Lecture
The Circular Economy Basics: Genesis, Structure, Peculiarities and the Functioning Principles

Content

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1. The essence of the circular economy, the prerequisites for its formation and development

The latest challenges of the world system, which are a synthesis globalization, the fourth industrial revolution and the transformation of the resource-raw material model of development emphasize the need to modernize industry, the tool of which is the implementation of organizational and economic mechanisms aimed at increasing the responsibility for maintaining the balance of economic interests, the ecological system and the rational use of nature.

In the middle of the XX century world scientific community came to the conclusion that limited opportunities for economic growth based on use linear industrial model by analyzing the negative trends of scientific and technical revolution. This prompted the search for alternative solutions and contributed to the rapid spread of new economic models focused on overcoming environmental challenges. The new one has received special attention over the last decade model of economy – *circular economy*.

A **circular economy** (*CE*) – is a model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible.

A circular economy aims to tackle global challenges like *climate change*, *biodiversity loss*, *waste*, and *pollution* by emphasizing design based implementation of the three base principles of the model.

Circular economy is a trend of the XXI century, which provides:

❖ raising awareness of the socio-economic, energy and environmental sectors;

❖ formation of approaches to solving the problem "safe environment vs economic development";

❖ search for a global consensus on the growing importance of environmental factors in the activities of domestic and international companies.

European Investment Bank outlined three main reasons for the transition to a circular economy:

1. **Resource constraints.** Global demand for resources is growing very fast, leading to constant growing scarcity of critical resources and water.

2. **Technological development.** Implementation of new ones technology allows you to develop and implement new business models of the circular economy. Without formation advanced technologies and innovative approaches, recycling, replacement and reuse of resources, the use of new IT technologies will be impossible.

3. **Socio-economic development**. Circular models play an important role in a growing context urbanization. In cities, it is possible to develop, implement and maintain systems that will collect and convert various goods, materials and other resources that will be cost-effective and environmentally friendly.

Some scientists (N. Pakhomov, K. Richter and others) focus on another reason for the transition to a circular economy – **environmental**. A striking example is the unused industrial waste, which occupies large areas, and their spraying and erosion leads to environmental pollution, harms the health of the population, agriculture, soil, water resources etc. Therefore, you need to consider the negative externalities that cause environmental threats and environmental degradation. The purpose of the circular economy is the internationalization of externalities, minimizing losses and restoring natural ecosystems to safety equal

The three principles required for the transformation to a circular economy:

1) eliminating waste and pollution;
2) circulating products and materials;
3) regeneration of nature.

Circular economy is defined in contradistinction to the traditional linear economy.

In a **linear economy**, natural resources are turned into products which are ultimately destined to become waste because of the way they have been designed and manufactured. This process is often summarised by "take, make, waste". By contrast, a circular economy employs reuse, sharing, repair, refurbishment, remanufacturing and recycling to create a closed-loop system, minimising the use of resource inputs and the creation of waste, pollution and carbon emissions.

The circular economy aims to keep products, materials, equipment and infrastructure in use for longer, thus improving the productivity of these resources.

Waste materials and energy should become input for other processes through waste valorization: either as a component for another industrial process or as regenerative resources for nature (for example, compost).

The Ellen MacArthur Foundation (EMF) defines the circular economy as an industrial economy that is restorative or regenerative by value and design.

There are many definitions of the circular economy.

In China CE is promoted as a top-down national political objective while in other areas such as the European Union, Japan and USA it is a tool to design bottom-up environmental and waste management policies. The ultimate goal of promoting CE is the decoupling of environmental pressure from economic growth. A comprehensive definition could be: "*Circular Economy is an economic system that targets zero waste and pollution throughout materials lifecycles, from environment extraction to industrial transformation, and to final consumers, applying to all involved ecosystems. Upon its lifetime end, materials return to either an industrial process or, in case of a treated organic residual, safely back to the environment as in a natural regenerating cycle. It operates creating value at the macro, meso and micro levels and exploits to the fullest the sustainability nested concept. Used energy sources are clean and renewable. Resources use and consumption are efficient. Government agencies and responsible consumers play an active role ensuring correct system long-term operation*".

More generally, circular development is a model of economic, social and environmental production and consumption that aims to build an autonomous and sustainable society in tune with the issue of environmental resources.

The circular economy aims to transform our economy into one that is regenerative. An economy that innovates with the intention of reducing waste and the ecological and environmental impact of industries prior to happening rather than waiting to address the consequences of these issues. This is done by designing new processes and solutions for the optimization of resources, decoupling reliance on finite resources.

The circular economy is a framework of three principles, driven by design:

1) eliminate waste and pollution;
2) keep products and materials in use;
3) regenerate natural systems.

It is based increasingly on renewable energy and materials, and it is accelerated by digital innovation. It is a resilient, distributed, diverse, and inclusive economic model. The circular economy is an economic concept often linked to the sustainable development, provision of the Sustainable Development Goals (Global Development Goals) and an extension of a green economy.

Other definitions and precise thresholds that separate linear from circular activity have also been developed in the economic literature.

History of circular economy development

The idea of circular flow for materials and energy is not new, appearing as early as 1966 in the book by Kenneth E. Boulding, who explains that we should be in a "cyclical" system of production. For its part, the term "circular economy" appeared for

the first time in 1988 in "*The Economics of Natural Resources*" and soon after that was used by Pearce and Turner to describe an economic system where waste at extraction, production, and consumption stages is turned into inputs.

From the early 2000s, China integrated the notion into its industrial and environmental policies to make them resource-oriented, production-oriented, waste, use-oriented and life cycle oriented. The Ellen MacArthur foundation was instrumental in the diffusion of the concept in Europe and the Americas.

The European Union introduced its vision of the circular economy from 2014, a New Circular Economy Action Plan having been launched in 2020 that "show the way to a climate-neutral, competitive economy of empowered consumers".

The original diffusion of the notion benefited from three major events: the explosion of raw material prices between 2000 and 2010, the Chinese control of rare earth materials, and the 2008 the economic crisis.

Today, the climate emergency and environmental challenges induce companies and individuals into rethinking their production and consumption patterns, the circular economy being framed as one of the answers to these challenges.

Key macro arguments in favor of the circular economy is that it:

- could enable an economic growth that does not add to the burden on natural resources extraction but decouples resource uses from the development of economic welfare for a growing population,
- reduces foreign dependence on critical materials,
- lowers CO_2 emissions,
- reduces the production of waste,
- introduces new modes of production and consumption to create further value.

Corporate arguments in favor of the circular economy is that it:

- could secure supply of raw materials,
- reduces the price volatility of inputs and control costs,
- reduce spills and waste,
- extends the life cycle of products,
- serve new segments of customers,
- generate long term shareholder value.

A key idea behind the circular business models is to create loops throughout to recapture value that would otherwise be lost.

Of particular concern is the irrevocable loss of raw materials due to their increase in entropy in the linear business model. Starting with the production of waste in manufacturing, the entropy increases further by mixing and diluting materials in their manufacturing assembly, followed by corrosion and wear and tear during the usage period. At the end of the life cycle, there is an exponential increase in disorder arising from the mixing of materials in landfills. As a result of this directionality of the entropy law, the world’s resources are effectively “lost forever”.

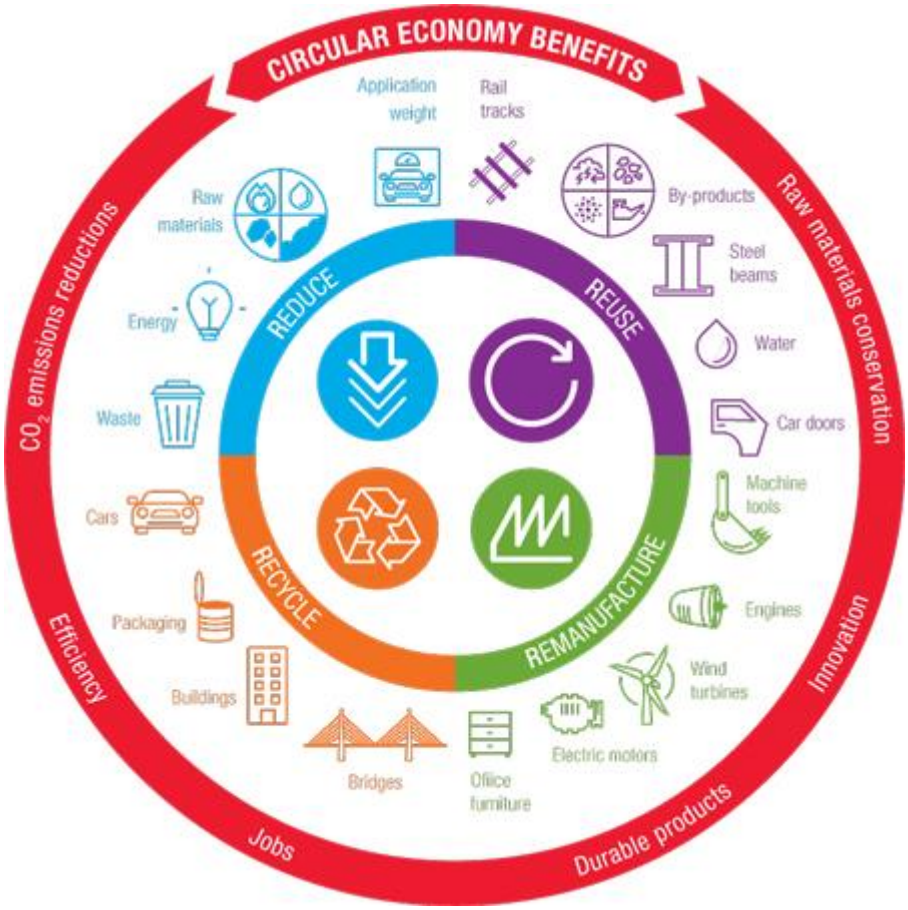


Fig. 2.2. Circular economy benefits

Circular development is directly linked to the circular economy and aims to build a sustainable society based on recyclable and renewable resources, in order to protect society from waste and to be able to form a model that is no longer considering resources as infinite. This new model of economic development focuses on the production of goods and services taking into account environmental and social costs.[13] Circular development therefore supports circular economy to create new societies in line with new waste management and sustainability objectives that meet the needs of citizens. It is about enabling economies and societies, in general, to become more sustainable.

However, critiques of the circular economy suggest that proponents of the circular economy may overstate the potential benefits of the circular economy. These critiques put forwards that the circular economy has too many definitions to be delimited, making it an umbrella concept that, although exciting and appealing, is hard to understand and assess. Critiques mean that the literature ignores much established knowledge. In particular, it neglects the thermodynamic principle that one can neither create nor destroy matter. Therefore, a future where waste no longer exists, where material loops are closed, and products are recycled indefinitely is, in any practical sense, impossible.

They point out that a lack of inclusion of indigenous discourses from the Global South means that the conversation is less ecocentric than it depicts itself. That there is a lack of clarity as to whether the circular economy is more sustainable than the linear economy, and what its social benefits might be, in particular due to diffuse contours. It may thus not be the panacea many had hoped for.

Sustainability

Intuitively, the circular economy would appear to be more sustainable than the current linear economic system. Reducing the resources used, and the waste and leakage created, conserves resources and helps to reduce environmental pollution. However, it is argued by some that these assumptions are simplistic; that they disregard the complexity of existing systems and their potential trade-offs. For example, the social dimension of sustainability seems to be only marginally addressed in many publications on the circular economy.

There are cases that might require different or additional strategies, like purchasing new, more energy-efficient equipment. By reviewing the literature, a team of researchers from Cambridge and TU Delft could show that there are at least eight different relationship types between sustainability and the circular economy.

In addition, it is important to underline the innovation aspect in the heart of sustained development based on circular economy components

2. The structure of the circular economy

Analysis of scientific publications on the study of circular economics shows a deep understanding of existing problems by scientists and the gradual formation of theoretical and methodological approaches to their solution. Based on the generalization of views on the essence of this category, we can identify the following areas of interpretation of the circular economy: model, activity, system, strategy, process, tool, philosophy.

It should be emphasized that the vast majority of authors in defining the principles of the circular economy uses the prefix "re" (from Latin means "again"), which characterizes the basic essence of the circular economy.

Thus, **the basic framework is circular economy "3R" consists of the following components:**

1) ***"reduce"*** – reduces the use of raw materials and materials, which involves reducing waste;

2) ***"reuse"*** – allows you to reduce the flow of resources into the production system;

3) ***"recycle"*** – recycling – involves a full-fledged resource use, which leads to a reduction environmental pollution.

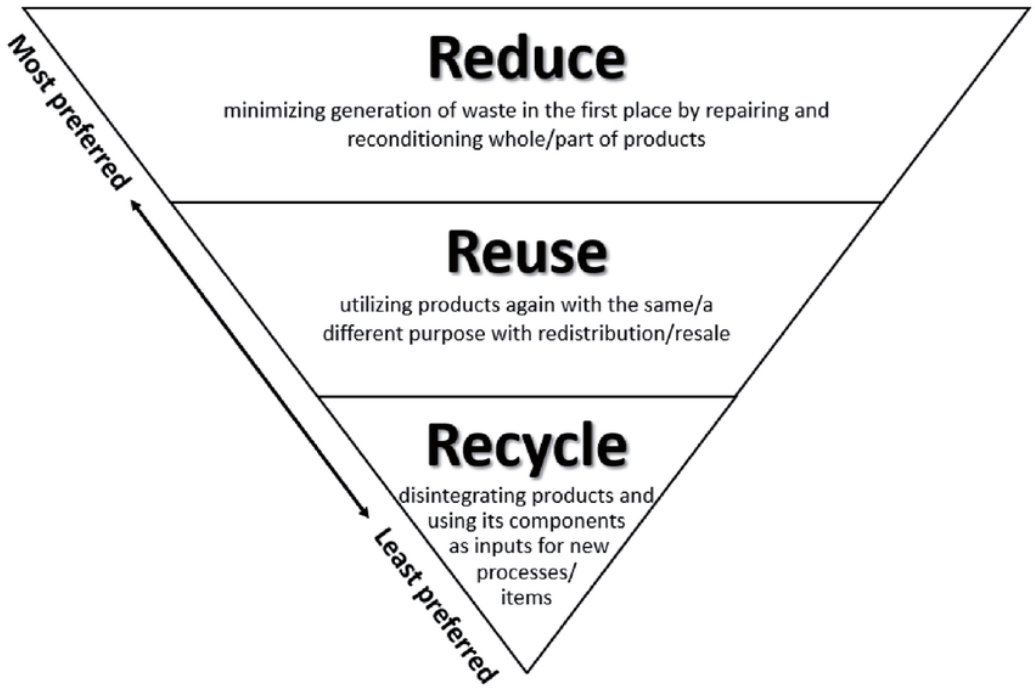


Fig. 2.3. The basic "3R" framework of circular economy

The conducted content analysis allowed to establish that at the beginning of the formation of the concept of circular economy, most scientists have identified it with the processes of recycling, as evidenced by the "3R" system.

Over time, the framework circular economy has been expanded to "10R", although in it clearly traces the continuity of the "3R" model, which expressed in the preservation of key elements of the system. Most scientists believe that the "10R" framework – this is not the final structure of the circular economy, as it is in constant improvement. Therefore, consider in more detail the components of the circular economy framework:

Elements of "10R" framework:

1) ***"refuse"*** – refusal of excessive use raw materials;

2) ***"rethink"*** – viewing the use of materials and products;

3) ***"reduce"*** – the use of fewer natural resources and materials;

4) ***"reuse"*** – reuse products that already were in use;

5) ***"repair"*** – repair and maintenance of a defective product with its subsequent use by main purpose.

6) ***"refurbish"*** – modernization of an old product;

7) ***"remanufacture"*** – change of product parameters, use of parts of obsolete product in a new product;

8) ***"repurpose"*** – repurpose used product to another area;

9) ***"recycle"*** – recycling;

10) ***"recover***" – energy production from materials and about products.

Thus, it can be stated that the circular economy is a prerequisite and driver of the new industrial revolution.

Conceptually, the circular economy involves the achievement of two goals. On the one hand, value used products must be recovered for ensuring maximum economic efficiency. On the other hand, the restoration of this value leads to a reduction in the negative impact on the environment and thereby meeting the socio-economic and environmental requirements of sustainable development.

Summarizing the above information, we can say that, the circular economy – is a restorative and regenerative system based on cyclicity resource flows, involves the formation of innovative solutions that synthesize environmental and economic aspects, creating a social basis for inclusive and sustainable development.

The consequences and prospects of practical implementation of the concept of circular economy differ depending on the level of functioning of the economic system. In particular, the implementation of the principles of circular economy at the micro level involves taking into account environmental aspects in the development of production processes and products (ecodesign), organization of clean production with low emissions, implementation of waste prevention systems, and strengthening consumer responsibility through eco-labeling and green public procurement.

Methods and tools of circular economy

Different tools and instruments have been developed by the Commission to facilitate the transition towards a more Circular Economy.

Let’s overview these available tools and highlights their area of intervention in the different steps of the Circular Economy.

Level(s) is a voluntary reporting framework to improve the sustainability of buildings. Using existing standards, Level(s) provides an EU-wide approach to assessing environmental performance in the built environment. It encourages life cycle thinking for the whole building by offering a step by step approach to life cycle assessment.

The building sector is a big consumer of resources in Europe. It uses about half of all materials extracted, half of all energy consumed and one third of all water consumed, and it generates one third of all waste. Environmental pressures arise at different stages of a building's life-cycle.

However, this also means that the building sector offers an enormous potential for setting the circular economy business case, including opportunities for sustainable building design, construction, repair, maintenance, as well as recycling and reuse of materials in the end of a building's lifespan. These opportunities have been increasingly recognised by the European Commission, which in 2014 adopted the *Communication on Resource Efficiency Opportunities* in the Building Sector and later on placed a special focus on sustainable buildings in the Circular Economy Action Plan.

To support such assessment, the Commission has developed a framework with indicators, called Level(s). It is a simple entry point to what can be a very complex area and covers energy, materials, water, health and comfort, climate change and life cycle cost and value.

Tools of circular economy:

1. ETV - EU Environmental Technology Verification. ETV is a new tool that helps innovative environmental technologies reach the market. This circular economy tool provides third-party verification of the performance of technologies, building trust among potential customers whilst reducing technological risk.

For successful circular economy uptake, innovative, efficient and at the same time reliable environmental technologies needs to enter the market ETV provides third-party verification of the performance of technologies, enabling innovators to differentiate themselves from competitors, build trust among potential customers and reduce technological risk. The verification procedure allows for an independent assessment and validation of the manufacturer's claims on the performance and environmental benefits of their technology. The information provided by ETV through the transparent, robust and independent process, can be useful especially to small companies that wish to enter and disrupt markets.

The EU-ETV Pilot Programme initiated by the European Commission has been targeted at environmental technologies whose value cannot be proved through existing standards or certification schemes and whose claims could benefit from a credible verification procedure as a guarantee to investors.

The Pilot Programme has been running in specific Technology Areas: Materials, Waste and Resources technologies, Water technologies and Energy technologies. Examples include new recycled, bio-based or recyclable materials, resource-efficient processes, performance of re-manufactured equipment. ETV may be used among others to integrate innovative requirements in supply chains and public procurement, to prove compliance with pre-standard specifications or generic requirements.

The EU Circular Economy Action Plan is set to further promote efficiency and updates of ETV especially in supporting innovations by SMEs.

2. PEF-OEF – Product Environmental Footprint and Organisation Environmental Footprint.

Product Environmental Footprint (PEF) and Organisation Environmental Footprint (OEF) – are comprehensive tools that measure and inform customers about the environmental impact of products and organisations. Their approach of assessing life-cycles reflects the essence of the circular economy. With increase of environmental consciousness customers are increasingly willing to buy green products. However, the current market offers a big variety of environmental labels and schemes leading to confusion and mistrust in environmental performance information. On the other hand, producers of green products in order to prove their environmental performance and enter the national markets need to apply methods that are authorised in these countries.

Therefore, the European Commission has adopted in 2013 two harmonised methods to quantify the environmental footprint of products and organisations:

1) based on life cycle assessment;
2) recognises the importance of addressing environmental impacts throughout the entire supply chain of product in an integrated way.

The life-cycle perspective of the PEF and OEF reflect the essence of the Circular Economy. This means by addressing the impact on each stage of the life cycle, PEF and OEF address better design of products, reduction of material use and waste, recycling. They enable companies to better define their circularity strategies, focusing their efforts where really matters, that is the reduction of the most relevant impacts related to their products/organisations. Through the Pilot the Commission supported development of PEF Category Rules for over 20 products and OEF Sector Rules for Retail and Copper production organisations. It is envisaged that PEF and OEF will contribute to Circular Economy growth in the EU by offering a strong gross-border market boost to products and stronger competitive position to companies assessed following the EU harmonised methods.

3. EU Ecolabel.

EU Ecolabel – is a voluntary label that helps to identify products and services that have reduced their environmental impact throughout their entire life cycle. It allows consumers to make informed choices and rewards producers who practice making efforts to create sustainable products.

Established in 1992, the EU Ecolabel promotes Europe's transition to a circular economy, supporting both sustainable production and consumption. Thanks to transparent ecological criteria, consumers can make conscious choices, without compromising on the quality of the products. Similarly, the EU Ecolabel rewards those manufacturers who choose to design products that are durable and repairable, promoting innovation and saving resources. Any goods or services that have been awarded the EU Ecolabel meet a set of high environmental and performance standards.

The EU Ecolabel is a component of the European Commission’s action plan on Sustainable Consumption and Production and Sustainable Industrial Policy and is referred to in the Circular Economy Action Plan. The EU Ecolabel has in fact acted as a pioneer in promoting circular economy, as the criteria to be complied with by the various products or services are based on the main principles of circular economy.

The EU Ecolabel supports products and services that have a lower environmental impact and contribute to sustainable development along their life cycle, are energy efficient, durable and repairable. In 2016-2017, the Commission adopted a new set of EU Ecolabel criteria for furniture, footwear, computers, wood-, cork- and bamboo-based floor coverings and tourist accommodation product and service groups, and more is to come. 2017 has been the year 25th anniversary celebrations of the EU Ecolabel, with actions promoting the scheme among all concerned stakeholders.

4. EMAS - Eco-Management and Audit Scheme.

EMAS – is the official European environmental management instrument that helps organisations improve their environmental performance and demonstrate their efforts to implement "reduce, reuse and recycle” practices. With EMAS, organisations can quantify their resource use, develop plans to improve their environmental performance, reach environmental goals, while coming up with new, more efficient management processes. EMAS is open to every type of organisation eager to improve its

environmental performance. It spans across all economic and service sectors and is applicable worldwide.

The European Commission sees EMAS as one of the tools that facilitate organisations towards the shift to the Circular Economy. EMAS offers organisations the management tools to save money and resources of all types by introducing various measures, including cutting wastes and material use, increasing water and energy efficiency, introducing "reduce", "reuse" and "recycle" practices. There are strong evidences that annual energy and material savings of EMAS registered organisation exceed the annual costs of maintaining EMAS.

In view of reaping the Circular Economy benefits, EMAS is increasingly offering more opportunities for economic savings. For examples, the European EMAS initiative have already registered experiences focusing on exchange and secondary use of products and materials by EMAS holders, which offer benefits such as avoiding cost for waste management for partners offering the materials and reduction of procurement cost for recipient organisations gaining access to resources.

Furthermore, the Green Public Procurement requirements are increasingly evolving to address Circular Economy, and the EMAS certified organisations with sustainable supply chains will have advantage in the procurement tenders.

5. GPP - Green Public Procurement.

GPP – is a powerful circular economy instrument that encourages demand for green products and services by promoting green markets and setting strong examples for public bodies to follow. The procurement of goods, services, and works by public authorities across Europe makes up around 14 % of the EU's GDP, accounting for about €2 trillion annually. By using their purchasing power to choose environmentally friendly goods, services and works, they can make an important contribution to sustainable consumption and production.

Green Public Procurement (GPP) is a voluntary instrument, but its key role in the EU's transition to a circular economy has been acknowledged in the Circular Economy Package. It can boost demand for resource efficient, durable, recyclable, repairable products, and promote new business models based on offering functionalities and services instead of selling products. Besides that, Green Public Procurement allows local, regional and national authorities to set examples to follow for businesses, industries, and organisations. To help public bodies to define green products the European Commission has developed support measures for public bodies, including the EU GPP criteria for priority product groups like construction, food and catering, IT equipment and transport. It has also set up a GPP helpdesk, published a "Buying Green!" handbook and built a collection of best practices that can provide ideas and inspiration for implementation.

The Circular Economy Package sets out several key actions on GPP, such as strengthening circularity requirements in the EU GPP criteria, and providing training on the circular economy. The Commission will also lead by example in its own procurement.

3. Models of circular economy

While the initial focus of academic, industry, and policy activities was mainly focused on the development of re-X (recycling, remanufacturing, reuse, etc.) technology, it soon became clear that the technological capabilities increasingly exceed their implementation. To leverage this technology for the transition towards a circular economy, various stakeholders have to work together. This shifted attention towards business-model innovation as a key leverage for 'circular' technology adaption.

Circular business models can be defined as business models that are: closing, narrowing, slowing, intensifying and dematerializing loops, to minimize the resource inputs into and the waste; emission leakage out of the organizational system.

This comprises recycling measures (closing), efficiency improvements (narrowing), use phase extensions (slowing), a more intense use phase (intensifying), and the substitution of products by service and software solutions (dematerializing).

These strategies can be achieved through the purposeful design of material recovery processes and related circular supply chains. These five approaches to resource loops can also be seen as generic strategies or archetypes of circular business model innovation. The development of circular products, circular business models, and, more generally the circular economy is conditioned upon the affordances of the materials involved, that is the enablement and constraints afforded by these materials to someone engaging with them for circular purposes.

Circular business models:

1. Circular suppliers.
2. Resources recovery.
3. Sharing platforms.
4. Product life extension.
5. Product as a service.

Circular Supplies Business Model

The Circular Supplies business model – is defined as fully renewable, recyclable, or biodegradable resource inputs that serve as feedstock, or raw materials, for a different production process. The overall goal of this business model is to lessen an organization’s dependence on new resources. This approach is especially important for companies that depend on scarce resources or commodities.

Building a circular economy means changing the way companies do business. It requires developing new, more efficient, and more profitable uses of waste and sources for industrial inputs that reduce our reliance on new, virgin natural resources. The overarching purpose of developing a circular economy is to allow all types of businesses to reduce, reuse, and recycle waste.

More than just decreasing the amount of trash in landfills and encouraging the recycling of paper and plastic, the models we’re discussing in this blog series are designed to turn all the waste that companies and individuals produce into a valuable, productive resource to be used again.

Starting from the premise that there would always be new resources to extract or cultivate, the business models of the past have been built around the concept that has been dubbed “take, make, waste.” The overconfidence caused by constant availability of new resources and the idea that we could manipulate nature continuously to meet our needs has led to resource depletion, large amounts of waste, and discarding existing goods or resources before their total value has been exhausted.

The question is, are there other ways of organizing businesses and economies that take into account the idea that earth’s resources are finite and are both profitable and sustainable? Simply, yes. There are multiple viable alternatives, and in this blog, we focus on the Circular Supplies model.

The Circular Supplies business model works by eliminating materials that are derived from virgin resources and replacing them with bio-based, renewable or recovered materials. This approach both reduces the use of new resources and allows the full value of existing resources to be extracted instead of discarded. In non-circular models, waste from one production process is thrown away, taking any residual value with it, but with the circular supplies model, it is used again, and that value is being better leveraged.

Why businesses should care about the Circular Supplies model

The driving force behind the Circular Supplies business model is to lessen our dependence on new resources. This model allows businesses to reduce their negative impact on the environment and operate on a more sustainable basis. In doing so, businesses can align themselves better with consumers who are demanding cleaner technology and less pollution and who are willing to pay for more expensive green, environmentally friendlier products.

Reducing their impact on the environment by using fewer resources is especially powerful for companies with a large environmental footprint or those dealing with scarce or depleted feedstock. As resources dwindle and become more expensive, adopting a Circular Supplies model will help these companies remain viable.

Examples of the Circular Supplies model

There are a number of examples of the Circular Supplies model in the real world. Any business that uses the residual outputs from one production process as feedstock for another process is operating on a circular basis.

Resource Recovery Busines Model

Resource recovery – is the activity of separating materials from waste that can be recycled into new products or used as an energy alternative to fossil fuels and is actioned with the goal of diverting as much waste from landfill as possible.

The efficient use of resources is what underpins the objective of resource recovery and is shaped by a hierarchy of 3 priorities outlined in the Waste Avoidance and Resource Recovery Act 2001, which is:

- ❖ avoidance
- ❖ resource recovery,
- ❖ disposal.

This hierarchy is most popularly known by the mantra reduce, reuse and recycle.

An example of reduction and avoidance of waste can be experienced in supermarkets and retail outlets across Australia with the ban on single-use plastic bags being introduced. With a reported estimate of 1.5 billion bags prevented from landfill by December 2018 alone, it is evident that reduction and avoidance in the first place is the most powerful method of resource recovery.

When complete avoidance and reduction of waste are not possible, resource recovery is most important. This not only involves the effective recovery of materials for recycling (processing waste materials to make the same or different products) but also, their re-use (without further processing).

During the recovery process, the waste is processed by machine and hand sorting to extract all recoverable materials for re-use and recycling. Materials are separated and processed for re-use – soil is screened, masonry is crushed, timbers and vegetation are mulched, while metals, glass, plastics, and cardboard are sent for recycling. Whether it's gravel for a rural road, mulch for landscaping in a city park, or a new glass bottle for soft drink, the bulk of the waste stream is re-purposed while the remaining residue of non-recyclable material is taken to certified landfill sites.

Great advancements and investments have been made in terms of resource recovery and increasing the amount of waste that is ultimately diverted from landfills. Waste Management experts such as Grasshopper Environmental have managed to achieve up to 90% in landfill diversion from the Building & Demolition waste stream alone. This is a significant achievement especially as we consider that the Building sector contributed to 20.4 Mt (Millions of Tonnes) of waste along in 2016-2017 according to the National Waste Report 2018 prepared for the Department of the Environment and Energy.

Sharing Platforms Business Model

The sharing model – is a service compensation model in which the owner sells access to underutilized assets to subsequent customers. Owners are responsible for maintenance and service quality.

One of the main differences with leasing is that the typical period of usage for sharing platforms is much shorter. Also, the number of users of assets in a sharing platform is much greater, justifying the name of this change in behavior as "*collaborative consumption*". Pooling is a type of sharing platform and provides an alternative perspective on product/service distribution options.

Industry examples of this type of revenue model include:

- ❖ vehicle ride sharing;
- ❖ short term accommodation rental;
- ❖ available labor and expertise;
- ❖ tools and equipment
- ❖ excess food supplies.

Product Life Extension Business Model

A circular economy is an alternative way of approaching products and resources. This is the final in a series of blog posts that explains the different business models that help companies at all scales and levels to reduce, reuse, and recycle waste, effectively and profitably. This post focuses on the Product Life Extension model.

The Product Life Extension business model focuses on lengthening the time period that a product can be used before disposing of it. The goal is to maximize both lifespan and utilization, by increasing the value extracted from products before they are discarded.

The ultimate goal of the model is to limit the amount of natural resources that a company is using. Products that quickly become obsolete or are made of low quality material and discarded are essentially wasting the resource inputs that went into making them. By either creating products that last longer or recycling those that become obsolete, this model can decrease our need for new, virgin resources.

On the surface, designing a product that lasts a decade instead of a few years does not seem easy or even beneficial to the people who produce the goods. In fact, it is often cheaper to replace an entire product rather than diagnosing the problem and replacing or repairing a single part of it. However, this mindset overlooks at least two crucial factors that will only become increasingly important as we move into a future with more limited resources and highly environmentally conscious consumers.

Cost reduction

By reusing materials from obsolete or damaged products, the producer can avoid purchasing raw materials, lowering input production costs. As new resources become scarcer and more expensive, finding alternative inputs will become even more critical to a business's success.

Corporate social responsibility

When goods are disposed of less often, less material ends up in landfills. In addition, not producing as many new products conserves energy and reduces pollution and harmful byproducts created through the manufacturing process. Helping to alleviate environmental problems has become and is becoming more important to many consumers. By adopting this model, a business can leverage being part of the solution, not the problem.

Why customers should care

If you're a customer, you might be thinking that this model will create more expensive products. In a way you would be correct. Companies will produce high quality, longer lasting goods that will most likely cost more to buy than lower quality, cheaply made goods.

While there is a higher upfront cost, you save more money in the long run through avoiding the purchase of cheaper products over and over again.

What are some real examples?

The Product Life Extension business model is not new. Essentially, any time you have something you own repaired, instead of throwing it away, you are engaging in this approach.

On the producer side, any time a company makes it easier for you to continue to use a product that you've already purchased, they are also engaging in this model.

Examples of this way of doing things stretch from simple to complex:

- **Remanufactured parts**. Instead of buying new parts or even whole new machines, equipment owners can have their existing components inspected, refurbished, and rebuilt to meet OEM specifications. This process allows owners to extend the life of their equipment at a fraction of the cost of buying a new machine.
- **Secondhand stores and online marketplaces**. Both old fashioned secondhand stores and online marketplaces embody the same principle: just because one person no longer has a use for a product doesn't mean another person can't gain value from it. Instead of throwing away goods, it's easier than ever to sell or give them away, so they can be used more than they would have been otherwise.
- **Updating software instead of hardware**. When companies offer or sell software updates and improvements or entire new operating systems, they are extending the life of their product. Building hardware that lasts while selling improved software is one way that businesses can still make a profit while selling fewer hardware products.

How can my business adopt the model?

Making the switch to a circular business model can be an attainable and profitable goal for any company. Implementation looks different for every business, but what's important is taking the first steps towards bringing circularity to your organization. Partnering with an organization that understands the circular economy and circular business practices is the first step.

Product as a Service Business Model

Product as a Service (PaaS) is a pragmatic and increasingly popular business model which provides the computing platform for cloud applications. The services developed within this model differ from the conventional process of simply selling a product. Instead, PaaS transforms the product into one that can be reused, repaired, recycled and redistributed. The user pays as and when they access the service, as opposed to paying a single lump sum for a single usage. PaaS indicates a business trend that favours practicality over conspicuous consumption. As well as making companies more efficient, this is contributing to overall sustainability. It also demonstrates the shift towards a circular economy.

Product-as-a-Service (PaaS) – is a business model that allows customers to purchase a desired result rather than the equipment that delivers that result. For example, a manufacturing operation may need to have two pieces of metal welded together. In the traditional purchasing model, the manufacturer would buy a welding robot. In the PaaS model, the company would purchase a certain number of welding operations, not the

robot itself – in effect, paying for repetitions instead of robots. This model offers benefits to both the customer and the provider. Some examples of products as a service, which shift the risk of performance from the customer to the manufacturer, include jet engines, compressed air, valves, robots, water pumps, smart lighting systems, and even passenger trains.

A PaaS relationship typically involves agreements among three entities:

1) the client, who purchases the service;
2) the manufacturer, who delivers the product and its associated services;
3) the PaaS platform provider, who handles the infrastructure, including data collection, transmission, storage, security, and analytics.

Broader adoption of product as a service has been enabled by IoT, sensor technology, data analytics, personal mobile devices and cloud computing. Cheap and widely available wireless and internet connectivity make it feasible for manufacturers to outfit their products with sensors that indicate how a product is being used, as well as environmental factors that affect its reliability, such as temperature and humidity, or the failure of a specific part. The manufacturer can monitor the product remotely and apply predictive analytics to the captured data to identify and address mechanical problems or find opportunities to offer new products and services to the customer. It can also foster the customer relationship through smartphone apps that allow the user to monitor and control certain aspects of the product, provide feedback to the manufacturer and order new products and services. Enterprise software, especially ERP, customer relationship management (CRM) and product lifecycle management (PLM), are usually necessary for managing the products, services and customer relationships, and some vendors are explicitly marketing their software as product-as-a-service platforms. Related tools, such as field service management (FSM), asset performance management and enterprise asset management (EAM) software come into play for managing and servicing products

Circular business models, as the economic model more broadly, can have different emphases and various objectives.

Objectives of circular economy models:

- ❖ extend the life of materials and products, where possible over multiple 'use cycles';
- ❖ use a 'waste=food' approach to help recover materials, and ensure those biological materials returned to earth are benign, not toxic;
- ❖ retain the embedded energy, water and other process inputs in the product and the material for as long as possible;
- ❖ use systems-thinking approaches in designing solutions;
- ❖ regenerate or at least conserve nature and living systems;
- ❖ push for policies, taxes and market mechanisms that encourage product stewardship, for example 'polluter pays' regulations.

4. Rational use of natural resources: methods of circular economy assessment

The circularity concept has undeniable relevance, it is considered as an oriented process of modernization for the linear model of the economy to achieve qualitative development of various socio-economic phenomena. A historical review was previously presented, it covers circular economy emergence and formation and its relationship with new industrialization phenomenon; a variety of interpretations of "circular economy" concept was studied and main approaches to its formation were determined.

The purpose of this question is to analyse various methodological approaches to the assessment of circular economy development in the socio-economic space, necessary for further development and testing a new assessment tool.

In 2019, a group of scientists, after studying more than fifty-five different approaches to circular economy assessment "... that are developed and used by scientists, companies, environmental organizations, government agencies, created their taxonomy based on the needs arising from application of such indicators, including ten categories for differentiation and definition of C- indicators driven by the principles of the circular economy...".

C-indicators include:

1) level (*micro, meso, macro*);
2) cycle (*conservation, reuse / recovery, recycling*);
3) performance (*internal, impact*);
4) perspective (*actual, potential*);
5) usage (*for example: improvement, comparison, communication*);
6) transversality (*general, branch*);
7) size (*one, several*);
8) units of measurement (*quantitative, qualitative*);
9) format (*for example: a web-based tool, Excel-formula*);
10) sources (*scientists, companies, agencies*).

C-indicators can be considered as extraordinary incentives to move to a more advanced level of circularity.

In 2011, the Regional Circular Economy Index System was introduced, based on three indicators, according to the **3R imperatives**: ***pollution reduction, waste recycling*** and ***recycling of materials***.

In 2011, researcher J. Guo-gang presented an **index system for assessing the level of circular economy development, consisting of 16 indicators grouped into four groups:**

1***) consumption*** (*water consumption per million GDP, water consumption per capita, elasticity in water use, energy consumption per million GDP*);

2) ***environmental violations*** (*norms of industrial wastewater discharge, level of harmlessness of household garbage, application of chemical fertilizers per unit of acreage*);

3) ***waste management*** (*urban wastewater treatment per capita, integrated solid industrial waste utilization rate, resource utilization network coverage, "three waste" utilization rate*);

4) ***social development*** (*GDP per capita, urbanization rate, unemployment rate, Engel coefficient, GDP growth*).

In 2012, a group of scientists led by Yu. Geng suggested a **system of indicators structured into two groups for evaluation:**

- **macro-level** (22 indicators);
- **industrial park** (12 indicators).

This system is designed to facilitate methodological processes of introduction of circular economy and increase attention to environmental problems.

In 2013, in China, the Ministry of Environmental Protection (MEP) drafted **indicators system for circular economy assessment at the meso-level based on 21 indicators divided into four groups**: *economic development, waste management, pollution control, administration and management.*

In 2015, C. Ruiter (2015) proposed "the Circular Economy Performance Index", acting as a useful **tool for assessing the level of business circularity. The system consists of 25 key performance indicators (KPI) of the circular economy, classified into three levels according to impact degree:**

1) high (red);
2) medium (orange);
3) low (green).

According to the obtained calculated values the analyzed object can be assigned to one of five categories: "non-compliance", "compliance", "beyond compliance", "integrated strategy", "goal/mission", providing an opportunity to quickly realize shortcomings in the circular economy concept implementation.

In 2015, "EU Resource Efficiency Scoreboard 2015" presents **a system for assessing the circularity of economy on 32 indicators formed into a three-level system:**

1) a common leading indicator of "resource productivity";
2) a second-level dashboard of additional macro indicators for materials, land, water and carbon;
3) a third-level of thematic indicators to measure progress towards key thematic goals, as well as actions and milestones set out in the road map...".

They are grouped into main topics and sub-topics:

• **resource productivity** (main indicator);

• **dashboard indicators** (materials, earth, water, carbon);

• **transforming the economy** (turning waste into resources, supporting research and innovation; pricing correctly);

• **nature and ecosystems** (biodiversity; clean air; land and soil);

• **key areas** (solving the food problem; improving buildings; ensuring effective mobility).

Resource productivity is the main indicator of the evaluation system under consideration. It is used as a measure of resource efficiency, i.e. how effectively an economy uses material resources to produce products and services available in the market.

The efficiency of resources use by the state largely depends on:

❖ the structure of national economy,

❖ the size and structure of international trade, while the economy is able to create more wealth without a proportional increase in resource consumption.

The World Business Council for Sustainable Development (WBSCD) identifies three other important tools for assessing the circular economy:

1) ***The Life Cycle Assessment (LCA)*** is a method of assessing the environmental impact associated with all stages of the product life cycle from extraction of raw materials to disposal; it is an indirect tool used in the circular economy, but, nevertheless, so-called "life cycle analysis" (or "ecobalance") is extremely important.

2) ***The Circular Economy Toolkit (CET)*** is an assessment method that identifies and evaluates the potential improvement in circularity of products, i.e. it is also associated with life cycle analysis. This is an online test without score points, which includes 33 questions, developed at the University of Cambridge. Questions are divided into 7 subcategories according to the stages of product/service life cycle. It is presented as a web page and gives a qualitative assessment, structured into three categories (low, medium, high).

3) ***Circular economy Indicator (the Circular Economy Indicator Prototype, CEIP)*** evaluates the performance of cyclic products. Developed on the basis of calculation functions of MS Office Excel, using a questionnaire with a score system of assessment, consisting of fifteen questions divided into 5 stages of a life cycle, namely:

❖ design or redesign;

❖ manufacture;

❖ commercialization;

❖ use;

❖ end of life.

Presented as a spreadsheet in an Excel file, gives a quantitative estimate, measured in %.

In 2019, A. Avdiushchenko A., Zając P. proposed **a system of evaluation "Circular Economy Indicators" which includes 25 indicators divided into 7 groups:**

1. **Economic development** (GDP per capita, average life expectancy at birth for men, registered unemployment rate, poverty risk level).

2. **Zero economy** (municipal waste collected selectively in relation to the total amount of municipal waste collected; municipal waste collected per inhabitant; industrial and municipal waste water requiring treatment; expenditures on fixed assets

serving environmental protection and water resources management related to waste processing and disposal).

3. **Innovation economy** (research and development expenditures per capita, fixed prices; average share of innovative enterprises in the total number of enterprises; adults involved in education and training; patent applications per 1 million inhabitants).

4. **Energy efficiency and renewable energy** (share of renewable energy sources in total electricity production; expenditures on fixed assets serving environmental protection and water resources management related to energy saving per capita; electricity consumption).

5. **Low-carbon economy** (emissions of carbon dioxide from plants particularly harmful to air purity; emissions of particles; cars; pollutants remaining or neutralized in pollutant reduction systems in common pollutants produced from plants particularly harmful to air purity; costs of fixed assets serving environmental protection and water management related to air and climate protection).

6. **Smart economy** (households with a personal computer with broadband Internet connection; businesses with broadband Internet access).

7. **Spatially efficient economy** (forest cover indicator; urban greenery and the share of parks, lawns and green areas in residential areas in the total area; urbanization coefficient).

The assessment of circular economy development takes place at three levels:

1) micro;
2) meso;
3) macro.

Macro-level indicators are needed for evaluation and monitoring in order to improve various programs at the state level.

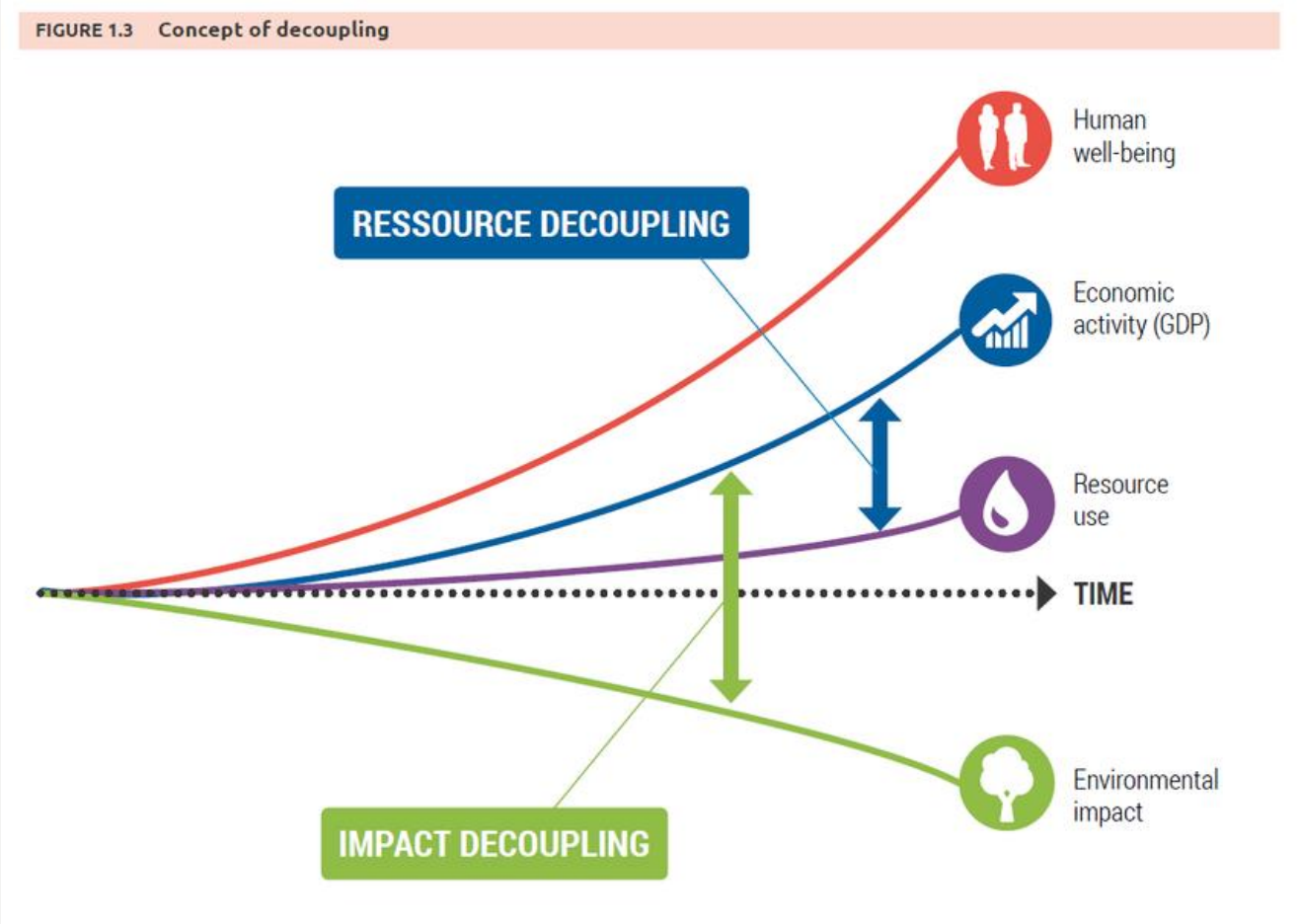
Micro-level indicators tend to cover 3R imperatives without reflecting the full range of distinctive features of the circular economy, analyzing the environmental friendliness and waste-free production and consumption.

At the same time, there is no clear distinction in the set of indicators, in this regard, they can be repeatedly used at the same time. Most of the studied indicators are focused only on one and/or several specific environmental problems than contribute to the estimated subjectivity.

An extremely important condition for activating the intensification of transition to the circular economy model is creation of a comprehensive methodological tool for assessing its development, which is required for effective strategic and program planning at the state level.

GLOBAL ECONOMIC DECOUPLING

1. DECOUPLING: WHAT ARE WE TALKING ABOUT?



- In economic and environmental fields, decoupling refers to an economy that would be able to grow without corresponding increases in environmental pressure.
- In many economies, increasing production (GDP) currently raises pressure on the environment. An economy that would be able to sustain economic growth while reducing the amount of resources such as water or fossil fuels used and delink environmental deterioration at the same time would be said to be decoupled.
- Environmental pressure is often measured using emissions of pollutants, and decoupling is often measured by the emission intensity of economic output.
- Examples of absolute long-term decoupling are rare, but recently some industrialized countries have decoupled GDP growth from both production- and, to a lesser extent, consumption-based CO2 emissions.

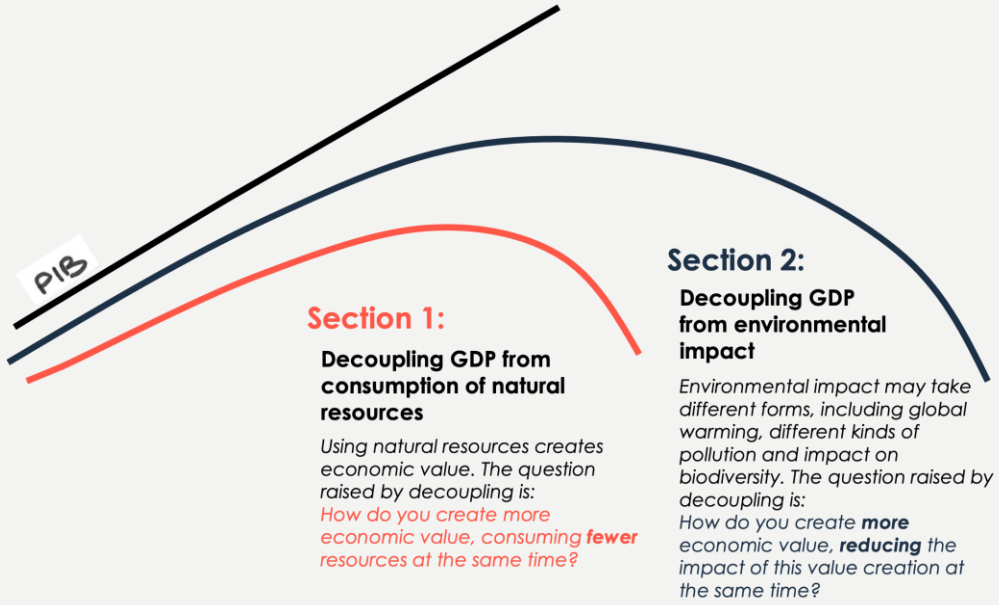
WHAT VARIABLES ARE WE TALKING ABOUT?

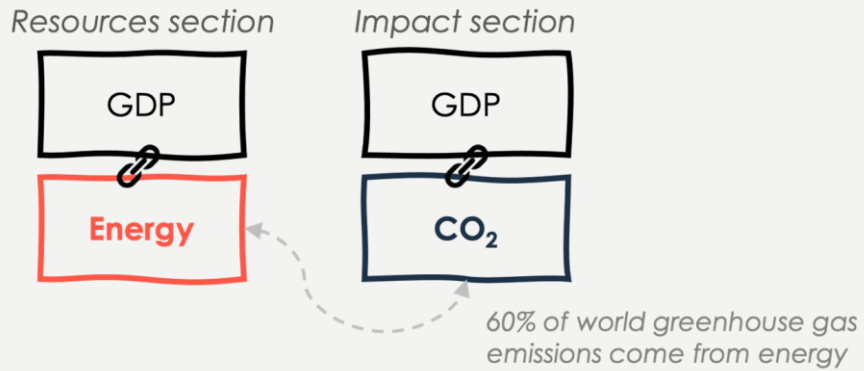
WHAT DO WE WANT TO DECOUPLE?

- On the basis that our society is faced with an unprecedented ecological crisis, it would mean, in the words of the OECD's, "breaking the link between environmental bads and economic goods"[1]. In fact, it is the need for double decoupling that must be stressed. In a context of economic growth, or rise in gross domestic product (GDP), it would mean:

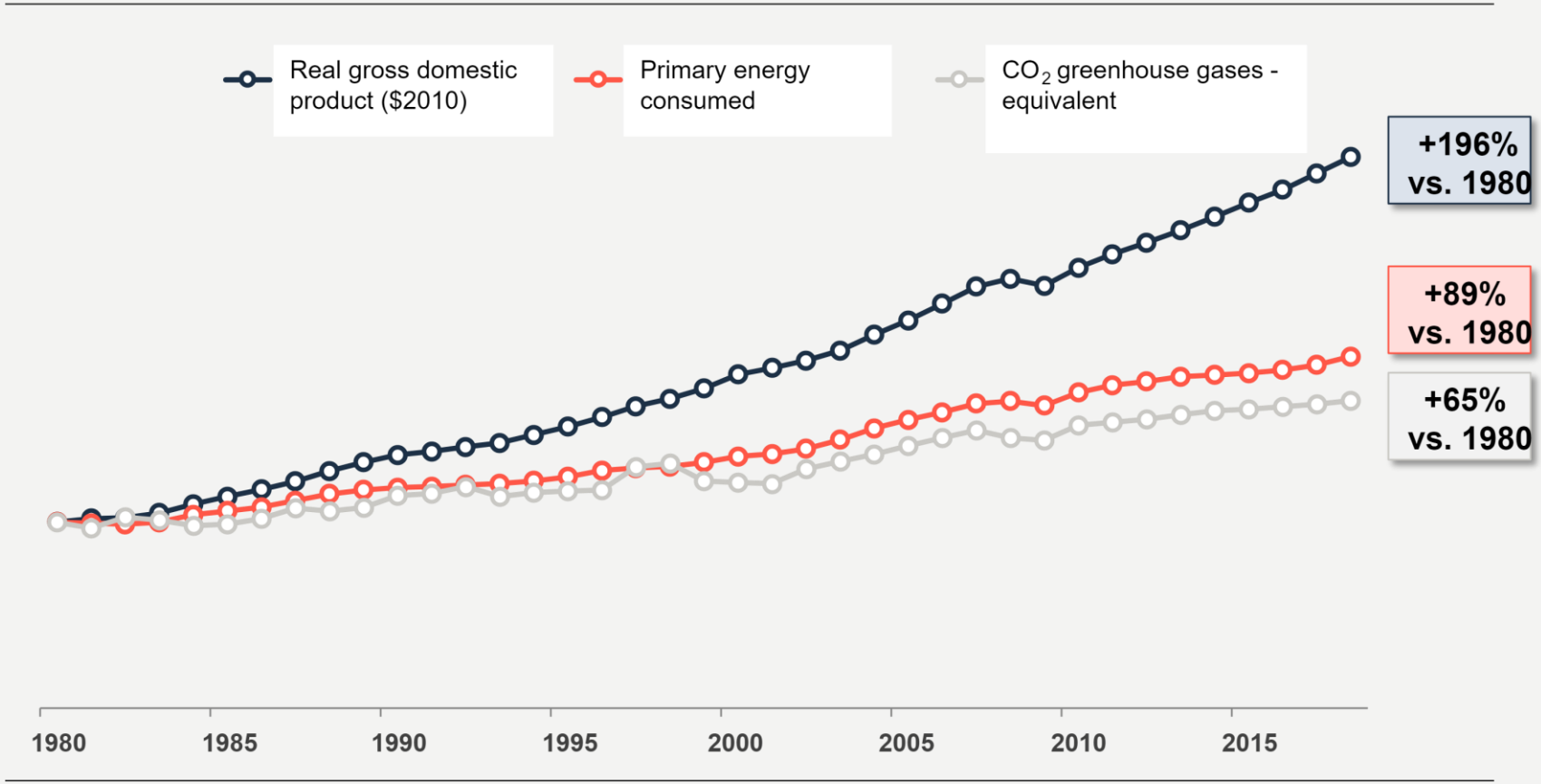
- upstream, to reduce the use of "finite" natural resources;
- downstream, to reduce the environmental impact of the use of these resources.
- This concept of double decoupling has been evoked by the European Commission since 2005 and has been cited in many reference publications on the subject. We ourselves are going to cite it in this publication, as it is worth focusing on both entrants into the economy (natural resources, some of which are non-renewable) and its impact on the environment.

DOUBLE DECOUPLING





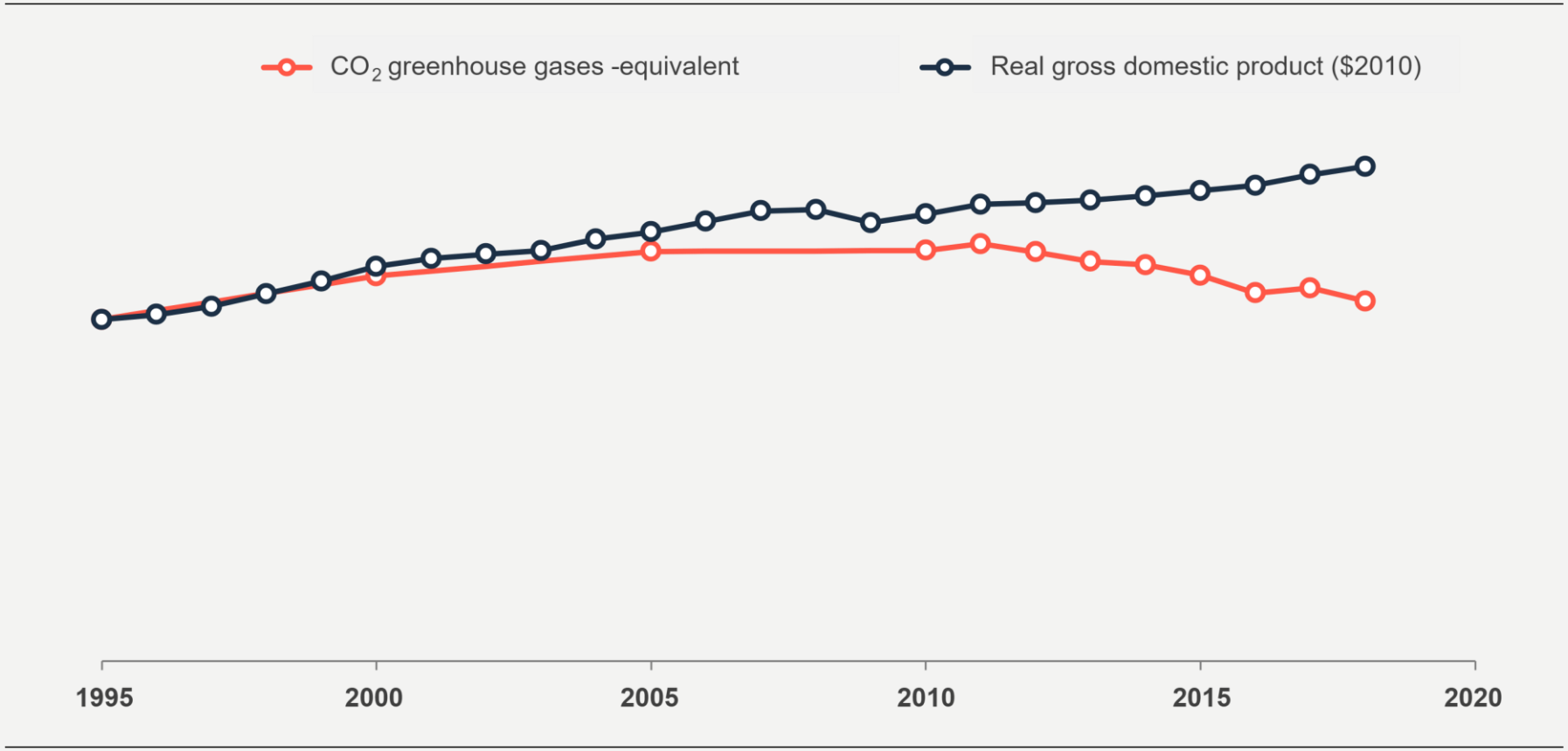
1. WE NEED ABSOLUTE DECOUPLING, NOT JUST RELATIVE



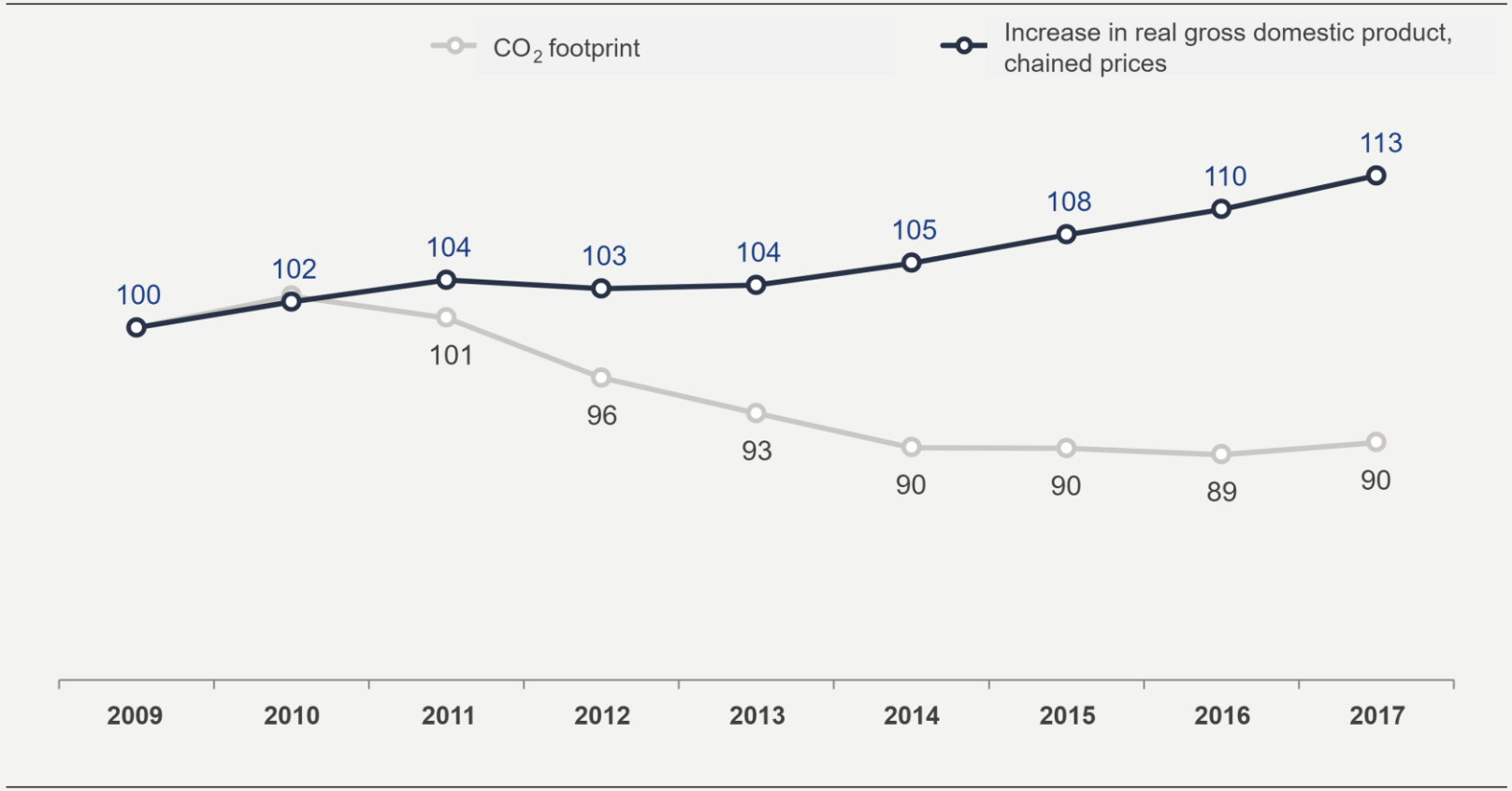
ABSOLUTE DECOUPLING

- means that the variables become independent of one another, and are therefore free to go in opposite directions. If one rises, this does not prevent the other from falling and vice versa; an increase in GDP could arise at the same time as a sufficient - even massive - fall in resource consumption, or environmental impact.
- In France, if we consider all greenhouse gases in the footprint (in other words, greenhouse gases induced by final demand), we see a reduction in this footprint from 2010 onwards. In parallel, GDP rises (with the exception of 2009, due to the economic crisis). From 2010 onwards, the variables "GDP" and "greenhouse gas footprint" go in opposite directions: thus, there is absolute decoupling between these two variables in France over the 2010-2018 period.

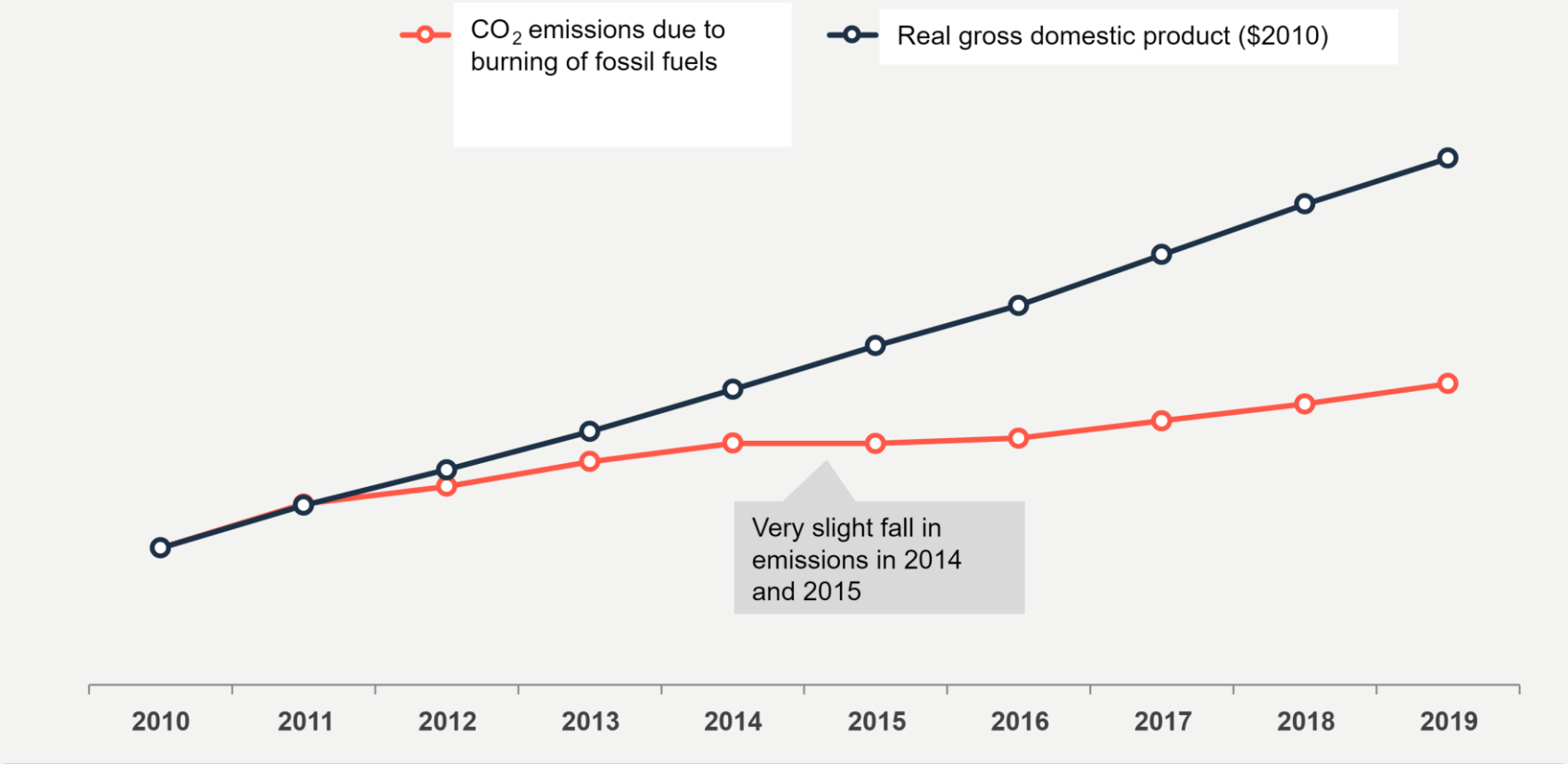
CHANGE IN GREENHOUSE GAS FOOTPRINT AND GDP IN FRANCE | 1995 - 2020

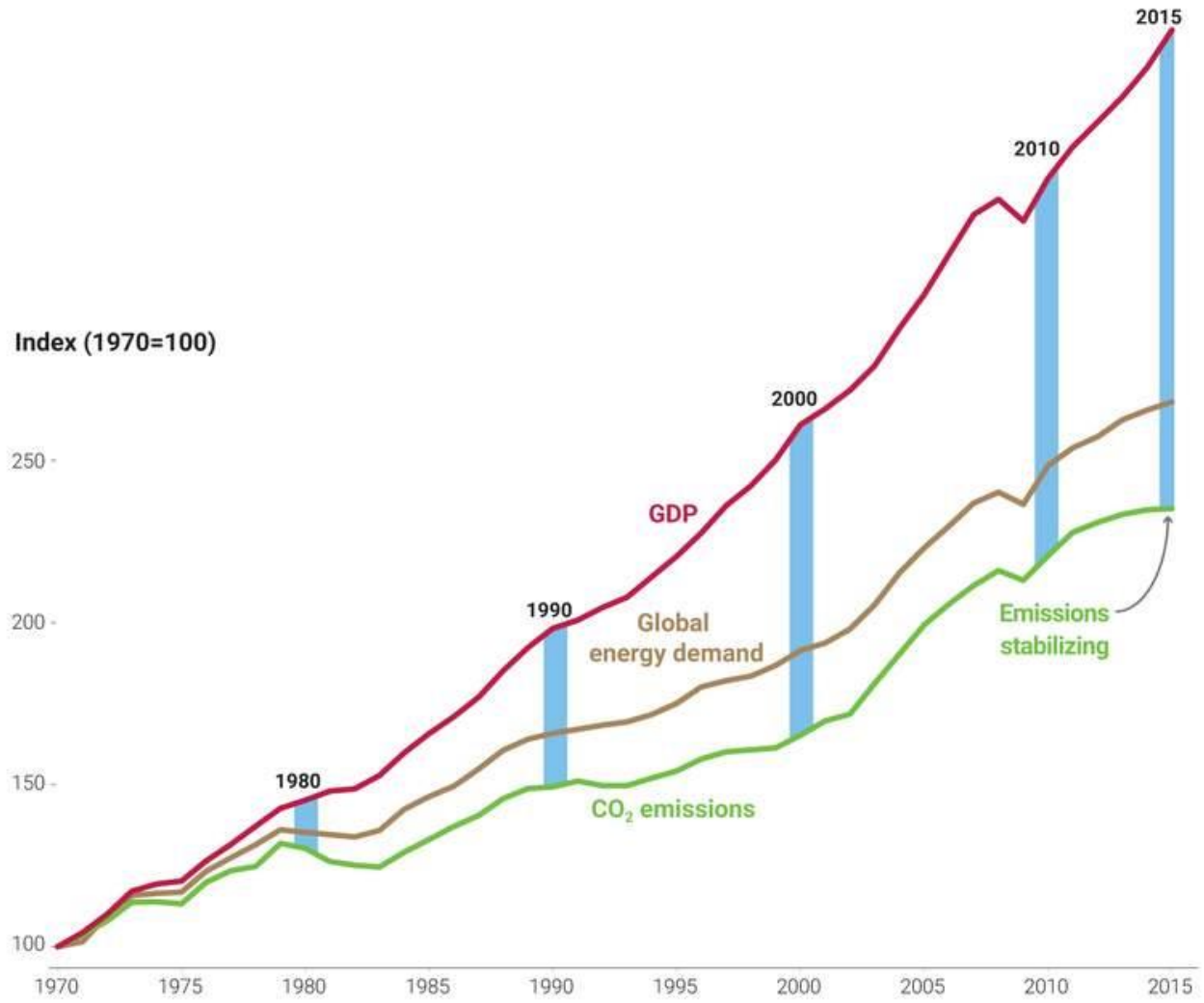


CHANGE IN CO2 FOOTPRINT AND GDP IN THE EUROPEAN UNION (EU28) | 2009 - 2017

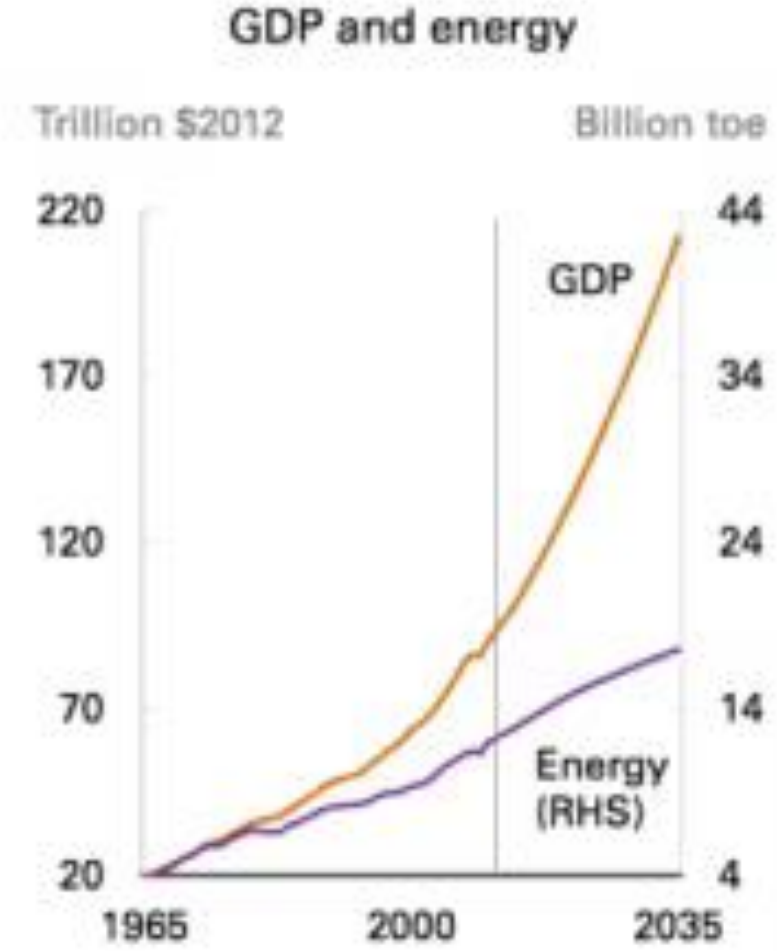


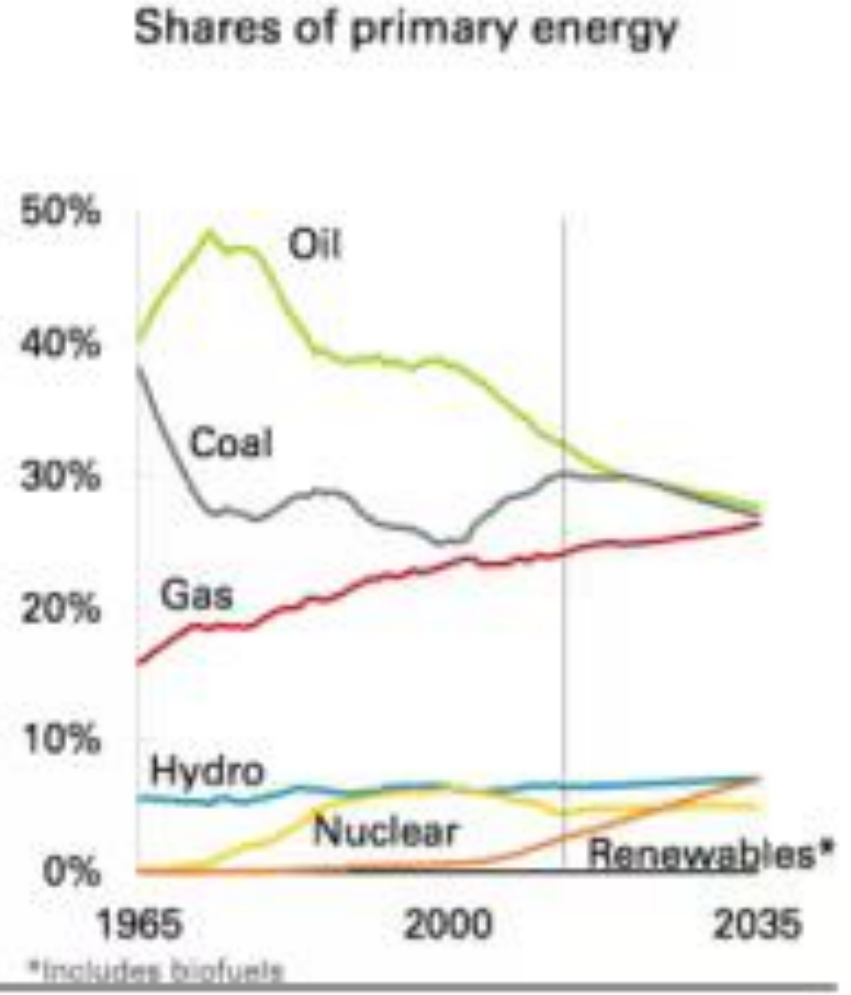
CHANGE IN CO2 EMISSIONS AND GDP ON A WORLD SCALE | 2010 - 2019 (BASE 100 IN 2010)



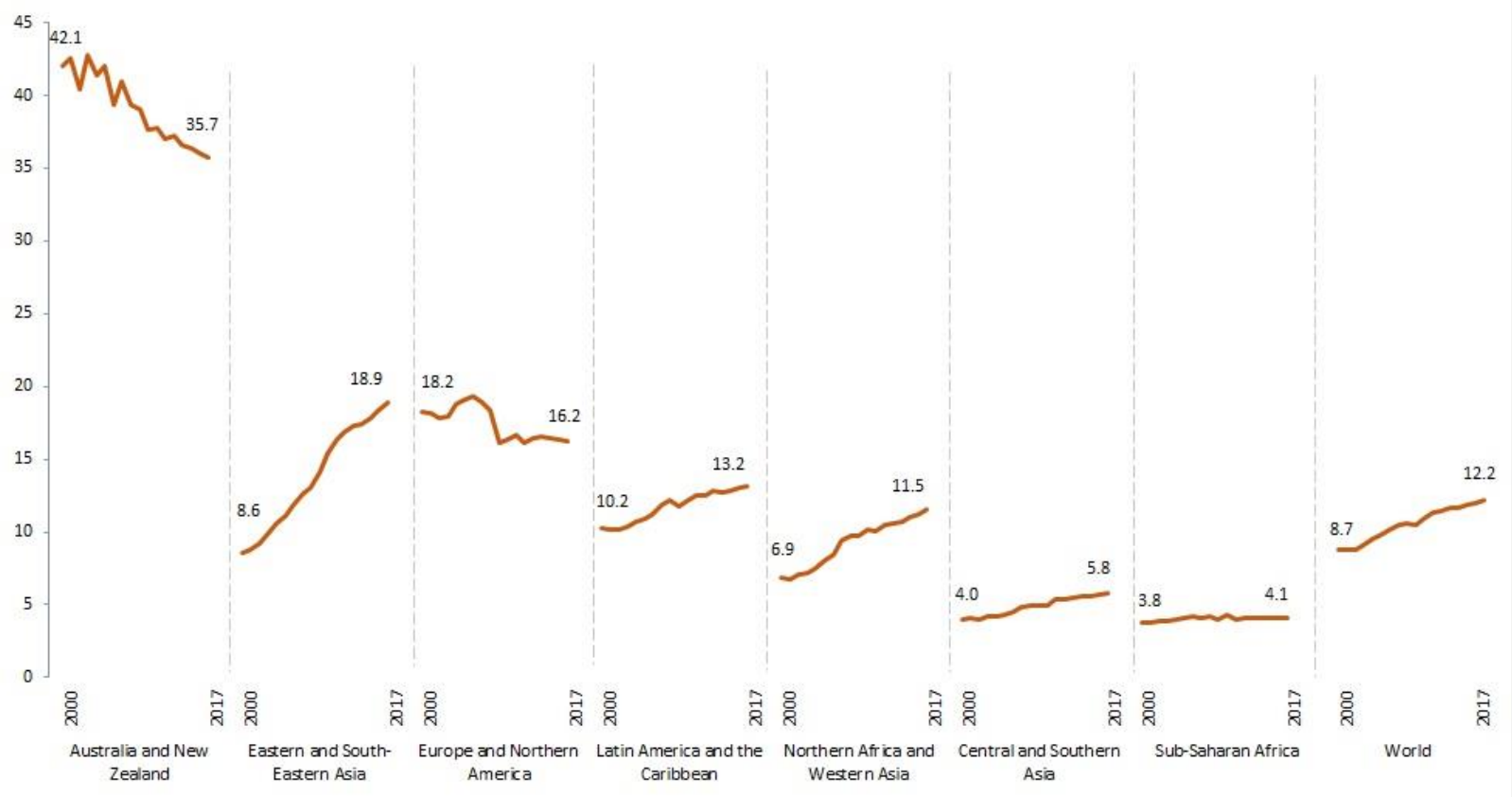

Index (1970=100)
250
200
150
100
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
1980
1990
2000
2010
2015
GDP
Global energy demand
CO_2 emissions
Emissions stabilizing

Energy is gradually decoupling from economic growth…

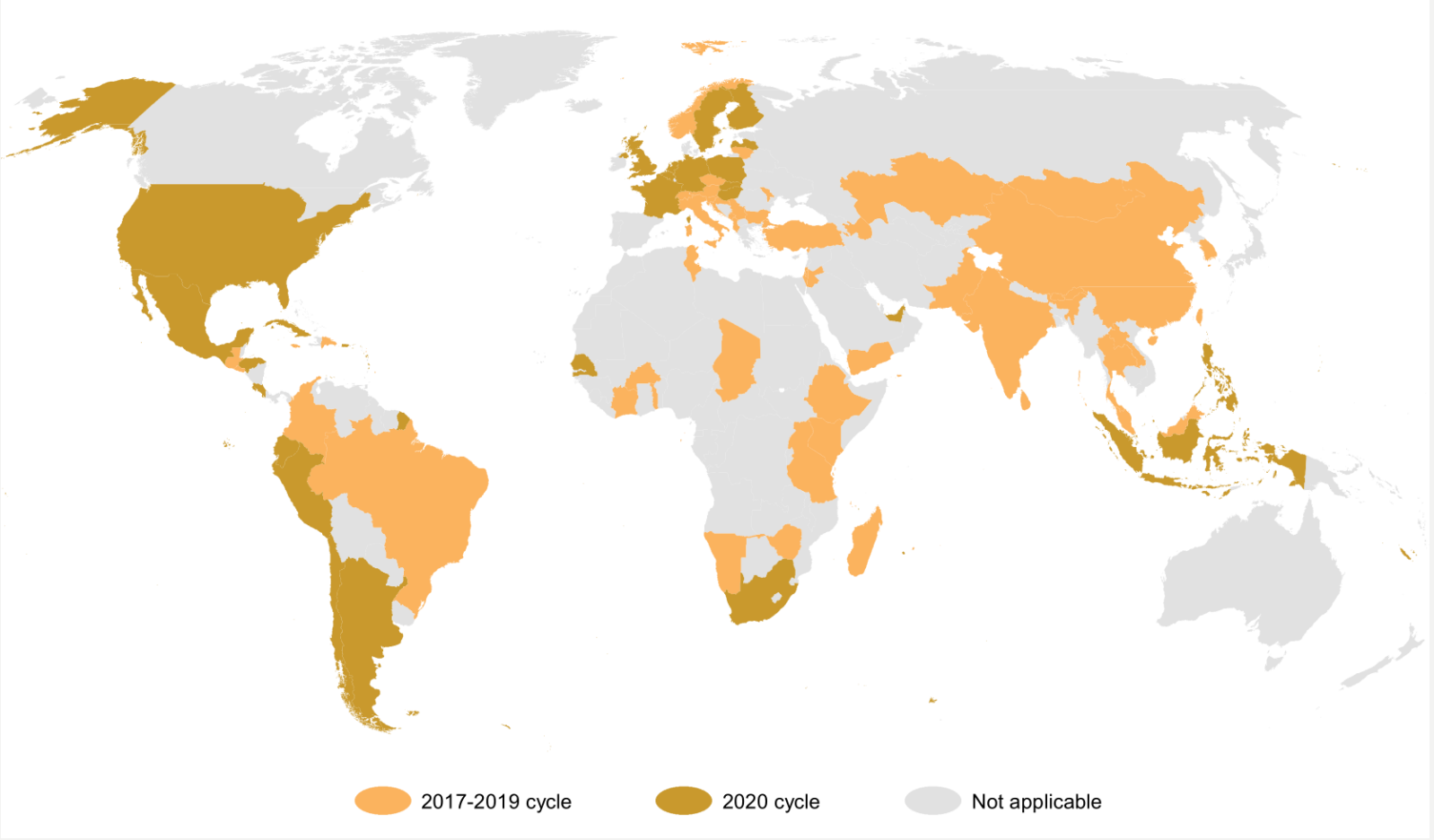




DOMESTIC MATERIAL CONSUMPTION PER CAPITA, 2000 TO 2017 (METRIC TONS PER CAPITA)



COUNTRIES REPORTING ON NATIONAL ACTION PLANS OR POLICIES ON SUSTAINABLE CONSUMPTION AND PRODUCTION, 2017–2019 REPORTING CYCLE AND 2020 REPORTING CYCLE



1

The rapidly growing rate of natural resource consumption is unsustainable

Globally, domestic material consumption per capita, the total amount of materials directly used by an economy to meet its consumption needs, rose by more than 40 per cent from 2000 to 2017 – from 8.7 to 12.2 metric tons. All regions except Europe and Northern America and Australia and New Zealand experienced significant increases over the past two decades. Rising domestic material consumption in developing regions is mainly due to industrialization, including the outsourcing of material-intensive production from developed regions. Natural resource use and related benefits, along with environmental impacts, are unevenly distributed across countries and regions. A path for sustainable consumption and production requires circular economy approaches, designed to reduce or eliminate waste and pollution, keep products and materials in use, and regenerate natural systems.

2

Progress to promote sustainable production and consumption is uneven

Shifting to sustainable consumption and production patterns is a prerequisite to addressing global crises, including climate change, biodiversity loss and pollution, and is central to achieving sustainable development. There is a positive trend in the development of national instruments and strategies aimed at supporting this shift. By 2020, 83 countries and the European Union reported a total of 700 policies and implementation activities under the 10-Year Framework of Programmes on Sustainable Consumption and Production. However, only 50 policies and implementation activities were reported in sub-Saharan Africa, compared with 374 in Europe and Northern America.

As of December 2020, 40 countries had reported on sustainable public procurement policies or action plans (or equivalent legal dispositions), which encourage the procurement of environmentally sound, energy-efficient products, and promote more socially responsible purchasing practices and sustainable supply chains.

3

Electronic waste continues to proliferate and is not being disposed of in a responsible way

In 2019, the world generated 53.6 million metric tons of electronic and electrical equipment waste (e-waste), an increase of more than 20 per cent since 2014. Each person generated about 7.3 kilograms of e-waste in 2019, of which only 1.7 kilograms was documented to have been managed in an environmentally sustainable way. Improper disposal of e-waste causes poisonous chemicals to be released into the soil and water, putting environmental and human health at risk. It results in a significant loss of scarce and valuable raw materials, such as gold, platinum, cobalt and rare earth elements. As much as 7 per cent of the world’s gold may currently be contained in e-waste.

E-waste generation is expected to grow by 0.16 kilograms per capita annually, reaching 9.0 kilograms per capita in 2030 (or 74.4 million metric tons in total). However, the realized annual growth rate of e-waste recycling in the past decade was only 0.05 kilograms per capita. It will need to be at least 10 times higher to ensure recycling of all e-waste by 2030.

Following on from this introduction, why focus on GDP as the variable to be decoupled from consumption of resources and environmental impact? Thought of as a monetary aggregate of everything that is physically produced through human productive activity, GDP is considered the reference indicator for quantifying the economy as a whole. However, it is not an indicator of the good health of societies and ecosystems.

In the US for example, life expectancy has been decoupled from GDP for 4 years[6]. As far as ecosystems are concerned, the increase in world GDP over the last 50 years has been accompanied by a biodiversity crisis.

As this indicator is generally used in debates on decoupling between economy and environment, it is the one we will use in this publication[7].

Let us consider the problem in terms of the climate emergency we are faced with.

What decoupling would we need to respond to this major[8] crisis?

We need decoupling that combines several additional criteria. They are described below and some are described in the report *Decoupling debunked*[9] by the European Environmental Bureau (a network of European environmental associations).

In practice, the term decoupling is used whenever there is loss of proportionality between the two variables considered.

- Relative decoupling means that the two variables remain coupled, but “to a lesser extent” than the historical trend, an increase in GDP therefore meaning “just” *a lower-than-before rise in consumption of resources and environmental pollution*[10].

Today, concerning global warming, the level of greenhouse gas emissions is such that we could not stop at mere relative decoupling: the annual flow of emissions must fall, rather than rise at a slower rate. As far back as there are statistics, the only phenomenon

that has been observed on a global scale is relative decoupling of GDP variables and energy consumption or greenhouse gas emissions.

Graph 1 below illustrates what relative decoupling is, both for energy and emissions versus GDP. Over the period 1980-2018, the three variables increase, but the energy and emissions increase more slowly than GDP. Each unit of GDP thus required less energy, and generated fewer greenhouse gases. Therefore, the 2018 GDP is higher than in 1980 for the same quantity of energy. However, for the overall climate system, it is the total quantity of greenhouse gases emitted that counts:

As long as this quantity continues to increase, it affects the climatic balance a little more, and increases the Earth's temperature.

Symmetrically, the only times when emissions and energy decrease is times when GDP falls (in 2009, and again in 2020).

11

We need sustainable decoupling

As with the geographical scope, the time period studied is important. It is in fact possible to observe one-off decoupling, followed by rebound effects (which could be qualified as recoupling). However, to meet the challenges posed by climate deregulation, we need to maintain this decoupling over time, until we reach a sustainable balance between greenhouse gas emissions and sinks (natural or technological).

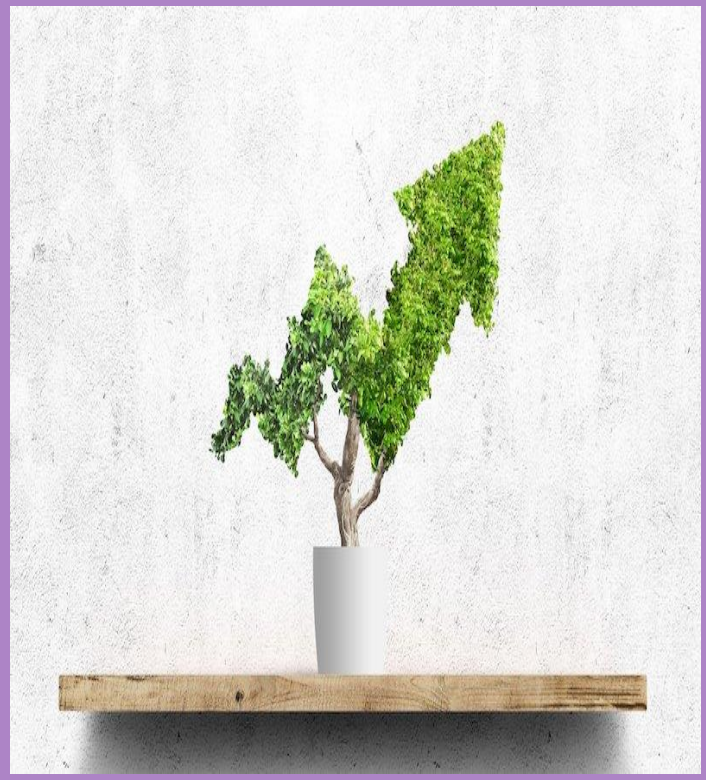
For example, in 2014 and 2015, global CO2 emissions due to the burning of fossil fuels fell very slightly, whilst GDP rose between these two milestones. The two trends are represented below, with the fall in emissions almost imperceptible (and therefore likely to be within the margin of error). This one-off absolute decoupling was not maintained over time since emissions began to rise again the following year[18].

Inclusiveness of Sustainable investments in circular economy

Iryna Zvarych, Doctor of Economics, Professor,

Head of the International Economics Department,

West Ukrainian National University



- **“Responsible” or “sustainable”** finance and a focus on *environmental, social and governance (ESG) factors* have moved firmly *into the mainstream today*

Environmental:

- Climate change
- Greenhouse gas (GHG) emissions
- Resource depletion, including water
- Waste and pollution

•Social:

- Working conditions, including slavery and child labour
- Local communities, including indigenous communities Conflict regions
- Health and safety
- Employee relations and diversity

•Governance:

- Executive pay
- Bribery and corruption
- Political lobbying and donations
- Board diversity and structure
- Tax strategy

Myth 1:
Sustainable investment is only about protecting the environment.

- **"E" in "ESG"** is really "**environment**", but sustainable investment is not just about protecting the physical aspects of the planet.
- **"S" and "G" ("social" and "government")** are also key to sustainable investment.

- But to meet the goal of limiting the global temperature increase to 1.5 °C (2.7 °F), about **$90 tn of investment is needed by 2030**

- **$30 tn Globally**, sustainable investing assets in the five major markets, representing **a 34% increase in two years**

Myth 2:
Sustainable investing is simply NOT investing in something (or "selecting" an investment).

- **what to invest** ……with the companies
- **in which you invest……** Including
- "**thematic investing**", "**investment impact**",

Myth 3:
Sustainable investing is about ***investor values, not good results.***

- sustainability factors should allow investors to better assess the **long-term potential of investments** and identify performers who will help them achieve their financial goals.

Myth 4:
Sustainable investment is only for
millennials

- **Millennials** are often referred to as the most interested age group with sustainable development problems…….**more than 25,000 investors**, found that **61% of Generation X investors** ……choosing an investment product, compared **to 59% of millennials.** ……. the majority of people **(60%) believe that their individual investment** decisions can influence the construction of a more sustainable world.

- **81% most millennials** want to know more about responsible investing
- **71% of CEOs** feel it is their personal responsibility to ensure that the organization's environmental, social and governance (ESG) policies reflect the values of their customers
- **55% of CEOs** believe that their organizations must look beyond purely financial growth if we are to achieve long-term, sustainable success

Myth 5:
Sustainable investing only applies to stocks.

mostly about **stocks**.....

but that's not the end of it.

For example, for bonds, ESG analysis helps identify risks to the borrower's ability and willingness to repay debts that could go unnoticed

- $30tn Global sustainable investment assets in 2018
- $78bn net inflows in ESG strategies worldwide, 2018
- $400bn Estimated growth in ESG ETFs over the next decade
- 63% of sustainable funds performed in the top half of their respective categories in
- 2018
- 34% Growth in ESG and impact investing assets under management across
- all regions from 2016-2019

$502bn
Estimated value of the **global impact investing sector in 2019**

$1tn

- **Estimated potential value of the sector by 2020**

Diversity and inclusion

- **Investors increasingly recognise that companies with higher levels of diversity and inclusion commercially perform better**

Lecture

The Circular Economy: Genesis, Structure, Peculiarities and the Functioning Principles

Content

1. The essence of the circular economy, the prerequisites for its formation and development.
2. The structure of the circular economy.
3. Models of circular economy.
4. Rational use of natural resources: methods of circular economy assessment.

1. The essence of the circular economy: the prerequisites for its formation and development

A **circular economy** (*CE*) – is a model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible.

A circular economy aims to tackle global challenges like ***climate change, biodiversity loss, waste***, and ***poluttion*** by emphasizing design based implementation of the three base principles of the model.


Re-use/Repair/Recycle
Recycling sector
Production
Distribution
Consumption
Circular Economy

Circular economy is a trend of the XXI century, which provides:

- raising awareness of the socio-economic, energy and environmental sectors;
- formation of approaches to solving the problem "safe environment vs economic development";
- search for a global consensus on the growing importance of environmental factors in the activities of domestic and international companies.

European Investment Bank outlined three main reasons for the transition to a circular economy:

1. Resource constraints.
2. Technological development.
3. Socio-economic development.

The three principles required for the transformation to a circular economy:

- eliminating waste and pollution;
- circulating products and materials;
- regeneration of nature.

The circular economy is a framework of three principles, driven by design:

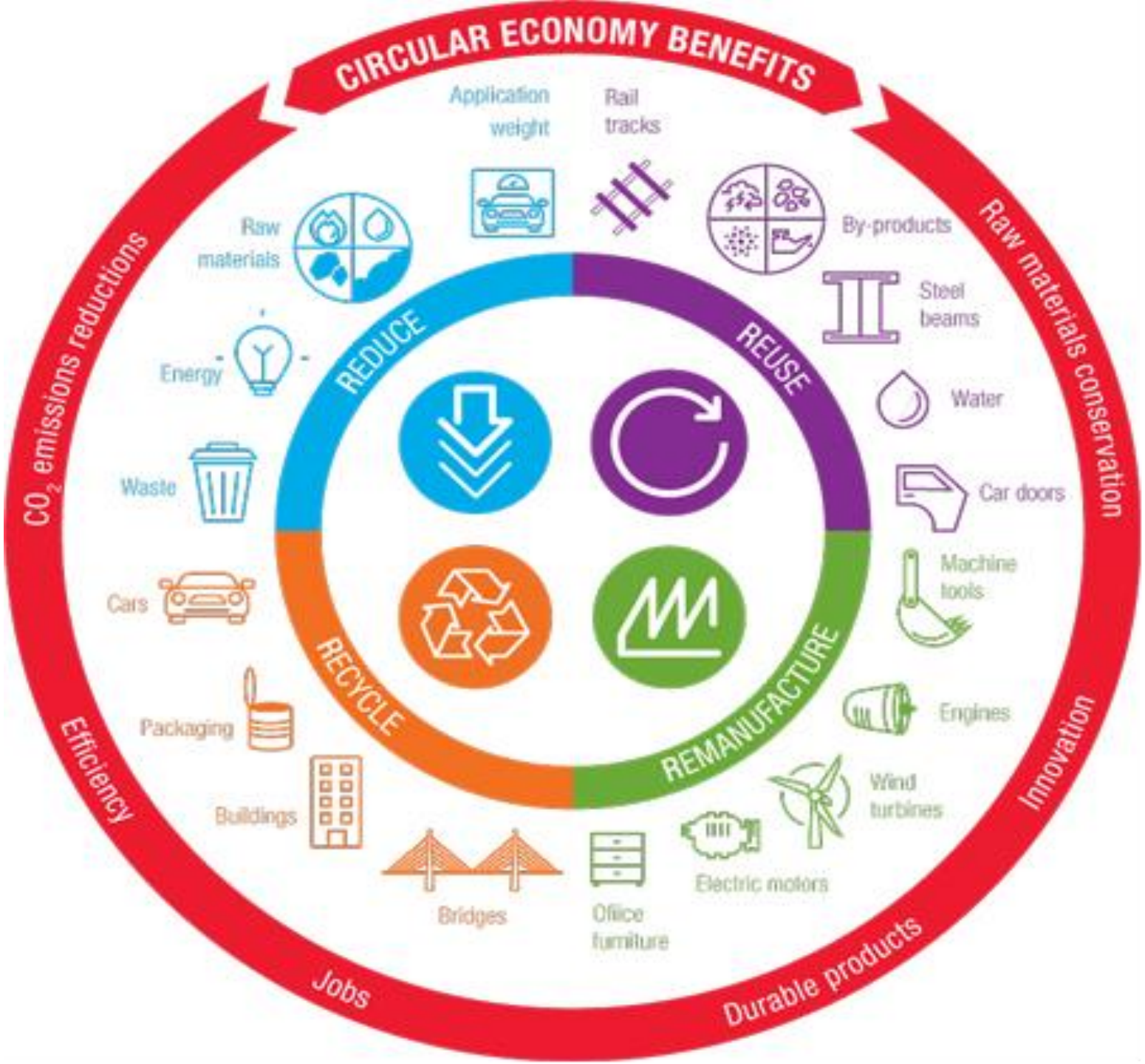
1) eliminate waste and pollution;
2) keep products and materials in use;
3) regenerate natural systems.

Key macro arguments in favor of the circular economy is that it:

- could enable an economic growth that does not add to the burden on natural resources extraction but decouples resource uses from the development of economic welfare for a growing population,
- reduces foreign dependence on critical materials,
- lowers CO_2 emissions,
- reduces the production of waste,
- introduces new modes of production and consumption to create further value.

Corporate arguments in favor of the circular economy is that it:

- could secure supply of raw materials,
- reduces the price volatility of inputs and control costs,
- reduce spills and waste,
- extends the life cycle of products,
- serve new segments of customers,
- generate long term shareholder value.


CIRCULAR ECONOMY BENEFITS
Application weight
Rail tracks
By-products
Steel beams
Water
Car doors
Machine tools
Engines
Wind turbines
Electric motors
Office furniture
Bridges
Buildings
Packaging
Cars
Waste
Energy
Raw materials
REDUCE
REUSE
RECYCLE
REMANUFACTURE
CO_2 emissions reductions
Efficiency
Jobs
Durable products
Innovation
Raw materials conservation

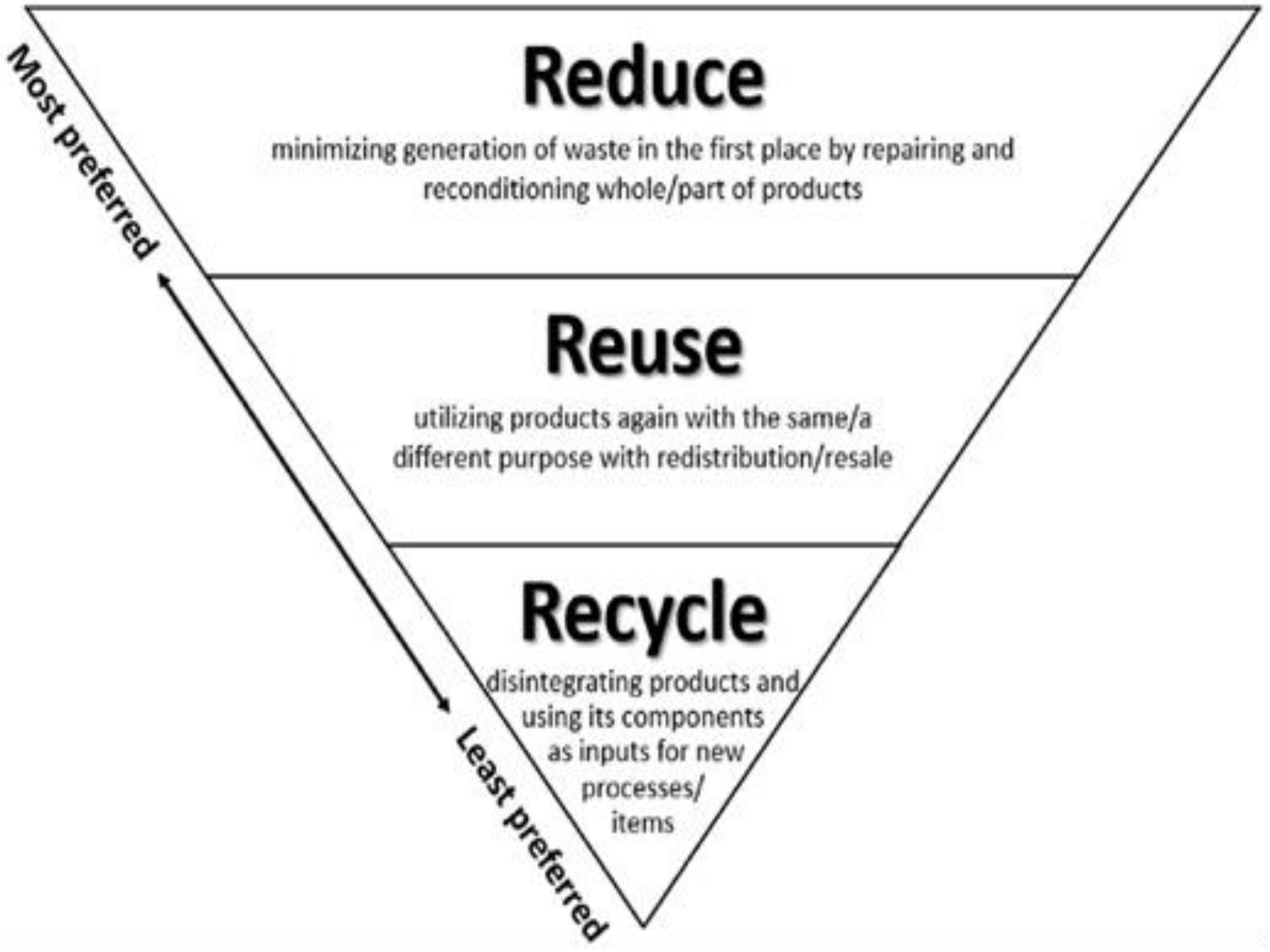
2. The structure of the circular economy

The basic framework is circular economy "3R" consists of the following components:

"reduce" – reduces the use of raw materials and materials, which involves reducing waste;

"reuse" – allows you to reduce the flow of resources into the production system;

"recycle" – recycling – involves a full-fledged resource use, which leads to a reduction environmental pollution.


Most preferred
Reduce
minimizing generation of waste in the first place by repairing and reconditioning whole/part of products
Reuse
utilizing products again with the same/a different purpose with redistribution/resale
Recycle
disintegrating products and using its components as inputs for new processes/ items
Least preferred

Elements of “10R” framework:

1) *"**refuse**"* – refusal of excessive use raw materials;
2) *"**rethink**"* – viewing the use of materials and products;
3) *"**reduce**"* – the use of fewer natural resources and materials;
4) *"**reuse**"* – reuse products that already were in use;
5) *"**repair**"* – repair and maintenance of a defective product with its subsequent use by main purpose.
6) *"**refurbish**"* – modernization of an old product;
7) *"**remanufacture**"* – change of product parameters, use of parts of obsolete product in a new product;
8) *"**repurpose**"* – repurpose used product to another area;
9) *"**recycle**"* – recycling;
10) *"**recover**"* – energy production from materials and about products.

Tools of circular economy:

1. ETV - EU Environmental Technology Verification.
2. PEF-OEF – Product Environmental Footprint and Organisation Environmental Footprint.
3. EU Ecolabel.
4. EMAS - Eco-Management and Audit Scheme.
5. GPP - Green Public Procurement.

3. Models of circular economy

Circular business models can be defined as:

- business models that are: closing, narrowing, slowing, intensifying and dematerializing loops, to minimize the resource inputs into and the waste;

- emission leakage out of the organizational system.

Circular business models:

1. Circular suppliers.
2. Resources recovery.
3. Sharing platforms.
4. Product life extension.
5. Product as a service.

Circular Supplies Business Model

Circular Supplies Business Model – is defined as fully renewable, recyclable, or biodegradable resource inputs that serve as feedstock, or raw materials, for a different production process.

The overall goal of this business model is to lessen an organization's dependence on new resources.

The Circular Supplies business model works by eliminating materials that are derived from virgin resources and replacing them with bio-based, renewable or recovered materials.

Resource Recovery Business Model

Resource recovery – is the activity of separating materials from waste that can be recycled into new products or used as an energy alternative to fossil fuels and is actioned with the goal of diverting as much waste from landfill as possible.

3 priorities:

1) avoidance;

2) resource recovery;

3) disposal.

Sharing Platforms Business Model

The sharing model – is a service compensation model in which the owner sells access to underutilized assets to subsequent customers. Owners are responsible for maintenance and service quality.

Industry examples of this type of revenue model include:

- ❖ vehicle ride sharing;
- ❖ short term accommodation rental;
- ❖ available labor and expertise;
- ❖ tools and equipment
- ❖ excess food supplies.

Product Life Extension Business Model

The Product Life Extension business model focuses on lengthening the time period that a product can be used before disposing of it. The goal is to maximize both lifespan and utilization, by increasing the value extracted from products before they are discarded.

Examples of this way of doing things stretch from simple to complex:

- Remanufactured parts.
- Secondhand stores and online marketplaces.
- Updating software instead of hardware.

Product as a Service Business Model

Product-as-a-Service (PaaS) – is a business model that allows customers to purchase a desired result rather than the equipment that delivers that result.

This model offers benefits to both the customer and the provider.

A PaaS relationship typically involves agreements among three entities:

1) the client, who purchases the service;

2) the manufacturer, who delivers the product and its associated services;

3)the PaaS platform provider, who handles the infrastructure, including data collection, transmission, storage, security, and analytics.

Objectives of circular economy models:

- extend the life of materials and products, where possible over multiple 'use cycles';
- use a 'waste=food' approach to help recover materials, and ensure those biological materials returned to earth are benign, not toxic;
- retain the embedded energy, water and other process inputs in the product and the material for as long as possible;
- use systems-thinking approaches in designing solutions;
- regenerate or at least conserve nature and living systems;
- push for policies, taxes and market mechanisms that encourage product stewardship, for example 'polluter pays' regulations.

4. Rational use of natural resources: methods of circular economy assessment

The circularity concept has undeniable relevance, it is considered as an oriented process of modernization for the linear model of the economy to achieve qualitative development of various socio-economic phenomena.

A historical review was previously presented, it covers circular economy emergence and formation and its relationship with new industrialization phenomenon; a variety of interpretations of "circular economy" concept was studied and main approaches to its formation were determined.

C-indicators include:

1) **level** (*micro*, *meso*, *macro*);

2) **cycle** (*conservation*, *reuse / recovery*, *recycling*);

3) **performance** (*internal*, *impact*);

4) **perspective** (*actual*, *potential*);

5) **usage** (*for example: improvement*, *comparison*, *communication*);

6) **transversality** (*general*, *branch*);

7) **size** (*one*, *several*);

8) **units of measurement** (*quantitative*, *qualitative*);

9) **format** (*for example: a web-based tool*, *Excel-formula*);

10) **sources** (*scientists*, *companies*, *agencies*).

Index system for assessing the level of circular economy development consisting of 16 indicators grouped into four groups:

1***)*** **consumption** (*water consumption per million GDP, water consumption per capita, elasticity in water use, energy consumption per million GDP*);

2) **environmental violations** (*norms of industrial wastewater discharge, level of harmlessness of household garbage, application of chemical fertilizers per unit of acreage*);

3) **waste management** (*urban wastewater treatment per capita, integrated solid industrial waste utilization rate, resource utilization network coverage, "three waste" utilization rate*);

4***)*** ***social development*** (*GDP per capita, urbanization rate, unemployment rate, Engel coefficient, GDP growth*).

System of indicators structured into two groups for evaluation:

1. **Macro level** (22 indicators);
2. **Industrial park** (12 indicators).

Indicators system for circular economy assessment at the meso-level:

1) economic development;
2) waste management;
3) pollution control;
4) administration and management.

Tool for assessing the level of business circularity

1) high (red);
2) medium (orange);
3) low (green).

The analyzed object can be assigned to one of five categories:

- "non-compliance“;
- "compliance“;
- "beyond compliance“;
- "integrated strategy“;
- "goal/mission“.

System for assessing the circularity of economy on 32 indicators formed into a three-level system:

1) a common leading indicator of "resource productivity";

2) a second-level dashboard of additional macro indicators for materials, land, water and carbon;

3) a third-level of thematic indicators to measure progress towards key thematic goals, as well as actions and milestones set out in the road map...".

They are grouped into main topics and sub-topics:

- **resource productivity** (*main indicator*);
- **dashboard indicators** (*materials*, *earth*, *water*, *carbon*);
- **transforming the economy** (*turning waste into resources, supporting research and innovation; pricing correctly*);
- **nature and ecosystems** (*biodiversity; clean air; land and soil*);
- **key areas** (*solving the food problem; improving buildings; ensuring effective mobility*).

The efficiency of resources use by the state largely depends on:

- the structure of national economy,
- the size and structure of international trade, while the economy is able to create more wealth without a proportional increase in resource consumption.

Development (WBSCD) identifies three other important tools for assessing the circular economy:

1) **The Life Cycle Assessment** (*LCA*).
2) **The Circular Economy Toolkit** (*CET*).
3) **Circular economy Indicator** (*the Circular Economy Indicator Prototype*, *CEIP*)

Five stages of a life cycle

1) design or redesign;
2) manufacture;
3) commercialization;
4) use;
5) end of life.

System of evaluation "Circular Economy Indicators“ (2019, A. Avdiushchenko A., Zając P.)

1. Economic development (*GDP per capita, average life expectancy at birth for men, registered unemployment rate, poverty risk level*).

2. Zero economy (*municipal waste collected selectively in relation to the total amount of municipal waste collected; municipal waste collected per inhabitant; industrial and municipal waste water requiring treatment; expenditures on fixed assets serving environmental protection and water resources management related to waste processing and disposa*l).

3. Innovation economy (*research and development expenditures per capita, fixed prices; average share of innovative enterprises in the total number of enterprises; adults involved in education and training; patent applications per 1 million inhabitants*).

4. Energy efficiency and renewable energy (*share of renewable energy sources in total electricity production; expenditures on fixed assets serving environmental protection and water resources management related to energy saving per capita; electricity consumption*).

5. Low-carbon economy (*emissions of carbon dioxide from plants particularly harmful to air purity; emissions of particles; cars; pollutants remaining or neutralized in pollutant reduction systems in common pollutants produced from plants particularly harmful to air purity; costs of fixed assets serving environmental protection and water management related to air and climate protection*).

6. Smart economy (*households with a personal computer with broadband Internet connection; businesses with broadband Internet access*).

7. Spatially efficient economy (*forest cover indicator; urban greenery and the share of parks, lawns and green areas in residential areas in the total area; urbanization coefficient*).

The assessment of circular economy development takes place at three levels:

1) Micro level.

2) Meso level.

3) Macro level.

Macro-level indicators are needed for evaluation and monitoring in order to improve various programs at the state level.

Micro-level indicators tend to cover 3R imperatives without reflecting the full range of distinctive features of the circular economy, analyzing the environmental friendliness and waste-free production and consumption.

THANK YOU FOR ATTENTION!!!

INNOVATION AS A WAY TO CIRCULAR BUSINESS MODELS

Starfish syndrome .. or why talk about the circular economy and innovation in it

Globechain is a B2B marketplace for reuse in many industries, such as construction, hotels, offices, medicine, restaurants and retail. Organizations that no longer need assets (such as furniture, equipment, or stationery) list them on a platform where they are requested and collected by other companies.
Globechain earns its income by collecting membership fees.

Globechain

is a data-driven reusable solution that makes waste a resource for everyone.

They are a leading reusable market that connects businesses with nonprofits, small businesses and people to redistribute unnecessary items.

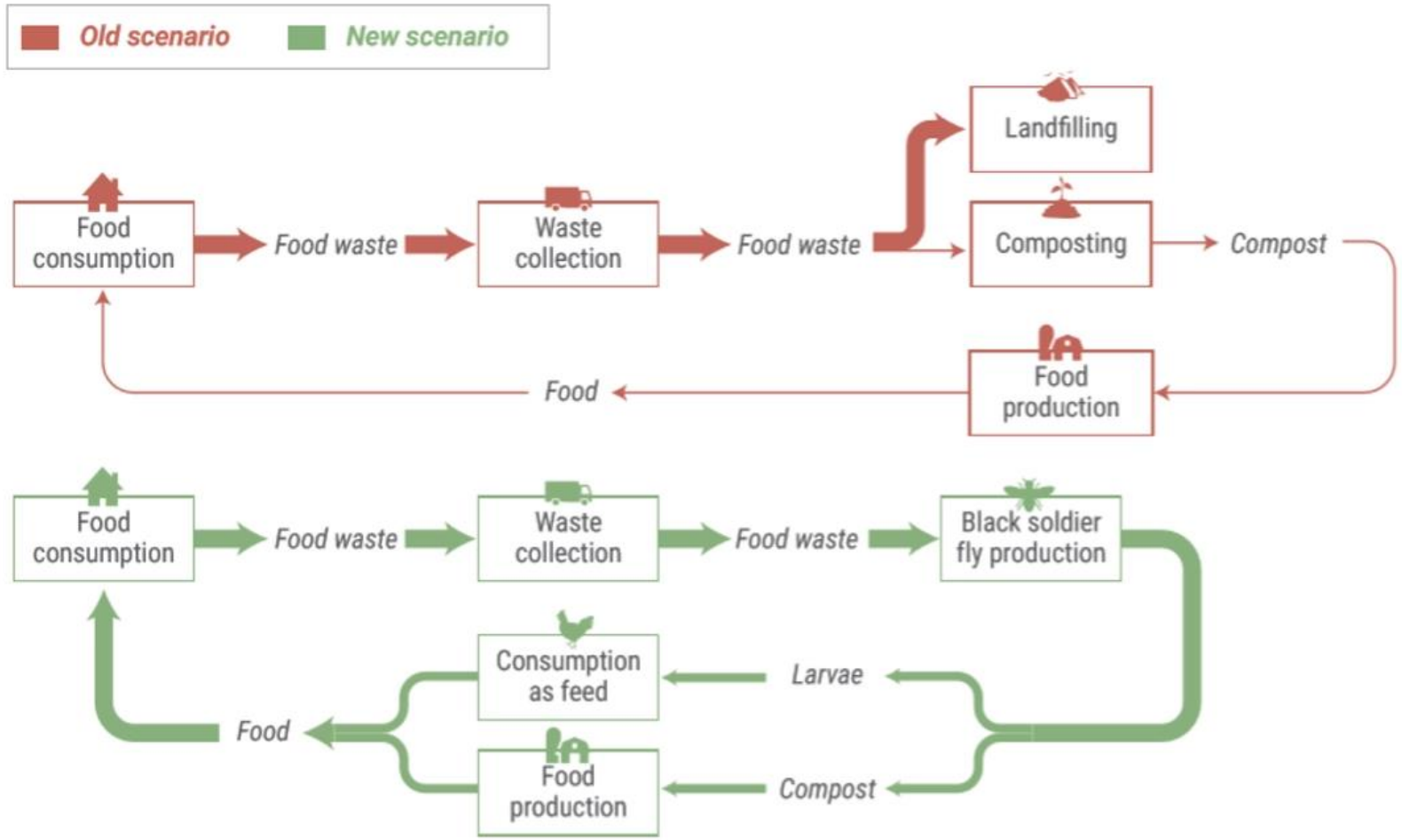
CIRCULAR PRODUCT DESIGN

Creating products, from recycle to reuse.

Scheduled for spring / summer 2021, FUTURECRAFT.LOOP is the first Adidas running shoe pair to be "made for recycling". The high-performance sneakers have been carefully designed in collaboration with manufacturing and recycling partners so that "it can be returned to Adidas, broken down and reused to create new sports sneakers."

Protix

converts food waste into sustainable protein for fish, chicken and pets. The Dutch company has invested 35 million euros in an industrial production facility where it uses food waste to breed black-winged larvae, which it collects to form high-value insect protein products.



7,000 tons of CO2 would be saved from 6,800 tons of feed

Replacing poultry feed also saves about 41,000 gallons of water per year and 3,200 hectares of land. In total, it can bring 200 thousand dollars. - $ 2.5 million profit per year and create 150-250 new jobs in production, as well as an estimated 83 additional jobs created in food waste collection.

In the first two years of life, the average child needs 280 items of clothing, most of which are worn for only about two or three months. As a result, huge amounts of children's clothing end up in landfills, losing value and creating adverse effects on the environment.

28.04.2022

Circos

- presented a subscription model of children's clothing (and clothing for pregnant women), where participants pay a monthly fee for access to a range of high quality clothing of various brands delivered to their doors. As babies outgrow their clothes, they are returned, cleaned, and redistributed to another customer - disposing of waste and spending on the cost of clothing, all while creating convenience for customers.

- **Re-Tek** provides reverse logistics and data destruction services for redundant IT equipment. By restoring equipment for resale or charitable transfer, Re-Tek distracts equipment from energy-intensive recycling processes, extends the life of the asset and minimizes environmental impact.

Philips

Refurbished systems - Philips allows hospitals to upgrade their medical equipment (such as MRIs and CT scanners) by selling their old equipment to get a discount on new systems. Philips restores and upgrades obsolete equipment and sells it again.

This business model helps hospitals benefit financially from their older equipment while effectively upgrading to the latest technology. It also allows Philips to reach different customer segments with high-quality systems available. This is a great example of a reusable business model that does not necessarily require construction or lease.

◦ Recycling

In 2019, H&M Group collected 29,005 tons of textiles for reuse and recycling through our clothing collection initiative - the equivalent of approximately 145 million T-shirts.

Rewear - clothes that can be worn again will be sold as second-hand clothes.

Reuse - old clothes and textiles are transformed into other products.

Recycle - old clothes and textiles are recycled into other products.

Recycling and Upcycling

Mr Green Africa

- Kenyan startup for plastics processing. They buy collected used plastic for consumption and industrial waste as raw materials and sell recycled plastic granules of various colors and qualities. They recently received an unknown amount of funding from DOB Equity (a Dutch family-sponsored investment organization operating in East Africa) and the Global Innovation Fund (partnership with Unilever) to scale their business model.