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INTRODUCTION TO THE CIRCULAR ECONOMY

Session 1
From linear to circular models

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Project: 101082209 — CIRCULAR — ERASMUS-EDU-2022-CBHE-STRAND-2

MODULE 1 - INTRODUCTION TO THE CIRCULAR ECONOMY

1.1. THEORETICAL FRAMEWORK

- Consumption pattern of developed economies
- Industrialization of emerging economies
- Current linear economic model- take- make-dispose

Increasing global demand for natural resources
*Total resource use could more than double by 2050 if these trends continue

- **Depletion of natural resources**
- **Pollutant emissions**
- **Massive amounts of waste**

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1.1. THEORETICAL FRAMEWORK

Challenge of sustainable development

"Meeting the needs of the present without compromising the ability of future generations to meet their own needs." (WCED, 1987).

2015 → UNITED NATIONS→ **17 SUSTAINABLE DEVELOPMENT GOALS (SDGs) FOR 2030**

CE is a key components to move the world closer to sustainability and help achieve the proposed goals

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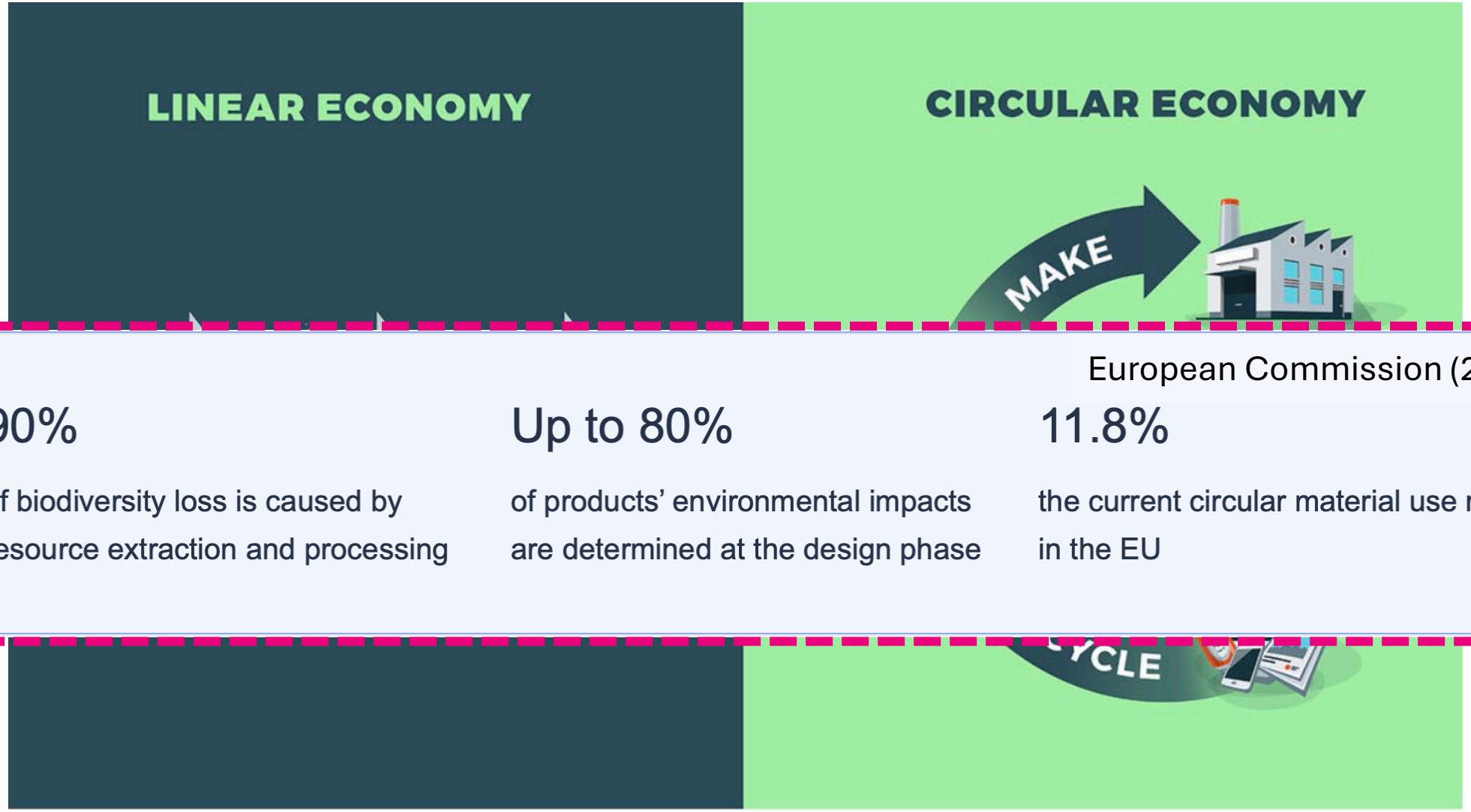
1.1. THEORETICAL FRAMEWORK



European Commission (2024)

90%

of biodiversity loss is caused by resource extraction and processing

Up to 80%

of products' environmental impacts are determined at the design phase

11.8%

the current circular material use rate in the EU

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1.1. THEORETICAL FRAMEWORK

WHAT DOES THE CIRCULAR ECONOMY MODEL MEAN ?

DEFINITION of the United Nations Environment Assembly

*"One of the current sustainable economic models, in which products and materials are designed in such a way that they can be **reduced, reused, recycled or repaired (4-R)** and thus maintained in the economy for as long as possible, along with the resources of which they are made, and the generation of waste, especially hazardous waste, is avoided or minimized, and greenhouse gas emissions are prevented or reduced"*

Kirchherr et al. (2017, p. 229)

"An economic system that replaces the 'end-of-life' concept with reducing, alternatively reusing, recycling and recovering materials in production/distribution and consumption processes. It operates at the **micro level** (products, companies, consumers), **meso level** (eco-industrial parks) and **macro level** (city, region, nation and beyond), with the aim to accomplish sustainable development, thus simultaneously creating **environmental quality, economic prosperity and social equity,** to the benefit of current and future generations. It is enabled by novel business models and responsible consumers".

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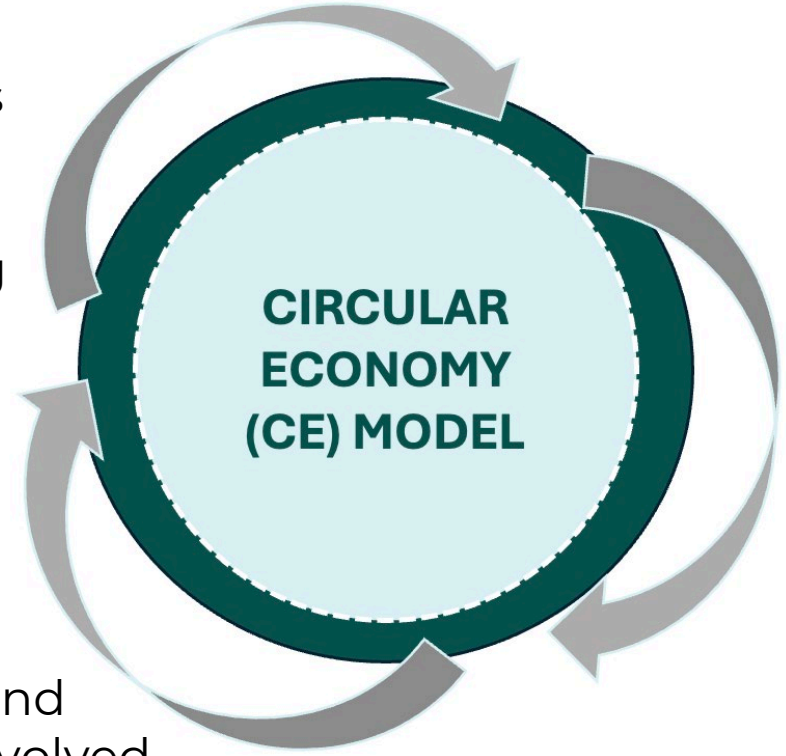
1.1. THEORETICAL FRAMEWORK

1 ECONOMIC PERSPECTIVE

- Optimization of resources
- Reduction of costs associated with the extraction and processing of raw materials
- New business opportunities

2 SOCIAL PERSPECTIVE

- Promote equity, inclusion and participation of all actors involved
- Guaranteeing fair working conditions, promoting equal opportunities, and promoting social cohesion in communities .



3 ENVIRONMENTAL PERSPECTIVE

- Minimize the negative impact of human activities on the environment
- Reducing waste generation
- Controlling pollution
- Preserving natural resources for future generations.

https://www.youtube.com/watch?v=zCRKvDyyHml

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1.1. THEORETICAL FRAMEWORK

ELEMENTS OF THE CIRCULAR ECONOMY

1. CORE ELEMENTS

Activities directly handling product or material flows. The main objectives are to extend the useful life of resources, prioritize regenerative resources, and use waste as a resource.

2. ENABLING ELEMENTS

Actions that remove obstacles for core actors. For instance, the design focused on stretch the lifetime; rethink the business model towards regenerative models that provide well-being for society...

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1.1. THEORETICAL FRAMEWORK

ACTION	DESCRIPTION
REGENERATE	A series of actions aimed at preserving and improving the biological capacity of the Earth. That requires the shift to renewable energy and materials; reclaim land, retain, and regenerate health of ecosystems and return recovered biological resources to the biosphere, through composting for example.
SHARE	Sharing products among different users (peer -to-peer sharing of privately owned products or public sharing of a pool of products), maximize the use out of goods and eliminates waste and duplication through maintenance, repair, and design for durability. It also includes reusing products through their entire technical lifetime (second hand).
OPTIMISE	Improve performance of products; remove waste in the entire supply chain (from sourcing and logistics, to production, use phase, end-of-use collection, etc.) encouraging investment in technological innovations that optimize processes.
LOOP	The essence of the circular model is based on the idea of a loop: resources are processed, circulated, and returned to the economy, rather than being lost to landfills.
VIRTUALISE	This concept means making use of virtual tools when they can improve the productivity of resources.
EXCHANGE	Replace old ways of doing things applying new technologies (e.g. 3D printing or electric engines) and choose new products/services (e.g. multimodal transport).

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1.1. THEORETICAL FRAMEWORK

BARRIERS TO ADDRESS

- **The cost to shift:** the transition requires a significant investment of time, knowledge, and resources.
- **Profitability of short life cycle products.**
- **Lack of innovation and development** to recover value from waste and reuse materials.

- **Lack of skills to recover or reuse** components due to lack of knowledge or legislation.
- **Absence** of **shared interest** among supply chain participants.
- **Fear of disruption** of existing business model system or value chain.

- **Conflict of interests** and misaligned objectives between stakeholders in the value chain could obstruct progress and/or generates wasted resources.
- **Asymmetric information** and disaggregated and unstructured knowledge.

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1.1. THEORETICAL FRAMEWORK

1. Design **regulatory frameworks** adaptable, scalable, and flexible to address the complex challenges facing different industries.

2. Encourage investment in production models that support sustainable consumption. **Fiscal support**, e.g., tax

3. -Favoring business **investment in R&D&I (e.g. subsidies).**
- Funding for **training, research, and development**.
- Awareness raising of stakeholders (e.g. education)
- Disseminate and **transfer** findings with integrity.

4. **Work together** throughout the entire supply chain, within stakeholders to rise transparency and **create joint value.**

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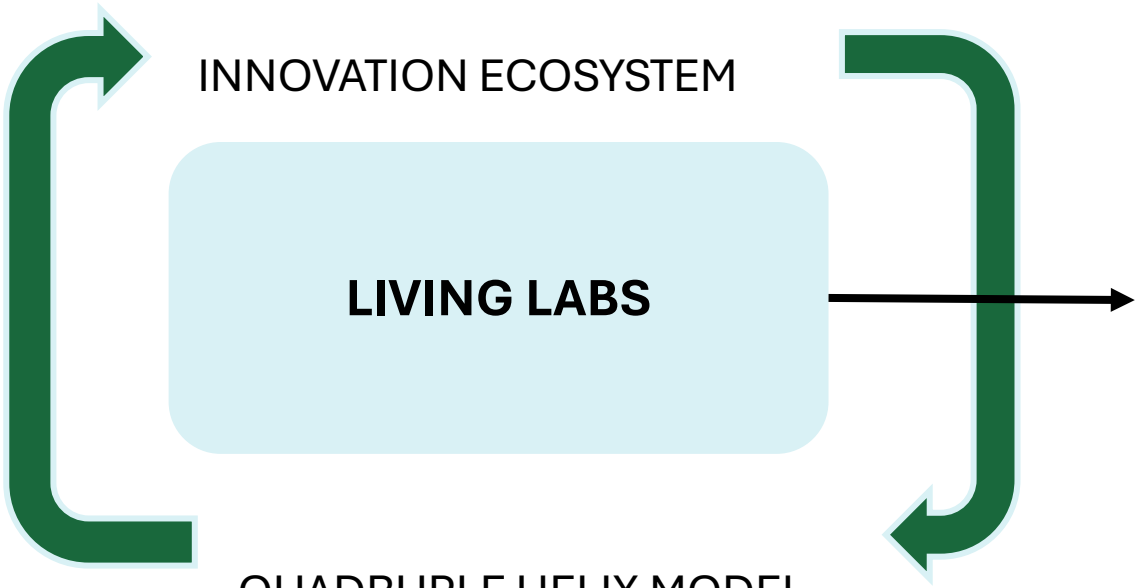
1.2.STAKEHOLDER ENGAGEMENT AND LIVING LAB DESIGN



1- Governments
2- Universities
3- Businesses
4- Civil society

European Commission definition:

"A user-driven **open innovation ecosystem** based on a business-citizens-government partnership which enables users to take active part in the research, development and innovation process";

Civil society becomes highly relevant, concepts such as social robustness, inclusivity, and sustainability are included in innovation ecosystems.

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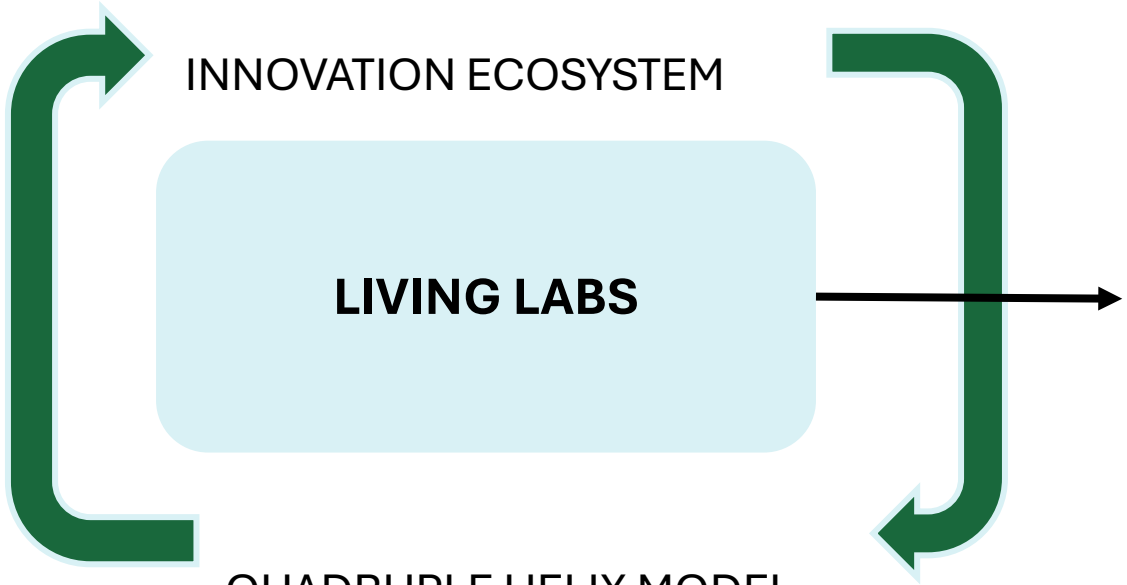
1.2.STAKEHOLDER ENGAGEMENT AND LIVING LAB DESIGN



- Integration of research and innovation processes in real-life communities and settings.
- They act as intermediaries between citizens, research organizations, companies, cities and regions for joint value co-creation, rapid prototyping or validation to scale up innovation and businesses.

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1.2.STAKEHOLDER ENGAGEMENT AND LIVING LAB DESIGN

THE ROLE OF UNIVERSITIES

- Platform for Quadruple Helix Model
- Leading role as:
  - **Enablers**
  - **Providers**
- Engage Stakeholders

The network forms around a provider organization (university), but information is collected and knowledge is co-created and utilized in the network to help the user community

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1.2.STAKEHOLDER ENGAGEMENT AND LIVING LAB DESIGN

THE ROLE OF UNIVERSITIES

❖ Engage Stakeholders

- LL acts as a bridge between open innovation and **user** innovation within the QHM.
- LLs are able to develop the iterative process of experimenting and learning from year to year. This means that they are able to provide a coherent basis for action over time

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1.2.STAKEHOLDER ENGAGEMENT AND LIVING LAB DESIGN

THE ROLE OF UNIVERSITIES

UNIVERSITY

❖ Engage Stakeholders. USERS

- Users are not anymore “consumers” with the role of observed subjects for testing products or services but are co-creators.
- Gain better insights into the possibilities, opportunities and restrictions of innovations.
- User knowledge offers a valuable resource for innovation because it fosters understanding of real-life situations where products and services are involved

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1.2.STAKEHOLDER ENGAGEMENT AND LIVING LAB DESIGN

“Circular Bioeconomy Alliance LL in the Amazonia”

Combining modern innovation with ancient wisdom

“Learning from indigenous communities how to translate our science into generating wiser decisions, into a wiser humanity”.

The project aims to accelerate rainforest restoration while creating new forest-based value chains around cocoa, vanilla, medicinal plants and eco-tourism. The inputs of traditional

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1.2.STAKEHOLDER ENGAGEMENT AND LIVING LAB DESIGN

Living Labs can be applied to a wide range of sustainability challenges.
Some examples include developing cascade valorisation processes

- Reduce non-reneweable raw materials
- Reduce waste
  - Efficiency in processes
  - Users attitudes
- Recycle (examples)
  - Developing new (bio)processes
  - New renewable energy technologies,
  - New (Biobased) materials
  - New Biobased food ingredients
  - New Biobased pharmaceuticals, cosmetics…
- Reuse: Innovation, re-design

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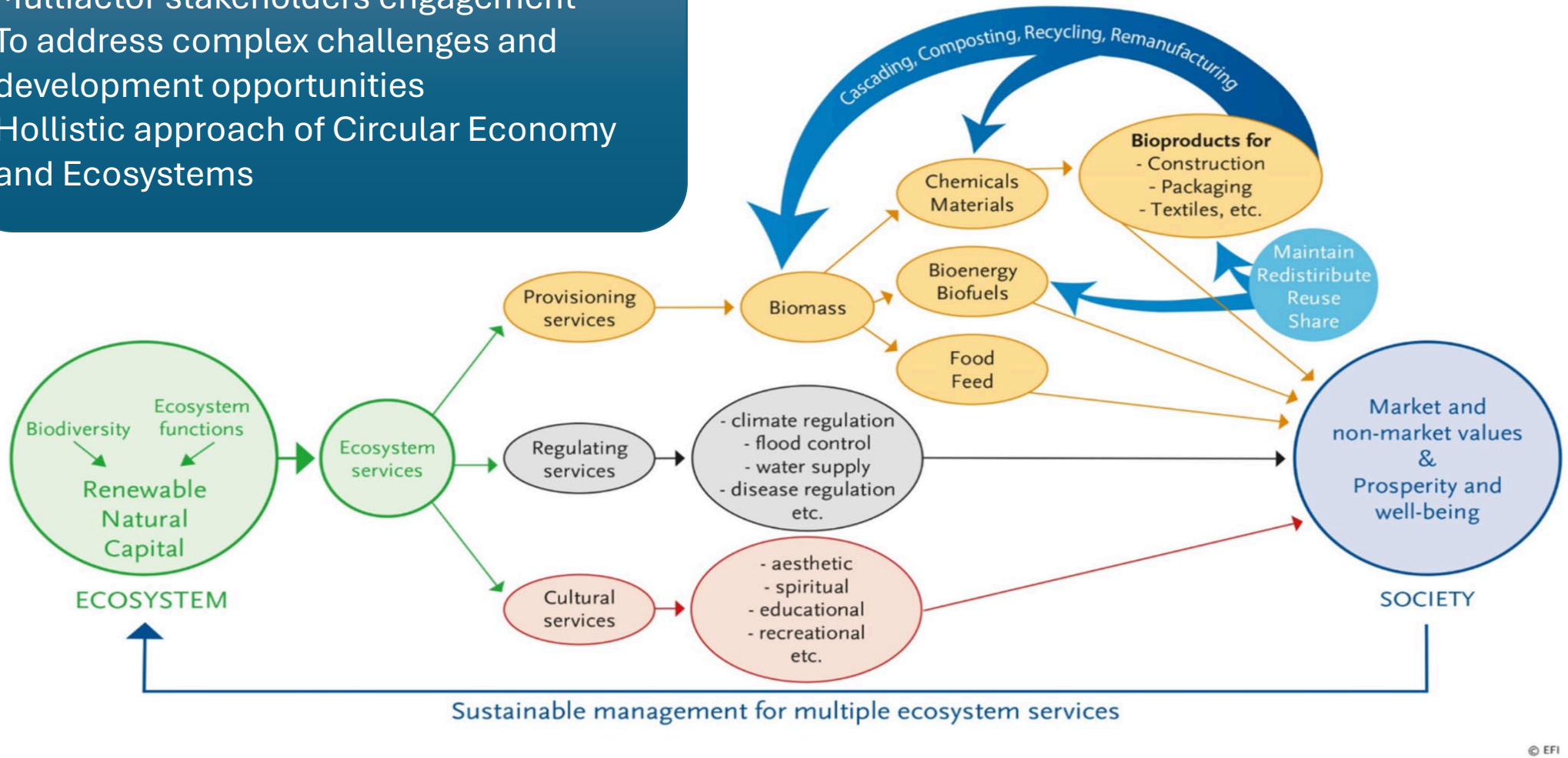
Multiactor stakeholders engagement
To address complex challenges and development opportunities
Hollistic approach of Circular Economy and Ecosystems



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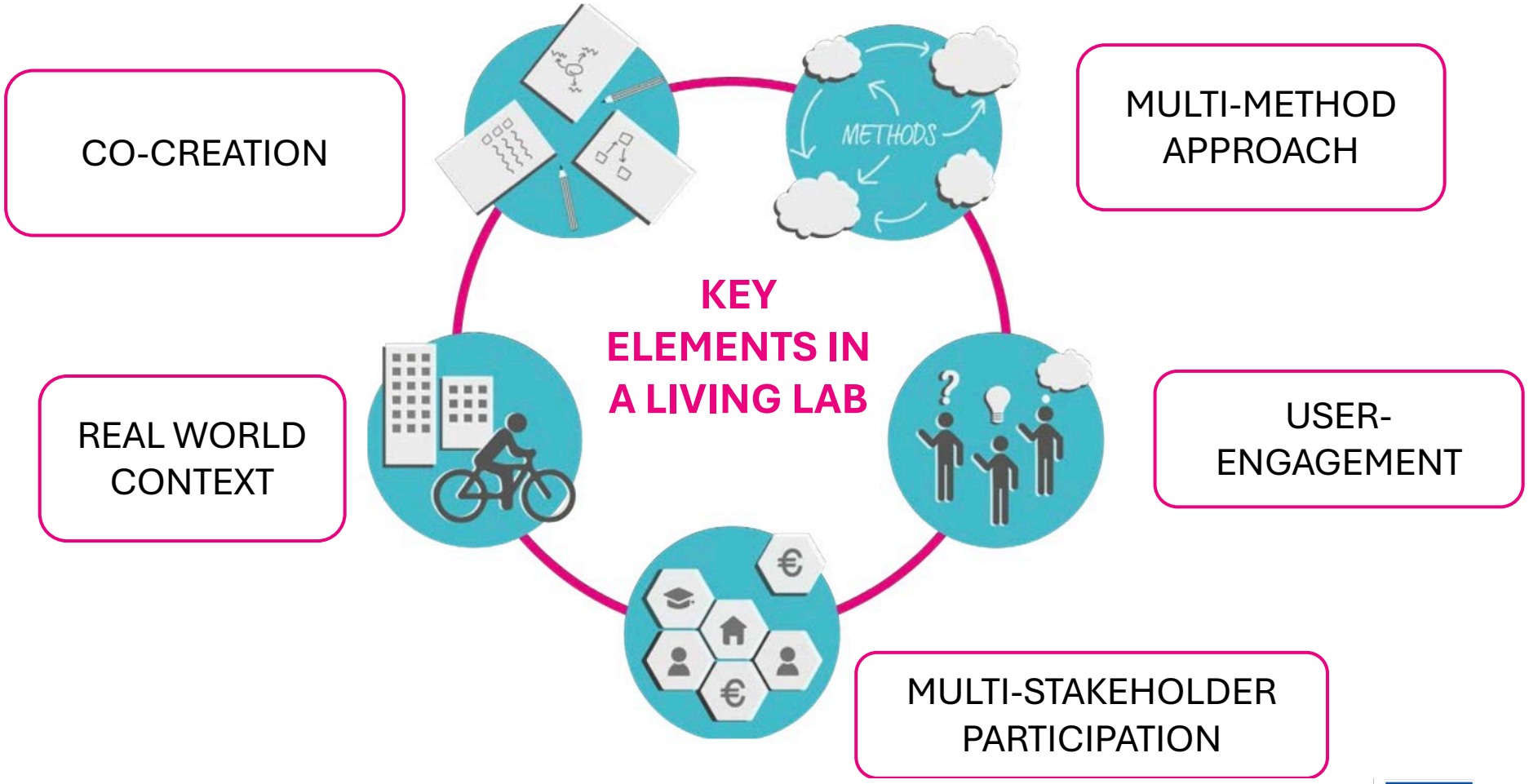

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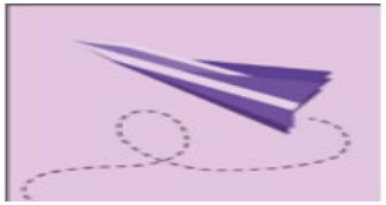
OPEN INNOVATION PHASES



EXPLORATION	EXPERIMENTATION	EVALUATION
Getting to know the 'current state' and designing possible 'future states'	Real-life testing of one or more proposed 'future states'	Assessing the impact of the experiment with regards to the 'current state' in order to iterate the 'future state'.
Brainstorming, ideation and co-creation techniques	Tangible products to intangible services or experience design prototypes	Generate a 'post-measurement' of the intervention and compare it to the 'pre-measurement' benchmark

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1.3. INTERCULTURAL COMPETENCE SET OF KNOWLEDGE AND SKILLS NECESSARY TO ACT IN AN INTERCULTURAL WAY IN DIVERSE CONTEXTS

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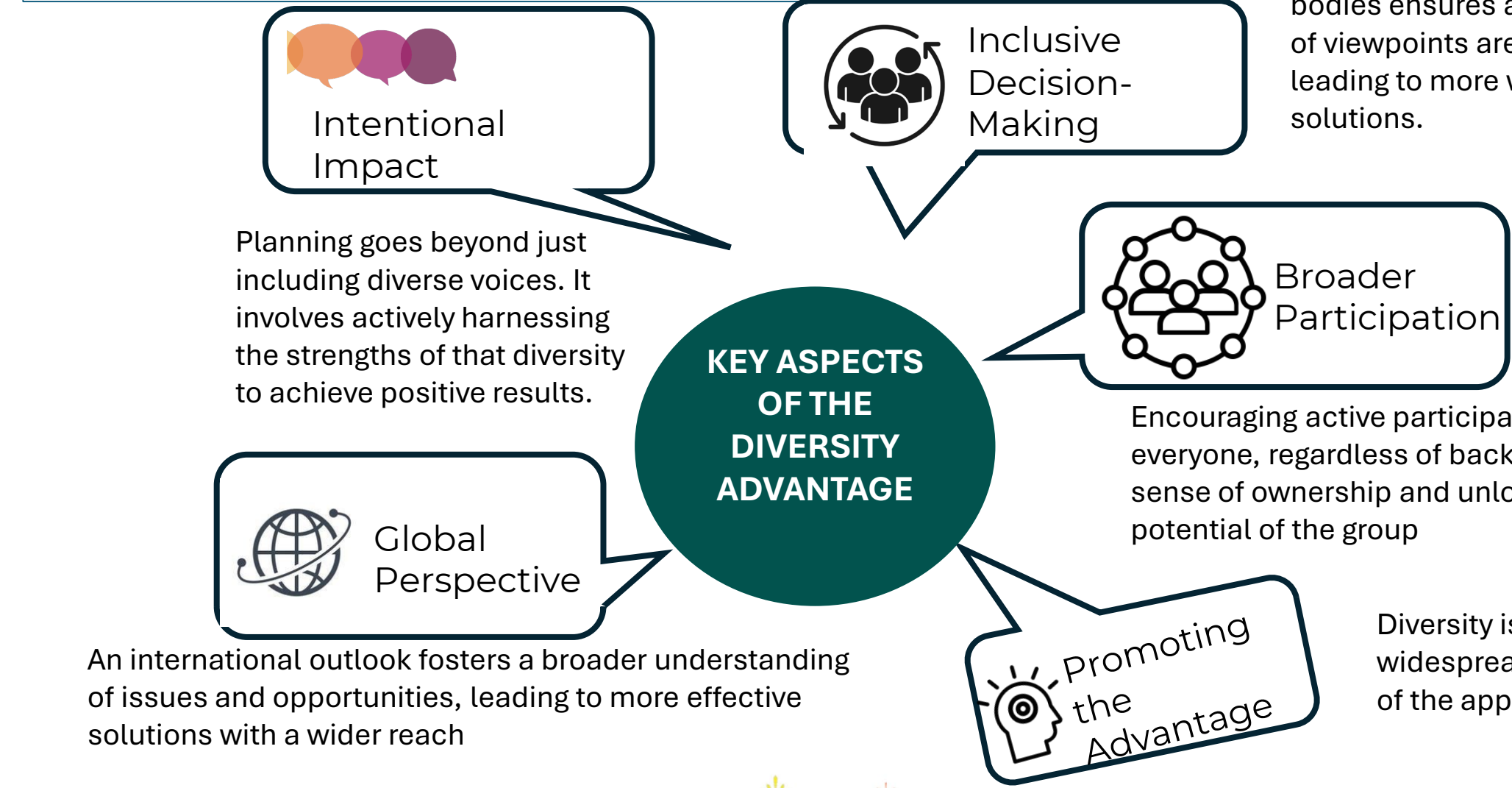
1.3. INTERCULTURAL COMPETENCE



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1.3. INTERCULTURAL COMPETENCE SET OF KNOWLEDGE AND SKILLS NECESSARY TO ACT IN AN INTERCULTURAL WAY IN DIVERSE CONTEXTS

CULTURAL AWARENESS	CULTURAL EMPATHY	CULTURAL KNOWLEDGE	CULTURAL SKILLS
Understanding the values, beliefs, and traditions that shape cultural behaviors related to consumption, waste management, and resource use.	Developing empathy and respect for diverse perspectives on these issues.	Acquiring specific knowledge about the cultural context where you plan to implement circular initiatives.	Skillfully communicating and collaborating across cultures to foster a shared understanding of circularity.

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EU EXAMPLES

Circular Economy Strategy

It aims to move away from the traditional linear model of "take-make-dispose" to a more circular approach where resources are kept in use for as long as possible. This involves reducing waste, reusing materials, and recycling products.

The strategy sets out ambitious targets for resource efficiency, such as reducing waste generation by 50% by 2030 and increasing the reuse and recycling rate of municipal waste to 65%.

Farm to Fork Strategy (2020)

It aims to make the EU's food system fair, healthy and sustainable. The strategy sets out a number of targets for reducing the environmental and climate footprint of the food system, while strengthening its resilience and competitiveness.
One of the key principles is the circular economy.

The strategy sets out a number of targets, including reducing the use of pesticides by 50% by 2030 and increasing the share of organic land area to 25% by 2030.

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EU EXAMPLES

Success stories of circular economy and Farm to Fork initiatives being implemented across the EU:

· **Italy (the Fuud project):** is using food waste to produce insect-based protein for animal feed. This project is helping to reduce food waste and provide a sustainable alternative to traditional protein sources.

· **Netherlands (the ReFNR project):** is using food waste to produce biofuels. This project is helping to reduce greenhouse gas emissions and provide a renewable alternative to fossil fuels.

· **France (the Too Good To Go app):** is connecting consumers with restaurants and shops that have surplus food to sell at a discounted price. This app is helping to reduce food waste and save consumers money.

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REAL-WORLD EXAMPLES

The Humblemend Project, India

Empowering women in underprivileged communities to become skilled repair technicians. They collect and repair discarded clothing, extending product lifespans and creating a sustainable livelihood for women. The project's success hinges on its deep understanding of the local culture's emphasis on resourcefulness and its ability to address the digital divide by providing training in basic repair techniques.

The Maasai Mara Leather Project (Kenya)

In the Maasai Mara, a region steeped in tradition, a community-based project upcycles discarded leather scraps from tourism into high-value handbags and accessories. This initiative not only generates income but also aligns with the Maasai's long-held respect for resourcefulness and utilization of all parts of an animal.

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EXAMPLE IN A COMPANY

Solid products that require no packaging

Moving from a liquid to a solid product can:

- Lower the cost of transport and reduce transport emissions
- Be more convenient for a consumer
- Increase e-commerce opportunities
- Present an opportunity to rethink the delivery model
- Make it easier to provide large quantities of product
- Allow you to use less packaging material per volume of product

Founded in the UK in 1995, **Lush** now has over 850 stores worldwide. It sells a wide range of solid products across hair, body, fragrance, toothpaste, and beauty care categories. Most products are sold naked in store, meaning that packaging that was previously required to contain the product (bottle, container, tube) has been eliminated.

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Linear or circular?

Company X takes used plastic packaging and turns it into mudguards for their bicycles, street furniture such as benches or roads.

Linear. Yes, the plastic is being used again but it's being downcycled into a mudguard or mixed with other materials to create a road, and, likely, it will eventually end up as difficult-to-manage and non-recyclable waste sooner or later.

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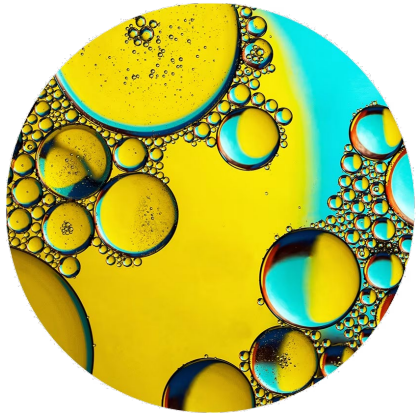
Linear or circular?

Company Y collects used plastic packaging and uses a new technology, called pyrolysis, to turn the plastic back into oil, which is sold as fuel to transportation companies.



Linear. Turning waste into fuel is not much different from burning waste to generate electricity. In both cases, while some one-time extra value is gained from the plastic, in the form of energy, the materials are then lost from the economy, which means new virgin materials are needed to produce the next generation of products.In a circular economy, the circulation of materials aims to keep the materials in the economy at its highest value. The last resort is recycling, but this should result in turning used plastics into new materials. There are difficult-to-recycle plastic packaging items, which pyrolysis can process into a raw material that is turned into new plastics, instead of producing a fuel that gets burned.

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Linear or circular?

Company Z has a chain of shops that provide hot coffee to go. The company has decided to give its customers discounts when they bring a reusable cup with them, rather than using a single-use takeaway cup.

Circular. While a takeaway cup is usually used only once before becoming waste, and can't be easily recycled because it is made from a mix of materials, the reusable cup can be used many times. By offering customers an incentive to carry reusable cups, Company Z is promoting 'reuse on the go'. Reusable packaging is a critical part of the solution to eliminate plastic pollution and create a circular economy for plastic.

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Circular

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