

MOVECO Toolbox

Principles of Circular Economy



DATE, PLACE, COUNTRY

NAME OF PRESENTER, ORGANIZATION

Aims

To understand:

- Importance of circular economy in keeping a sustainable socio-economic ecosystem and necessity to follow structured approaches for putting circular economy into practice
- Correct meaning of principles that characterize circular economy
- Implications of the application of circular economy principles at organizational level, value chain level and business systems level

To learn:

- Key elements that shape each principle of circular economy
- How to put in practice the principles of circular economy

To recognize:

- Maturity of an organization towards circular economy
- Gaps and imbalances in implementing principles of circular economy within an organization

Content

Introduction to circular economy

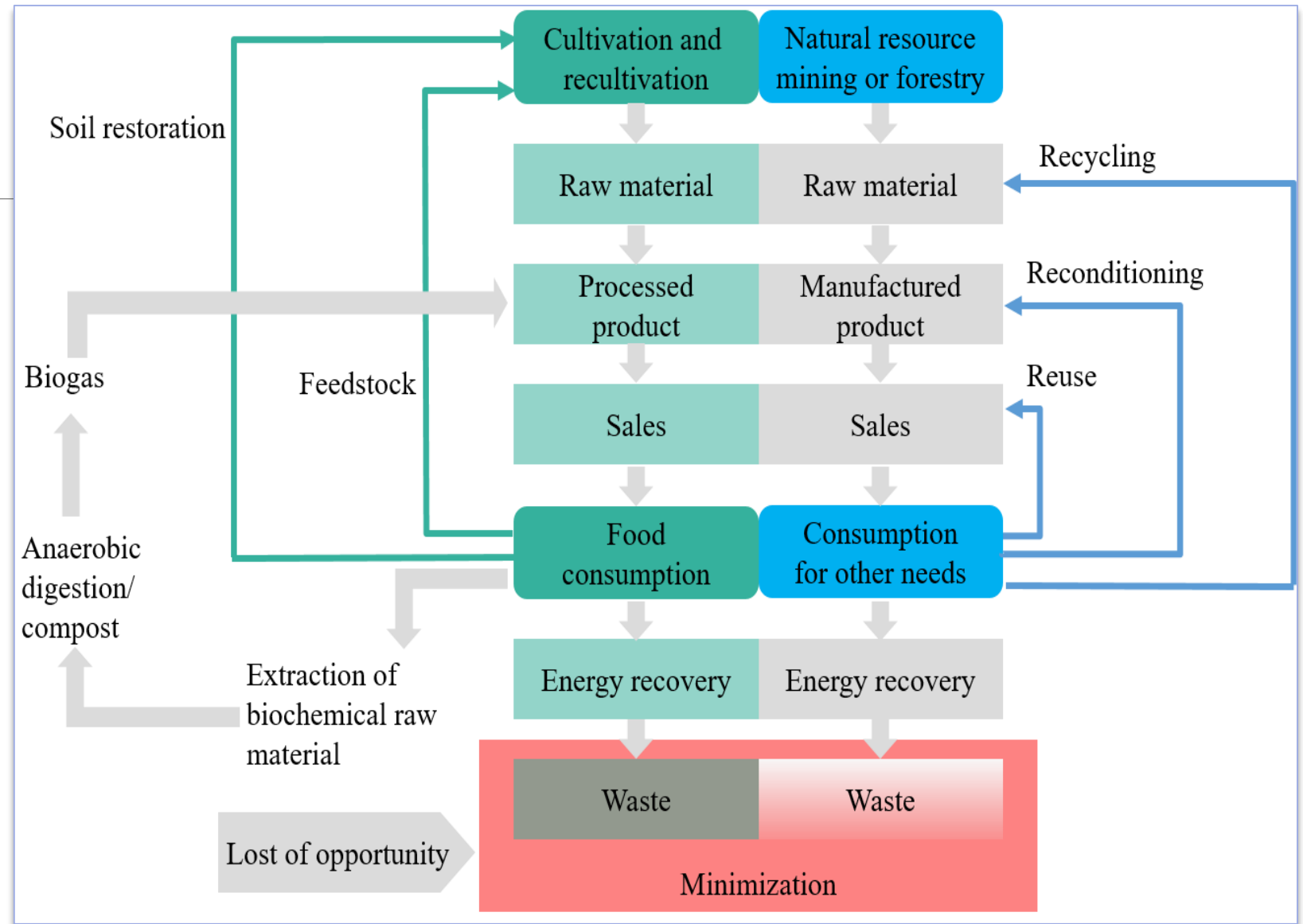
Principles of circular economy according to BS 8001:2017

Principles of circular economy according to “Ellen MacArthur” Foundation

The two major streams of circular economy

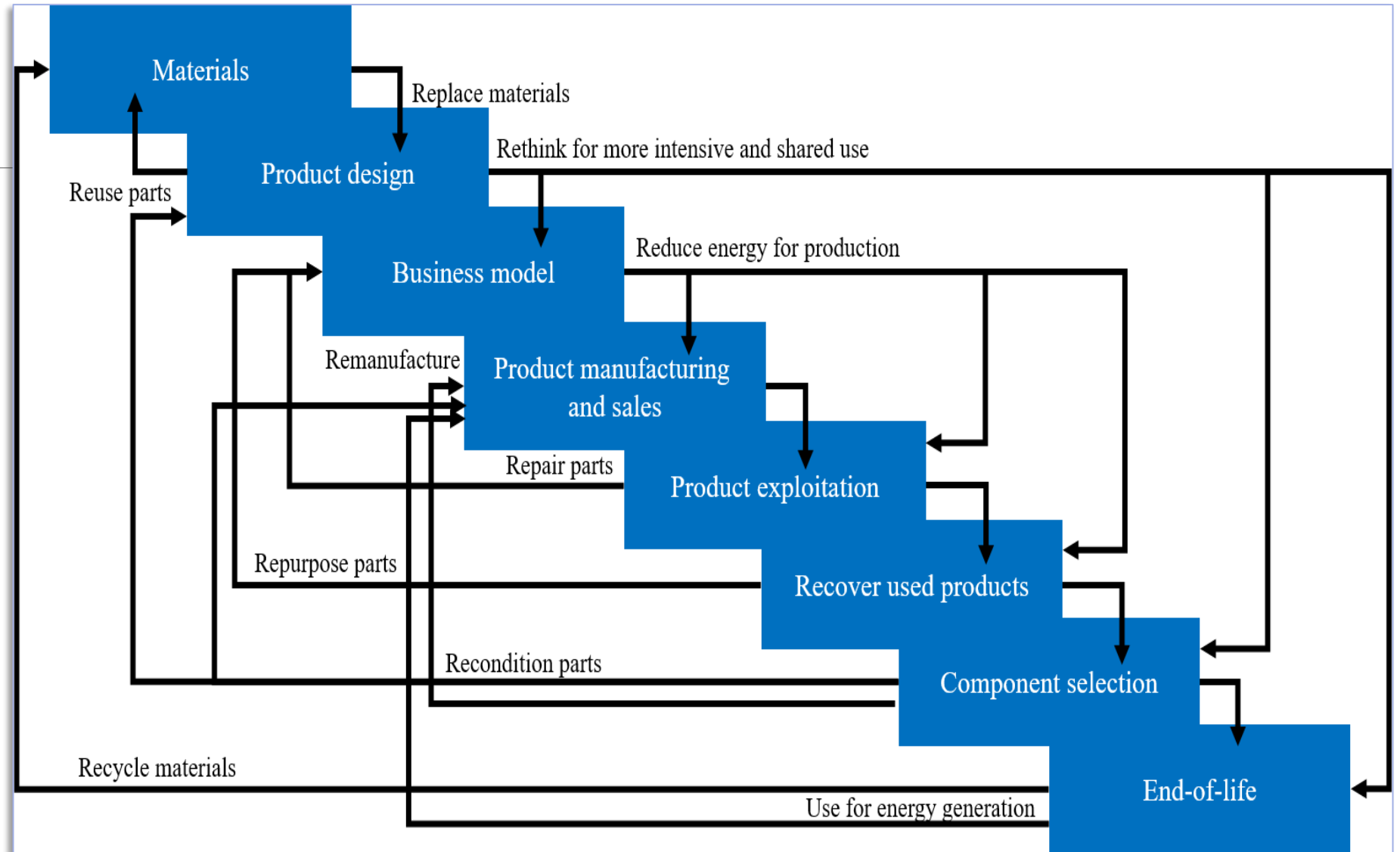
Circular economy is about recovering resources at their highest quality from consumed products and transforming them into new raw materials or new parts to be reused, thus keeping them in circulation for several life-cycles into new products, for future consumptions

To enable circular economy, we need an adequate design of products and novel business models that keep to producers the ownership on the manufactured products over their entire life-cycle



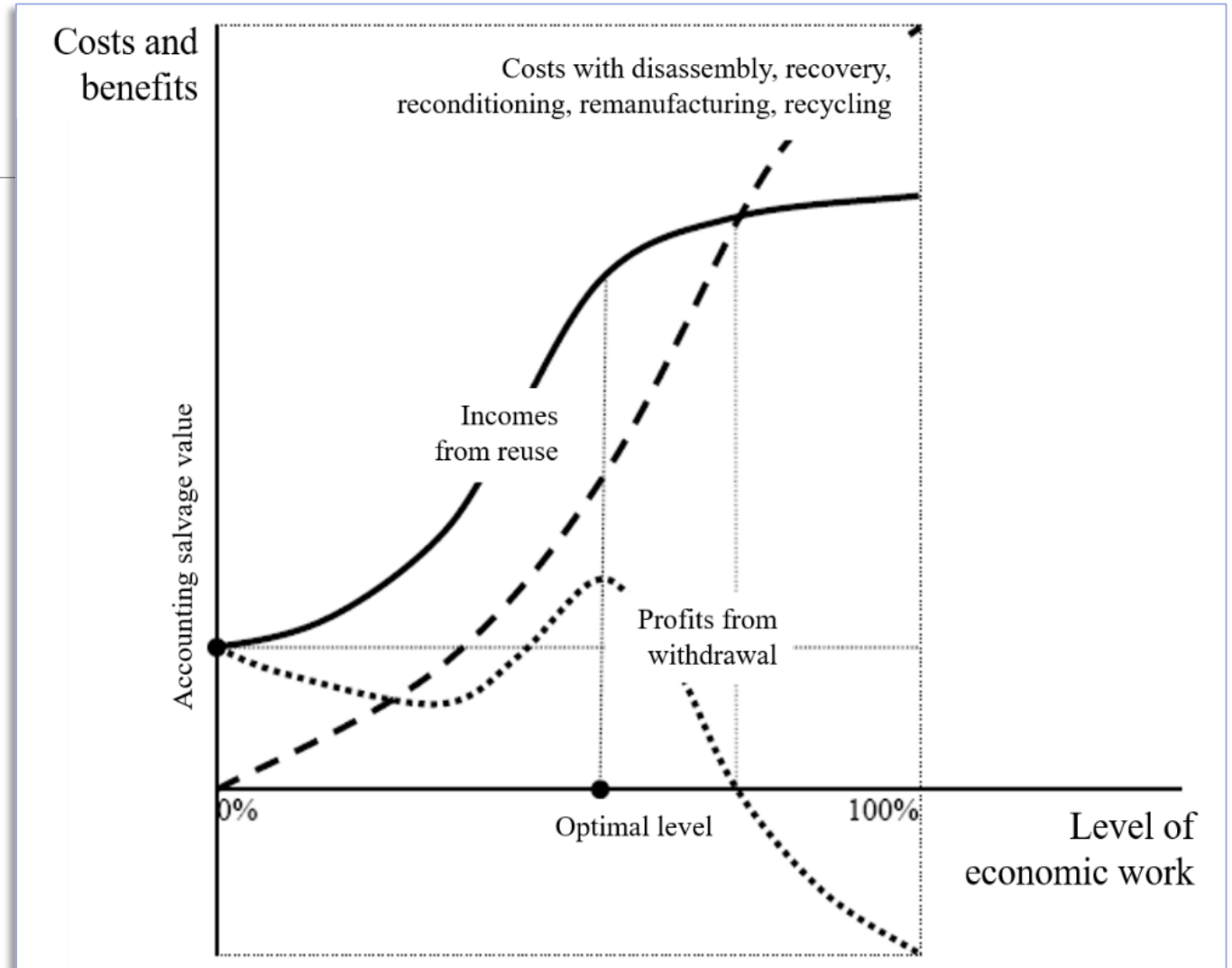
Value added activities in circular economy of technical products

Circular economy, as any other potential economic model, cannot be implemented without ensuring a financial sustainability of all businesses in the value chain. Therefore, circular economy comes in package with innovations in product design, business models, product manufacturing, product operation and servicing, product withdrawal, and product “reincarnation” into new products.



Mastering circular economy from a financially sustainable perspective

Understanding the costs over the whole life-cycle of a product is essential to implement circular economy concept to the level of each link along the value chain of the business



Principles of circular economy according to BS 8001:2017

1. System thinking: understand how your business impacts the whole ecosystem
2. Innovation: manage resources for more value creation
3. Stewardship: take responsibility for the ripple-effect impacts that come up from your business activities
4. Collaboration: secure benefits at system wide level by strong cooperation in the value chain
5. Value optimization: keep materials at the highest value and function quality
6. Transparency: reveal to everyone the environmental impact of all your business activities

System thinking principle

Companies must consider a holistic approach in product design and manufacturing to understand how individual decisions and activities affect the wider ecosystem, including natural environment, social and economic dimensions.

In the context of BS 8001:2017, system thinking is about understanding the complex, nonlinear, and interconnected perspective of a system (e.g. a product, a business, a chain of interrelated businesses, suppliers, etc.). Any part of a system (e.g. people, organizations, regulations, etc.) generates attractors (e.g. feedback loops, constrains, relationships, etc.) upon some other parts of the system. It is important to understand all these relationships such as to design company's activities in order to maximize value added in terms of intelligent and sustainable management of resources in the portfolio of solutions (e.g. services, products, product-service systems) delivered onto the market.

Innovation principle

Companies must innovate in a way that creates business value through the sustainable management of resources incorporated within products and services they design. In other words, this principle strives for connecting economic and environmental gains in product design, manufacturing and use.

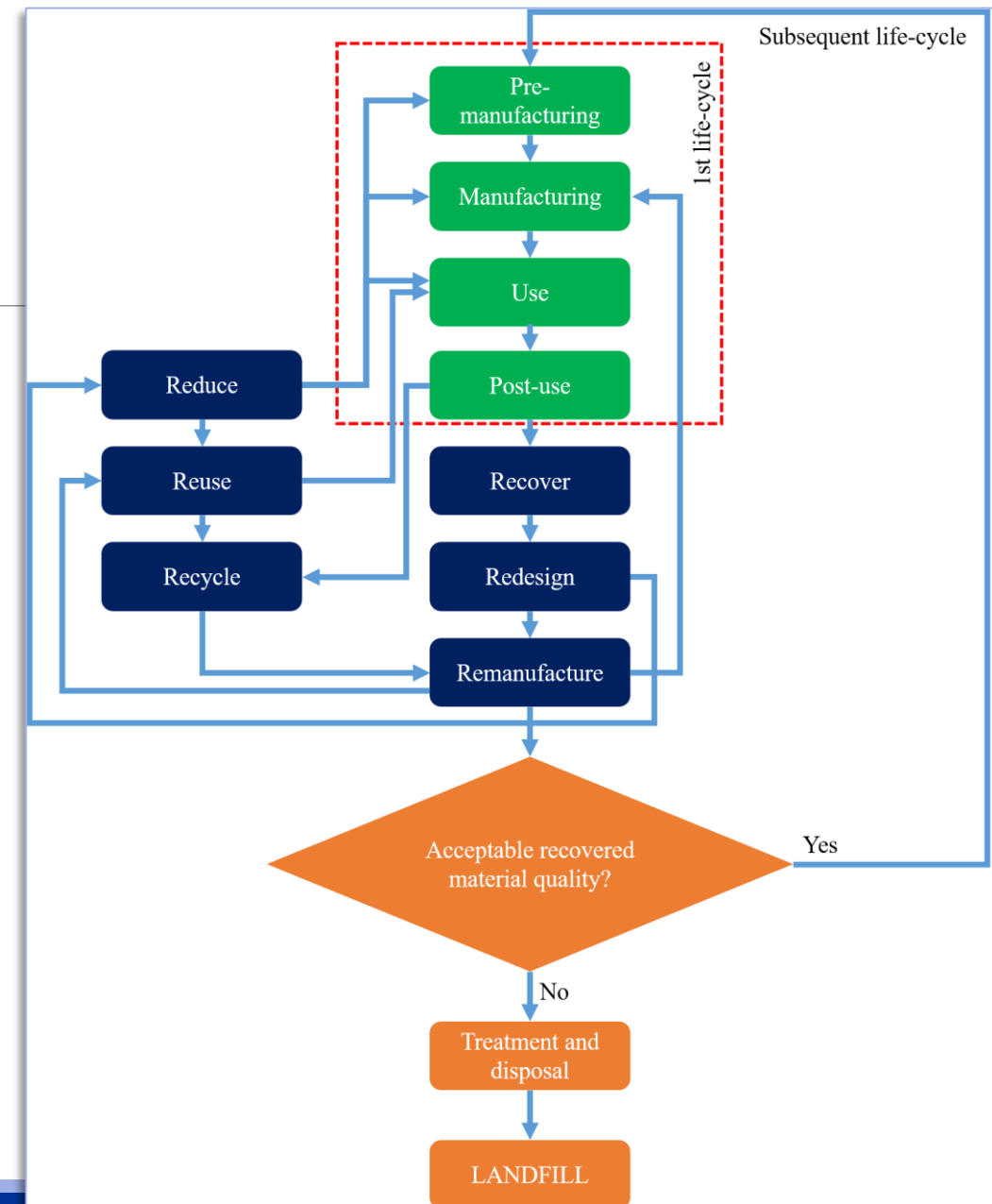
BS 8001:2017 looks at innovation as everything that generates a new output and/or outcome which realizes or redistributes value. Circularity requires a radical review and reconsideration of consumption and production, with significant implications on current practices and methods of doing business. The key question in circularity-driven innovation is: “How to extract value from what otherwise is seen as waste?” More than this, innovation principle is looking for business models where companies sell solutions not products, and owning is replaced by sharing.

6R-based closed loop in sustainable manufacturing

In manufacturing, innovation principle of circular economy considers both the concept of multiple product life-cycle and the concept of 6R-closed loop system (recover-recycle-redesign-reduce-remanufacture-reuse).

To put innovation principle into practice, companies in any field of activity and in any position in the value chain have to apply design for X methodologies and methods. X generically describes a target function.

In real life, circular economy indicates that a product, process or technology has to be simultaneously designed with respect to several target functions. For example, a car engine shall be designed such as to be light, with high power, fabricated from recyclable materials, to involve low costs to be manufactured, to be reliable, to have low consumption, be easy to maintain, and compatible with bio-fuels.



Stewardship principle

Companies have to manage the direct and indirect impacts of their decisions and activities across the systems they create and interact with.

In the context of BS 8001:2017, stewardships means a company is responsible for any consequence of its managerial decisions in relation to product design, its production and exploitation, as well as its end-of-life.

The term “product stewardship” is a bit confusing, but as a starting point it may be interlinked with the concept of “extended producer responsibility” (EPR). Product stewardship evolved along time from responsible management of hazardous wastes towards a wider focus on resource conservation.

In essence, the objective of stewardship principle is to minimize the environmental impact of products through the multiple life-cycles.

Collaboration principle

Companies have to conduct continuous cooperation, both internally and with external stakeholders, through various business arrangements such as to create mutual business value for all stakeholders. Cooperation in circular value chains is dictated by the complexity of these chains and the related business models.

As BS 8001:2017 highlights, it is a less probability that an individual organization could be capable to tackle circularity in doing businesses and to support transition towards a more eco- and social responsible business models without cooperation. In circular economy, life-cycle orientation, responsibility and/or ownership are key characteristics of the business models.

This means, in circular economy, we discuss about system-scale innovation; that is, individual companies depend on the maturity of suppliers in emergent value chains.

Value optimization principle

Companies have to keep all products, components and materials at their highest value and utility at all times, such as recirculation to be done with minimal energy consumption.

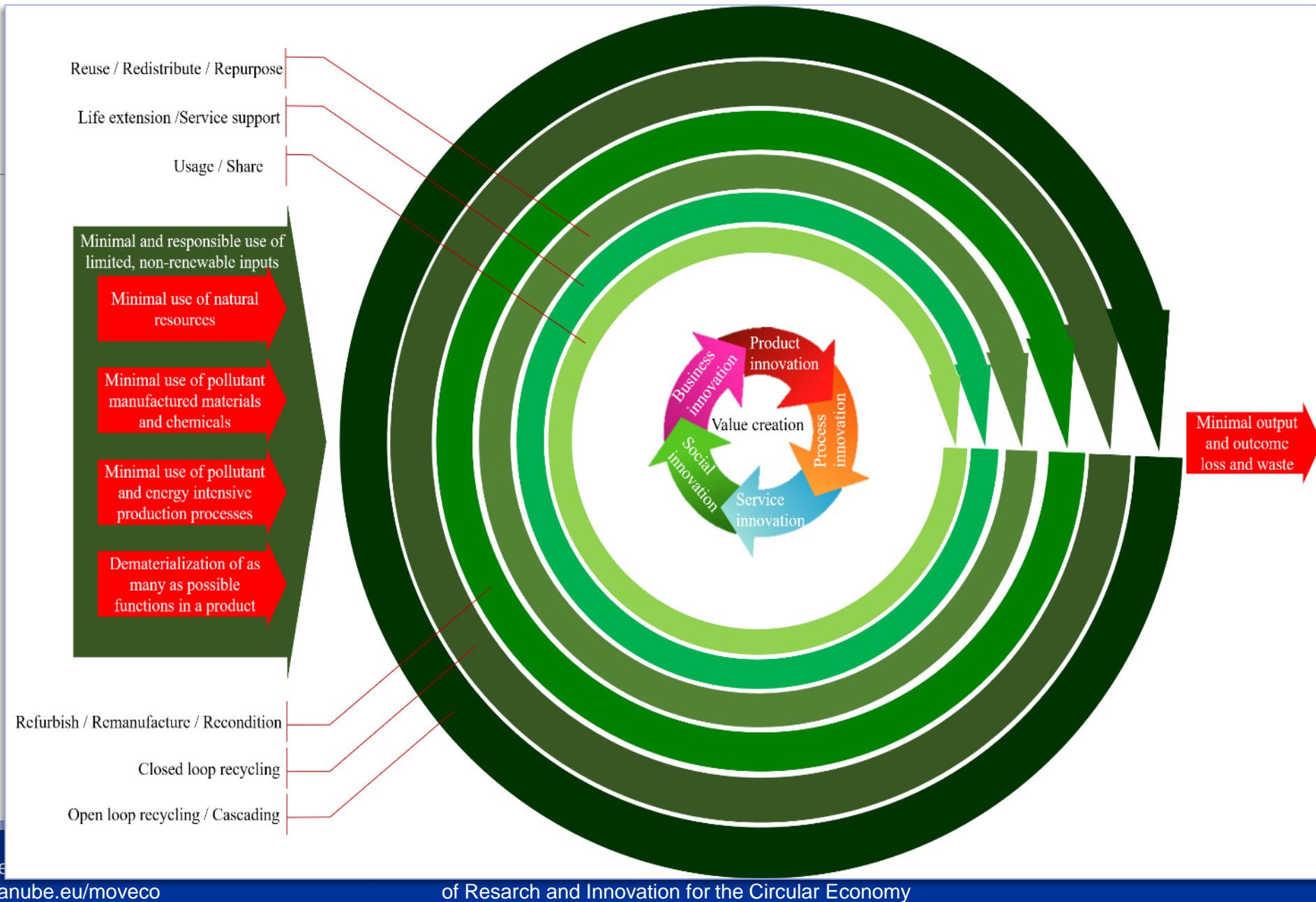
Recirculation, in any form, is not the goal of circular economy. Recirculation is only a mean to create new value in the system from elements that are considered loss or waste.

Value added is in cost saving, in lower environmental impact, in higher business resilience, in new revenue streams and in better relationships with customers. Optimization is reached when the normalized impact (value weight) of each business activity in the value chain and each component from the product is of the same magnitude with their normalized costs. Thus, according to circular economy, the goal is not to optimize profit but rather the value.

The mechanism for optimizing value creation in a circular economy

Optimization of value is about finding an alternative (a solution) with the highest possible performance under given constraints (e.g. human, financial, natural, technological), by maximizing useful and desirable factors while minimizing harmful factors.

Priorities will follow the rule: natural capital first, followed by human capital and then by manufactured capital.



Transparency principle

Companies are fully aware and open about decisions and activities that affect their ability to move towards a more sustainable and circular mode of operation and are willing to communicate their effects in a clear, accurate, timely, honest and complete manner. In this respect, companies have to work in a systematic way to ensure traceability of materials they use, where they come from and who made them.

Moreover, responsibility covers impact of their work on environment. In this line, companies have to conduct researches to understand the effect of materials and processes they use to the level of natural environment. In addition, they have to communicate how materials release certain compounds in the air, soil and/or water and whether they cause any negative effects.

Principles of circular economy according to “Ellen MacArthur” Foundation

- Principle of preserving and enhancing natural capital by controlling finite stocks and balancing renewable resource flows
- Principle of optimising resource yields by circulating products, components, and materials in use at the highest utility at all time in both technical and biological cycles
- Principle of fostering system effectiveness by revealing and designing out negative externalities

PRINCIPLE 1
Preserve and enhance natural capital by controlling finite stocks and balancing renewable resource flows

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

PRINCIPLE 3
Foster system effectiveness by revealing and designing out negative externalities

The diagram illustrates the Circular Economy framework, showing the flow of materials and products through various stages and cycles.

PRINCIPLE 1: Preserve and enhance natural capital by controlling finite stocks and balancing renewable resource flows.

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.

PRINCIPLE 3: Foster system effectiveness by revealing and designing out negative externalities.

The diagram shows the flow of materials and products through various stages and cycles:

- Regeneration:** Includes the Biosphere, Farming/collection, Biochemical feedstock, and Biogas.
- Renewables flow management:** Includes Renewables, Substitute materials, Virtualise, and Restore.
- Stock management:** Includes Recycle, Reuse/redistribute, Maintain/prolong, Share, and Refurbish/remanufacture.
- Collection:** Includes Consumer and User.
- Extraction of biochemical feedstock:** A process that feeds back into the Regeneration cycle.
- Minimise systematic leakage and negative externalities:** A goal that informs the design of the system.

Source of picture: website of "Ellen MacArthur" Foundation

1. Hunting and fishing
2. Can take both post-harvest and post-consumer waste as an input

1. Hunting and fishing
2. Can take both post-harvest and post-consumer waste as an input

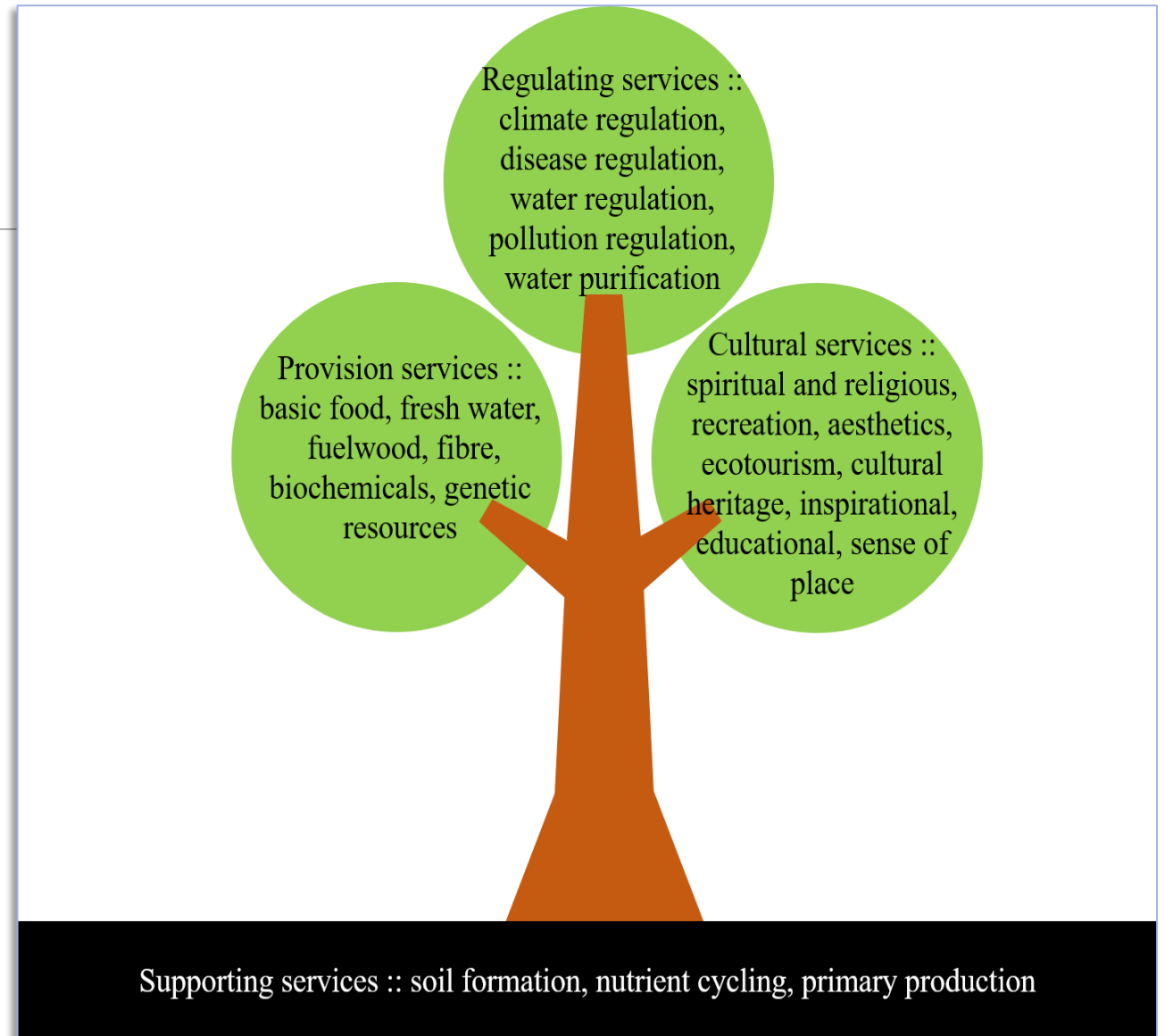
Preserving and enhancing natural capital principle

The emergence of the concept of natural capital indicates that environmental systems play a key role in the economic output and human well-being by providing resources and absorbing emissions and wastes. Natural capital is the most fundamental form of capital since it provides the ground conditions for human existence. These conditions include fertile soil, multifunctional forests, productive land and seas, good quality freshwater and clean air.

They also include critical mechanisms such as pollination, climate regulation and protection from natural disasters. Natural capital sets the ecological limits for our socio-economic systems. The complexity of natural systems and irreversibility of some transformations in nature indicate that replacing natural capital with other forms of capital is non-substitutable and involves catastrophic risks. This is the reason we need to integrate natural capital in our economic and social systems.

Natural ecosystems services

The key question with respect to preservation and enhancement of natural capital is: Who is paying for the services provided by natural capital?

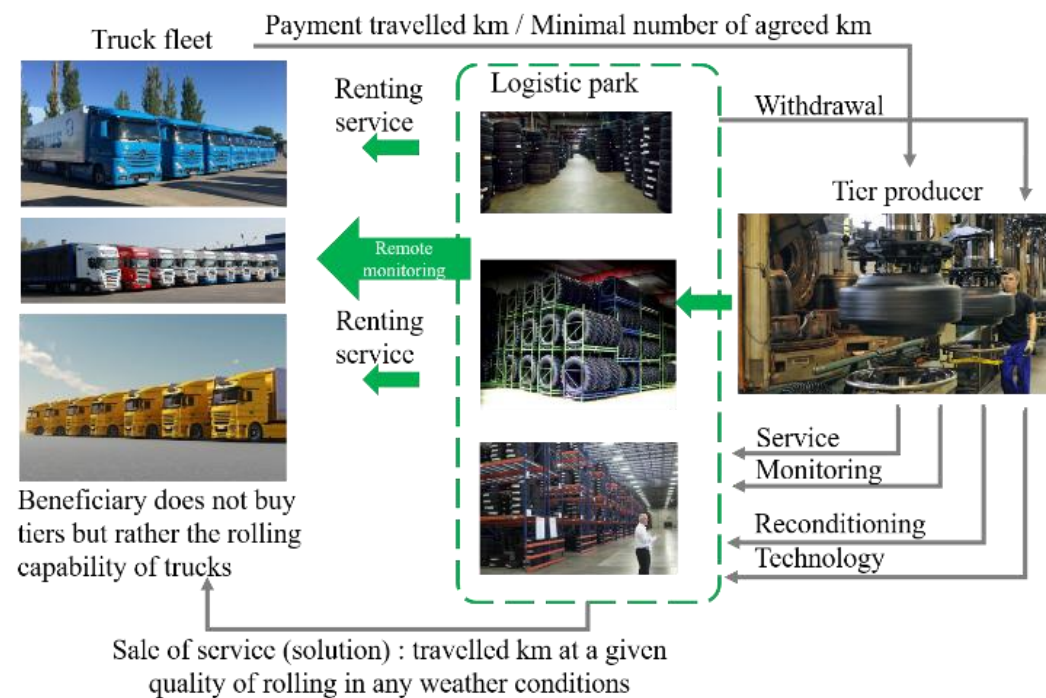
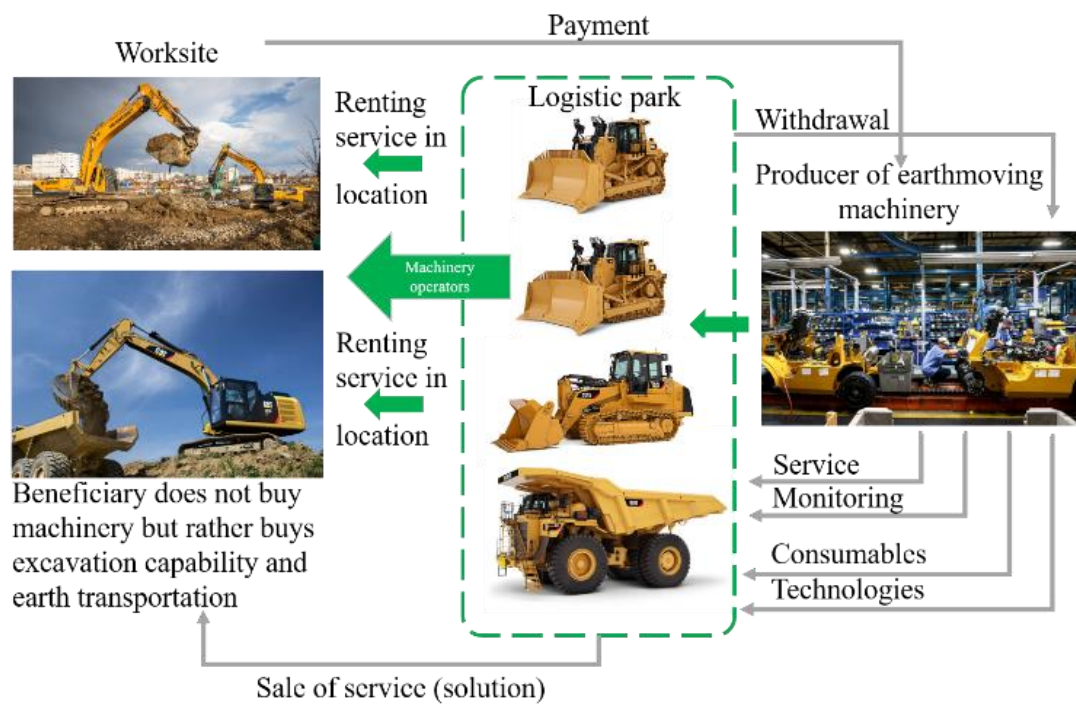


Optimising resource yields principle

The second principle promoted by “Ellen MacArthur” Foundation indicates practices to design physical products for easy remanufacturing, easy and cost-effective refurbishing, and cost-effective recycling to keep technical elements and semi-fabricated materials in circulation for several life-cycles; thus, contributing to natural capital preservation and reduction of natural ecosystems degradation.

According to the second principle, instead of waiting for recycling parts at the end of their life-time, it is more responsible to intervene with tighter, inner loops (e.g. maintenance, upgrading) during the usage period to prolong useful life of products and components. Thus, revenue streams must be generated not from encouraging consumption, but from encouraging upgrading of current products and replacing current business models (based on commercial transactions between producers and consumers) with leasing, renting and servitization models.

Examples of product servitization



Minimization of negative externalities principle

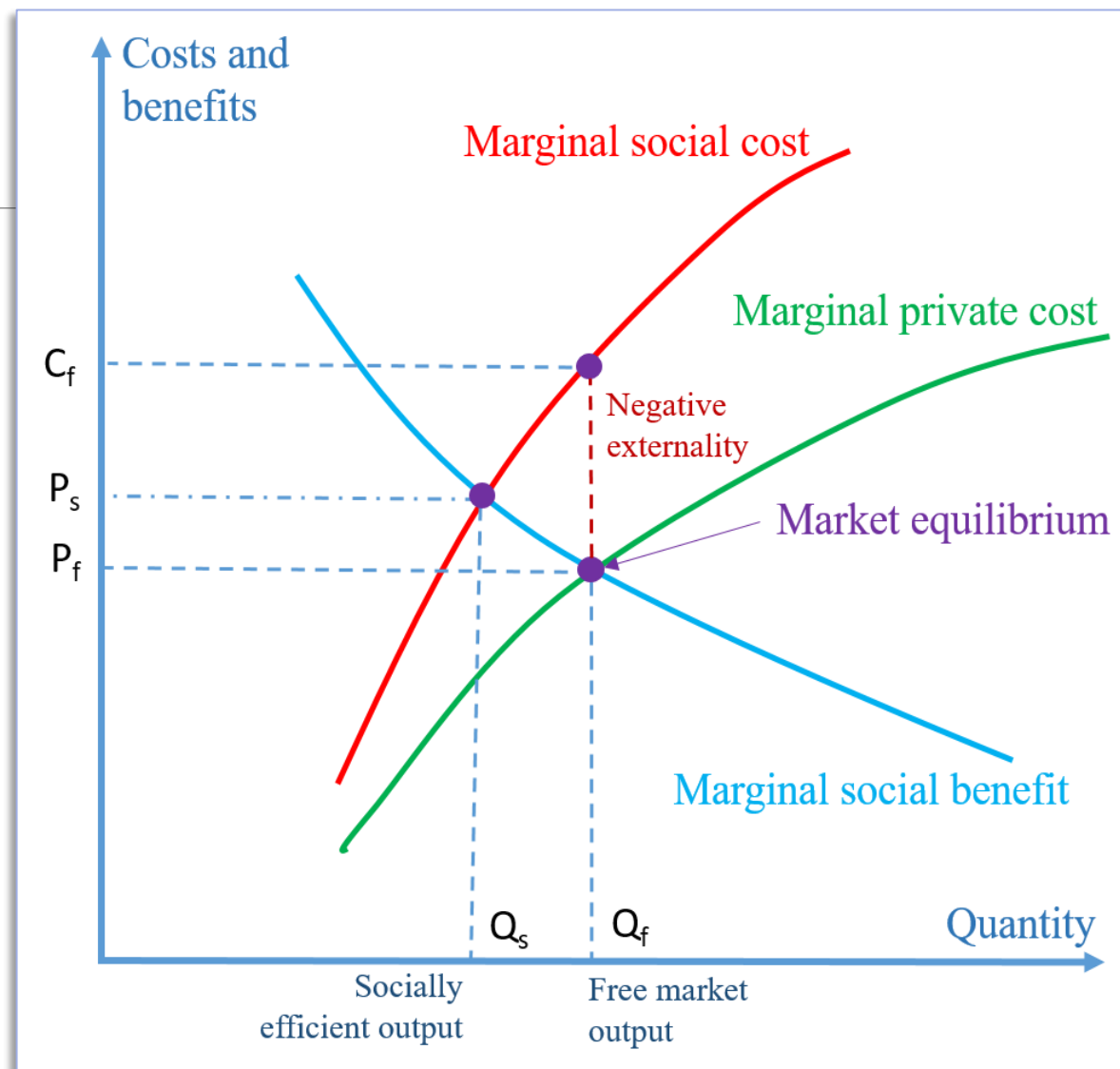
Negative externalities are referring to costs that are suffered by third parties as a result of economic transactions. In a transaction, producer and buyer are the first and second parties, whereas the third parties include individuals, entities and resources that are indirectly affected in a negative way. Negative externalities are also referring to external costs. Some negative externalities, such as waste, arise from consumption, while other negative externalities, such as CO₂ emissions, arise from production of goods and products, from energy production and from transportation of goods and people.

Negative externalities occur in those situations where property rights over assets or resources have not been allocated, or are fuzzy. Who owns oceans, water from rivers and lakes, nutrients from soil and air from atmosphere? Where there is no private property on these resources or the state is a poor manager of natural resources, first and second parties may pollute them without fear of being called to court.

Negative externality due to lack of social property rights on natural resources

A negative externality, such as the cost of pollution from industrial production, makes the curve of marginal social cost higher than the curve of private marginal cost.

If spillovers are introduced in the equation of business, beneficiary must pay the price P_s for the output Q_s . Because there is no advocate of environment and society to protect them against harmful effects (e.g. air pollution, soil degradation, water pollution, food chemicalization, etc.), market equilibrium is set at Q_f for the price P_f , with $Q_f > Q_s$ and $P_f < P_s$. On short term, beneficiary is happy because it buys cheaper, and producer is happy because it produces more. But there is a cost of this game, equals with $C_f - P_f$, which actually means loss of welfare. Over-production is thus welfare loss. In conclusion, we need a third party in the game, which must be responsible to negotiate the price with the first and second parties such as to reduce negative externalities. The equilibrium is when the price is P_s and the produced output is Q_s .



Conclusions

Circular economy is about introducing social costs in the economic equation and, as a consequence, identification and application of efficient and effective tools and approaches in product design, production, usage and withdrawal by respecting a set of well-defined principles that finally lead to a responsible consumption and production for more resilient social and environmental ecosystems at global scale.

Even if proper regulations and control mechanisms can reduce negative externalities, companies can innovate on products, processes and business models by themselves using the circular economy paradigm and generate new revenue streams. Limitations are not in technology, but rather in the indolence and lack of understanding of decision makers.

Application of circular economy principles is feasible and can lead to profitable business activities. Those companies that will act proactively to adopt the principles of circular economy in their activities will attain competitive advantages.

Contact

Contact details of the host organization (= MOVECO Partner)

This training was delivered by

Contact details of trainer