer returns include *reimbursement guarantees* and *warranty returns:*

- *Reimbursement guarantees* refer to those cases where an unsatisfied customer can change their mind.
- *Warranty returns* refer to those cases where products do not meet the promised quality standard, which in some cases are subject to repair or maintenance.

End-of-use returns, such as bottle return or leasing cases, occur when users have the option to return products at some stage.

End-of-life returns are made at the end of the products' economic or physical life. Products may be returned to the original manufacturer due to legal products *take back* obligations or to another company for value-added-recovery. Returns often require an active role by the customers, which can be stimulated through incentives. (de Brito & Dekker, 2002)

REVERSE LOGISTICS: WHAT? (1/3)

Typical characteristics of returned products can be classified by their **composition**, **use patterns** and **deterioration**.

Product composition characteristics include the *ease of disassembly, homogeneity of constituting elements, presence of hazardous materials,* and *ease of transportation.* These aspects affect the economics of reverse logistics and should be considered when designing products.

- *Ease of disassembly* occurs, for example, when computer chips are removed from old computers and reused.
- *Homogeneity of constituting elements* refers to situations where one wants to obtain similar components in order to use them as feedstock for new materials.
- *Presence of hazardous materials* occurs, for example, in situations where batteries with toxic materials are removed from appliances before the appliances can be recycled.
- *Ease of transportation* takes place usually at local level. Sometimes collection of old and distribution of new items like reusable soft drink bottles can be combined, which lowers transportation cost. (de Brito & Dekker, 2002)

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REVERSE LOGISTICS: WHAT? (2/3)

Product use pattern refers to location of use and intensity and duration of use:

- Location of use determines how difficult the collection is. The more locations the more difficult the collection is.
- Intensity and duration: It makes a difference is a product is used constantly or occasionally for a short of long time. For example, pallets are reused frequently but only a short time.

Deterioration determines whether reusability is wholly or partly feasible which is why the following characteristics should be considered: *intrinsic deterioration, reparability, homogeneity of deterioration* and *economic deterioration*

- *Intrinsic deterioration:* should products be used during their use, like gasoline, or should they age fast, like batteries, their reuse is limited, and recycling may be a better option.
- *Reparability*: can products be repaired easily, or is recycling economically more feasible?
- *Homogeneity of deterioration*: if product components do not become old equally, the product may be a good candidate for remanufacturing or parts recovery.
- *Economic deterioration*: products like computers become outdated, offering the potential for reuse or parts recovery. (de Brito & Dekker, 2002)

REVERSE LOGISTICS: WHAT? (3/3)

Examples of product types that are applicable in the context of reverse logistics include but are not limited to the following:

- **Food:** leftover food used as animal feedstock.
- **Civil objects**: buildings and bridges can, for example, be renovated or refurbished, and when obsolete, they can be separated and recycled.
- **Industrial goods:** engines can be refurbished or remanufactured or leased.
- **Minerals, oils and chemicals:** cooking oil can be collected for biofuel production or gasoline vapour can be recovered.
- **Consumer goods:** shorter life cycles of products raise environmental concerns, which is why attention should be paid to recyclability. Remanufacturing may occur less if consumers prefer new products. Repairs have become more expensive due to increased labour costs. (de Brito & Dekker, 2002)

REVERSE LOGISTICS: HOW? (1/2)

How do reverse logistics works in practice can be described by the **actors** involved in the processes, **types of recovery,** and **reverse logistic processes**:

Actors in the reverse logistics process can be differentiated into *returners, receivers and collectors/processors:*

- *Returners* can be any actors in the process, including customers;
- *Receivers* are suppliers, manufacturers, wholesalers, and retailers;
- *Receivers* can be independent intermediaries, specific recovery companies, reverse logistics service providers, municipalities organising the waste collection, and public-private foundations taking care of recovery.

(de Brito & Dekker, 2002)

REVERSE LOGISTICS: HOW? (2/2)

Types of recovery can be divided broadly into *product recovery*, *component recovery*, *material recovery* and *energy recovery*:

- Product recovery concerns a reuse in the original or secondary market.
- Component recovery concerns product that are dismantled and parts are remanufactured into same products or manufactured into different products.
- Material recovery concerns materials deriving from products destined to recycling, which are sorted out and reused like paper pulp and glass.
- Energy recovery occurs, for instance, when solid waste is burned.

Reverse logistic processes can be broadly divided into four stages:

1) Collection, where products from the customer/user are brought to the point of recovery;

2) Product is inspected and sorted according to the chosen recovery type (direct recovery or processing);

3) Direct recovery embraces one of the following processes: reuse, resale, and redistribution;

4) (Re)processing occurs by repairing, refurbishing, remanufacturing, retrieval, recycling (which can also occur in combination).

(de Brito & Dekker, 2002)

EXTENDED PRODUCER RESPONSIBILITY (EPR)

Background and definition; Policy instruments

EPR: BACKGROUND & DEFINITION

- **Extended producer responsibility (EPR)** for the end-of-life management of products emerged in the late 1980s from municipalities challenges in managing the growing volume of waste. ERP policy sought to shift the burden from municipalities and taxpayers to producers.
- As a result of the exchange of good practices, research and policy dialogue, OECD published a Guidance Manual on EPRs in 2001 to implement EPR policies in Member countries; since then, many EPR systems have emerged within OECD emerging economies.
- **OECD defines EPR:** "as an environmental policy approach in which a producer's responsibility for a product is extended to the post-consumer stage of a product's life cycle". OECD (2016).

Short video: Reverse Logistics in Circular Economy

In the EU, EPR is mandatory within the context of waste electrical and electronic equipment (WEEE), Batteries, and end-of-life vehicles (ELV) Directives.

Packaging Directive also indirectly invokes EPR, requiring member states to take necessary measures to ensure systems are set up for waste collection and recycling.

Source: EC (2019, link)

EPR: POLICY INSTRUMENTS (1/3)

Economic and market-based instruments provide financial incentives to implement EPR policy and consist of deposit-refunds, advanced disposal fees, material taxes, and upstream combination tax/subsidies:

- *Deposit-refund* is an initial deposit made at purchase and refunded when returned);
- *Advanced disposal fees* are levied by public or private entities on certain products at purchase based on the cost of collection and treatment;
- *Material taxes* is a way to create incentives to use recycled or less toxic materials by taxing on virgin materials or materials containing toxic or difficult to recycle;
- *Upstream combination tax/subsidy* is a tax paid by producers used to subsidy waste treatment, and simultaneously provide an incentive to alter material input/product design and a financial mechanism to support recycling and treatment.

Source: OECD (2016, link)

EPR: POLICY INSTRUMENTS (2/3)

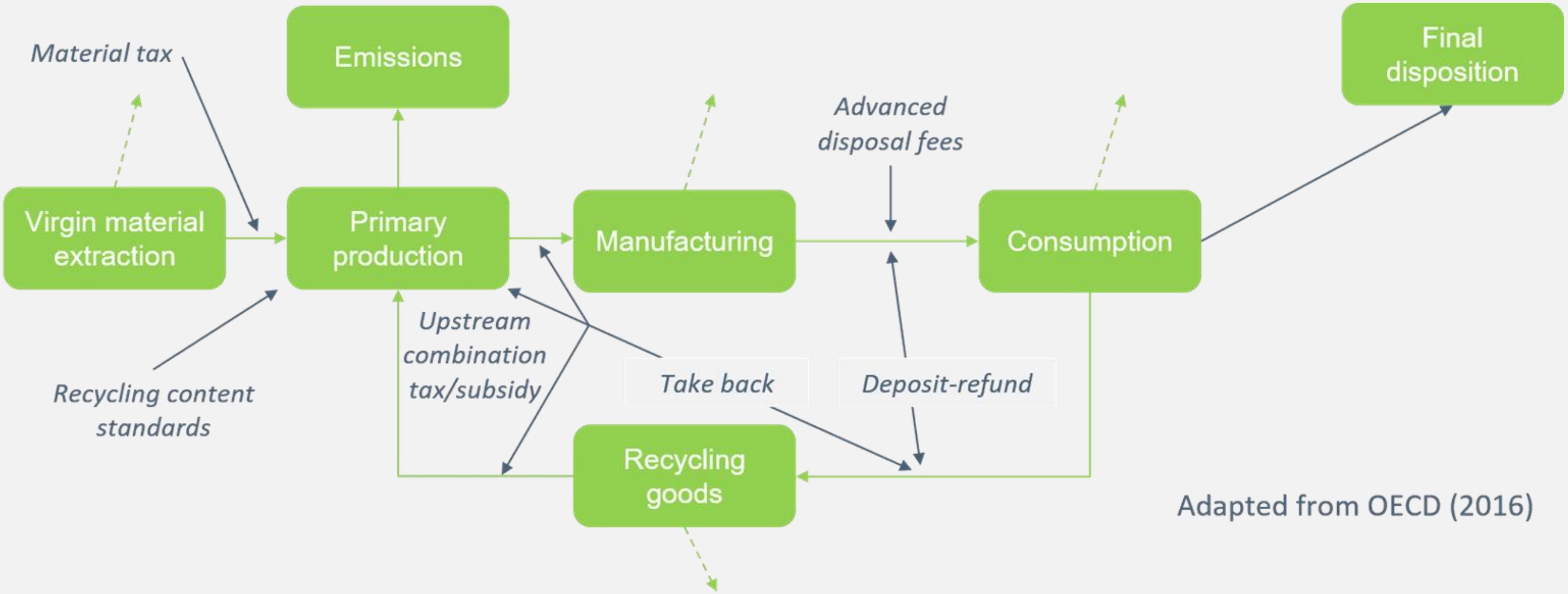
Take back requirements involve assigning responsibility to producers or retailers for the end-of-life management of products, for example, by establishing a voluntary or mandatory recycling targets for products/materials. Consumers can also be provided with incentives to return products.

Regulations and performance standards include voluntary or mandatory minimum *recycling content standards, and* encouragements for *take back* of end-life products, strengthening incentives for product redesigning.

Information-based instruments such as product labels and reporting requirements raise public awareness.

Source: OECD (2016, link)

EPR: POLICY INSTRUMENTS (3/3)



Adapted from OECD (2016)

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ECO-INDUSTRIAL PARKS (EIPs)

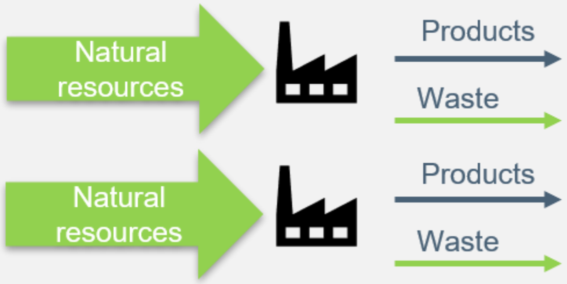
Background; Definition; Industrial Symbiosis; Drivers and Barriers

EIP: BACKGROUND

Traditional Industrial park

Industrial parks are important drivers of industrialisation. They group industrial firms in colocations, offering important collaborative and efficiency gains.

While industrial parks bring about economic growth and societal development of a country or a region, they also have potential environmental and social impacts including: climate change, pollution, resource depletion, and labour issues.

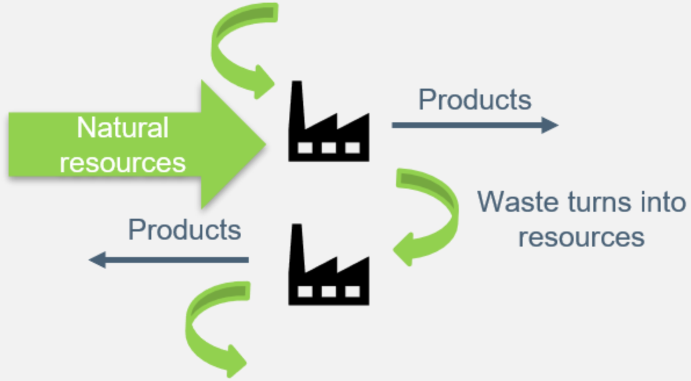


Eco-Industrial Park (EIP)

The idea of Eco-industrial Parks (EIPs), was first described at the United Nations Conference on Environment and Development in Rio de Janeiro 1992.

EIPs have been viewed by many as an appropriate and effective framework to transition to **sustainable production.**

Download An International Framework for Eco-Industrial Parks Manual at the World Bank Group's website (link)



EIP: DEFINITION

“Broadly, an EIP may be defined as a dedicated area for industrial use at a suitable site that supports sustainability through the integration of social, economic, and environmental quality aspects into its siting, planning, management and operations.” – World Bank (2021, link)

Lowe’s (1997) definition is referenced by many international organisations active in this area:

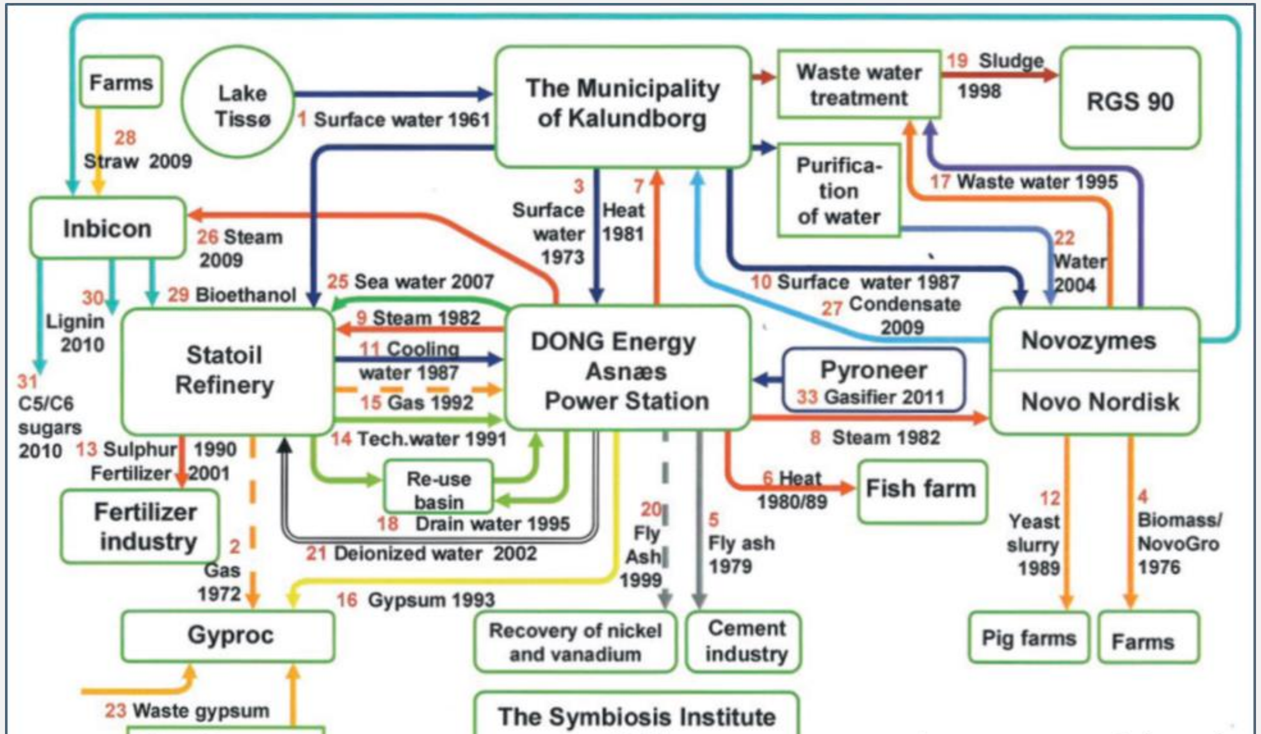
“A community of manufacturing and service businesses located together on a common property. Member businesses seek enhanced environmental, economic, and social performance through collaboration in managing environmental and resource issues. By working together, the community of businesses seeks a collective benefit that is greater than the sum of individual benefits each company would realize by only optimizing its individual performance”

EIP: INDUSTRIAL SYMBIOSIS

Eco-industrial parks aim to exploit synergies in energy, materials and water supply chains.

The use of by-products (or waste) of one company as raw materials of another is often referred to as industrial symbiosis.

A well-known example of industrial symbiosis is the Kalundborg EIP in Denmark. The image on the right illustrates various symbiotic relations created and exploited between enterprises co-located in the EIP



Timmerman et al. (2014)

Short read: Kalundborg Symbiosis (link)

Short video: Kalundborg Symbiosis (link)

Read more: Kalundborg Symbiosis website

EIP: DRIVERS

- Colocation offers efficiency and collaborative opportunities.
- Industry competitiveness is significant driver for EIPs.
- The imperatives of environmental protection, climate change mitigation and resource use efficiency strengthen the case of EIPs.
- As a result of increased industrial input, EIPs can help maintain social standards and protection of employees and the wider economy.
- EIPs provide economic benefits such as employment creation.
- EIP model can help to manage reputational risks.

Read more about the drivers in the manual available at the World Bank Group's website (link)

EIP: BARRIERS

- Management may lack skills in improving processes, and initial investment costs of eco-efficient industrial processes can be costly.
- Retrofitting existing parks entail complex processes into their infrastructures.
- Regulatory barriers such as the lack of sufficient regulations and their enforcement.
- Technological and socio-economic barriers such as technological solutions that are not advanced enough or too expensive to implement.
- Various internal barriers exist, one of which is technical capacity.

Read more about the barriers in the manual available at the World Bank Group’s website (link)

CIRCULAR ECONOMY & RENEWABLE ENERGY

CIRCULAR ECONOMY & RENEWABLE ENERGY (1/2)

- The importance of renewable energy is often mentioned in conjunction with circular economy. Renewable energy often comes with trade-offs.
- The EU aims to become carbon neutral by 2050, which necessitates transitioning to a low-carbon energy model, requiring the energy sector to be almost completely redesigned to accommodate emerging technologies like solar photovoltaic (SPV) and wind power; supported by energy storage technologies.

Challenges:

- Rapid technological development means that equipment can become obsolete relatively fast and generate complex waste streams with logistical challenges for managing the infrastructure at its end-of-life stage.
- Waste generation stemming from SPVs, wind turbines and batteries is expected to increase dramatically.
- All three energy infrastructure types contain critical raw materials (i.e. raw materials which are economically and strategically important for the European economy but have a high-risk associated with their supply).

Opportunities:

- Much of the wastes, e.g. steel in wind turbines, glass in SPV and aluminium in SPV and batteries, belong to established recycling streams.
- Industry can address the challenges through circular economy approaches such as eco-design, recycling targets and EPR.

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CIRCULAR ECONOMY & RENEWABLE ENERGY (2/2)

- Different wastes can be turned into energy: solid waste, wastewater/sludge, manure, leftover food scraps, cooking oils, and so on.
- Including waste-to-energy (WTE) in the domain of sustainable renewable energy is controversial as waste incineration is a carbon-intensive process.
- The EU's revised Renewable Energy Directive gives priority to waste prevention and recycling. The EU's Taxonomy Regulation states that an activity that "leads to a significant increase in the generation, incineration or disposal of waste, except for the incineration of non-recyclable hazardous waste" harms the objective of the circular economy transition. (Makavou, 2021)
- OECD classifies the renewable fraction of municipal waste into the definition of renewable energy. "Municipal waste comprises wastes produced by the residential, commercial and public service sectors that are collected by local authorities for disposal in a central location for the production of heat and/or power" (OECD, 2021).
- The International Renewable Energy Agency considers WTE offering a promising way to create circular economy. It, for example, reduces landfilling (IRENA, 2020).

Case example

In Umeå, Sweden, Dåva 1 CHP (combined heat and power) plant, located at Dåvamyran industrial landfill, opened in 2000 and is one of the world's most energy-efficient and environmentally-friendly facilities using the municipality's waste as its main fuel. The generation from Dåva 1 can heat about 18,000 homes and produce electricity to supply approx. 6,500 homes.

Short read: Dåva CHP case (link)

REFERENCES (1/2)

Aldieri, L. et al. (2021) 'Circular economy business models: The complementarities with sharing economy and eco-innovations investments', Sustainability (Switzerland), 13(22). doi: 10.3390/su132212438.

de Brito, M. and Dekker, R. (2002). Reverse Logistics - a framework. Erasmus University Rotterdam, Econometric Institute, Econometric Institute Report. Available at: https://www.researchgate.net/publication/46434127_Reverse_Logistics_-_a_framework

Codagnone, C and Martens, B (2016) Scoping the Sharing Economy: Origins, Definitions, Impact and Regulatory Issues. Institute for Prospective Technological Studies Digital Economy Working Paper 2016/01. JRC100369 Available at: https://ec.europa.eu/jrc/sites/default/files/JRC100369.pdf

EEA (2021, Aug 24) Emerging waste streams: Opportunities and challenges of the clean-energy transition from a circular economy perspective. Available at: https://www.eea.europa.eu/publications/emerging-waste-streams-opportunities-and

EC (2019, Aug 2) Development of guidance on Extended Producer Responsibility (EPR). Available at: https://ec.europa.eu/environment/archives/waste/eu_guidance/introduction.html

European Commission (2016) A European agenda for the collaborative economy. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2016%3A356%3AFIN

IRENA (2020), Rise of renewables in cities: Energy solutions for the urban future, International Renewable Energy Agency, Abu Dhabi. Available at: https://www.irena.org/publications/2020/Oct/Rise-of-renewables-in-cities

REFERENCES (2/2)

Jenkings, A (2021) A Guide to Reverse Logistics: How It Works, Types and Strategies. Available:

https://www.netsuite.com/portal/resource/articles/inventory-management/reverse-logistics.shtml

Makavou, K. (2021, May 26) The EU is clear: Waste-To-Energy incineration has no place in the sustainability agenda. Available at: https://zerowasteeurope.eu/2021/05/wte-incineration-no-place-sustainability-agenda/

OECD (2016), Extended Producer Responsibility: Updated Guidance for Efficient Waste Management, OECD Publishing, Paris. Available at: https://read.oecd-ilibrary.org/environment/extended-producer-responsibility_9789264256385-en#page1

OECD (2022), "Renewable energy" (indicator), https://doi.org/10.1787/aac7c3f1-en (accessed on 12 January 2022).

Šiuškaitė, D., Pilinkienė, V. and Zvirdauskas, D. (2019) 'The conceptualization of the sharing economy as a business model', Engineering Economics, 30(3), pp. 373–381. doi: 10.5755/j01.ee.30.3.21253

Timmerman, J., Deckmyn, C., Vandevelde, L. and Van Eetvelde, G. (2014). Low carbon business park manual: a guide for developing and managing energy efficient and low carbon businesses and business parks. Available at: https://www.researchgate.net/publication/263655783_Low_carbon_business_park_manual_a_guide_for_developing_and_managing_energy_efficient_and_low_carbon_businesses_and_business_parks

World Bank (2021) International Framework for Eco-Industrial Parks v.2. Washington,

DC: World Bank. Available at: https://www.unido.org/sites/default/files/files/2021-04/An%20international%20framework%20for%20eco-industrial%20parks%20v2.0.pdf

SELF-STUDY QUESTION

- How the selected company can protect natural resources?
- What kind of actions can be taken by companies in order to reduce their impact on the environment?
- How to improve the business processes to go towards circularity?

SELF-STUDY QUESTION (1/3)

This thinking exercise consists of two parts that can be done individually or in groups.

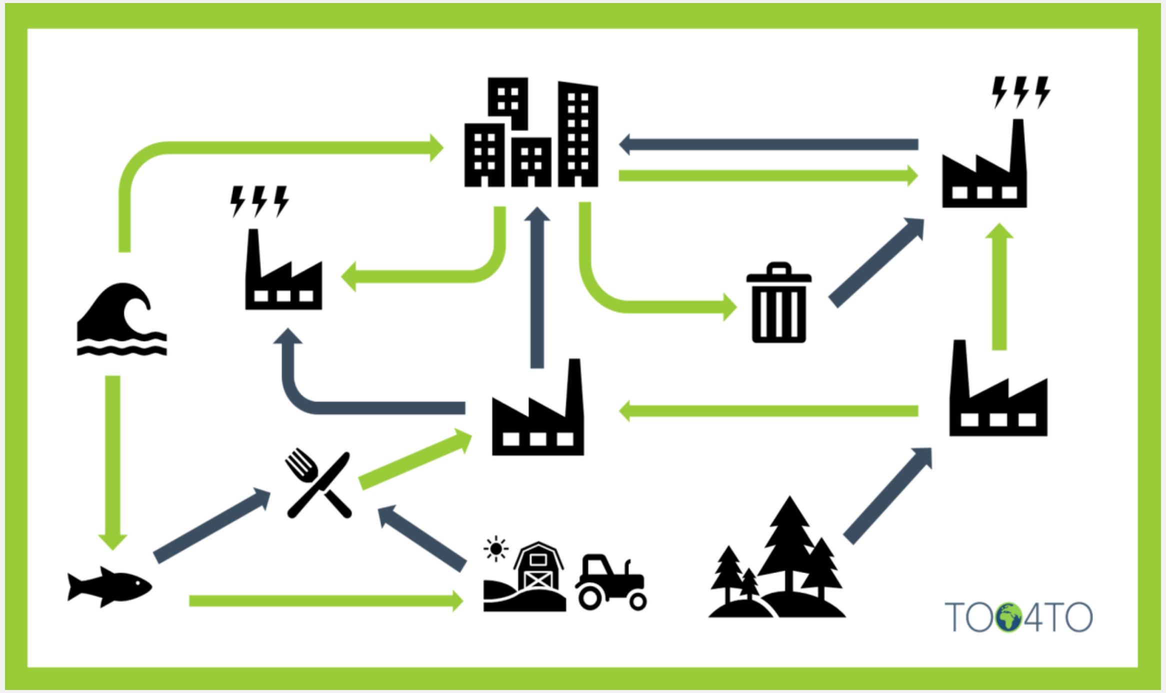
Before forming your opinion on these questions, please get yourself acquainted with the following learning resources:

- Slides 30-35 found in this presentation.
- Short read: Kalundborg Symbiosis (link).
- Short video: Kalundborg Symbiosis (link).
- Kalundborg symbiosis website (link).
- pages 13-14 and 21-25 from World Bank (2021) International Framework for Eco-Industrial Parks (link).

SELF-STUDY QUESTION (2/3)

Part 1.

Think about what are the major advantages of traditional industrial parks (also known as industrial clusters), and then what are their disadvantages from the sustainability perspective. Why should businesses in an existing industrial park increase their efforts in seeking industrial symbiosis and turn into an eco-industrial park (EIP); what are the potential barriers to this transformation?



SELF-STUDY QUESTION (3/3)

Part 2.

To advance your understanding of EIPs and their potential benefits, brainstorm, individually or as a group, how could the following colocated industry actors on the right-hand side take advantage of each other's material exchange waste:

- Municipality: produces solid waste and wastewater/sludge
- Local forestry industry: produces wood chips as a by-product
- Restaurants: produce organic waste and waste vegetable oil as by-products
- Local biodiesel production plant: produces biofuels and glycerol
- Papermill: produces wastewater/sludge as a by-product
- Combined heat and power plant: produces electricity and heating, and steam as a by-product
- Agricultural sector: produces crops, grain and livestock
- Local food industry: produces food products and organic waste as a by-product
- Biogas plant: produces vehicle fuel and biofertilizers, and steam as a by-product
- Biogas distribution network: distributes vehicle fuel
- Wastewater treatment plant: produces biogas as a by-product
- Ethanol plant: produces ethanol and livestock feed
- Local lake: supply of freshwater
- Fish farm: produces fish, organic residue and sludge as by-products