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M3. Environmental Management, Impact and Risk Assessment

3.2. Circular economy

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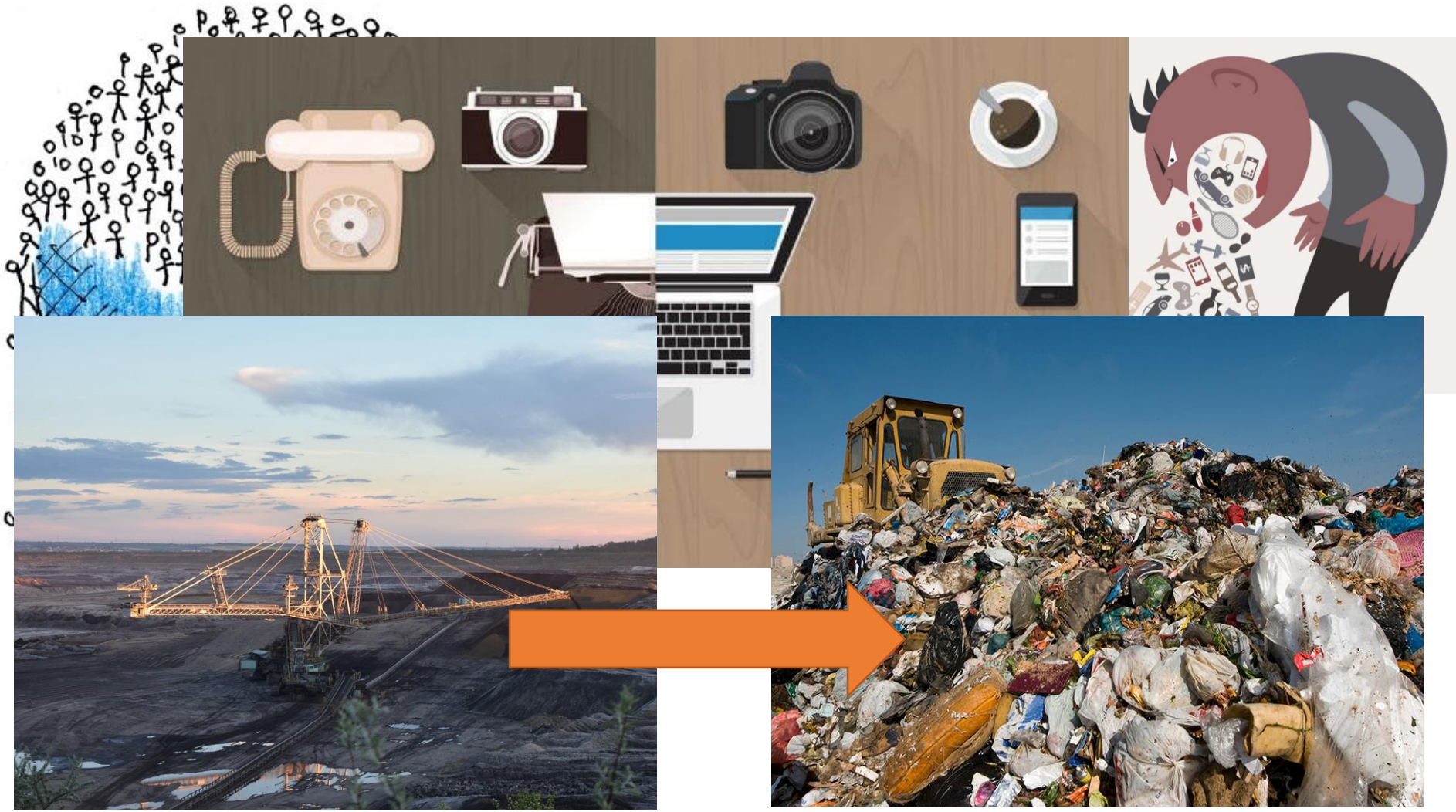
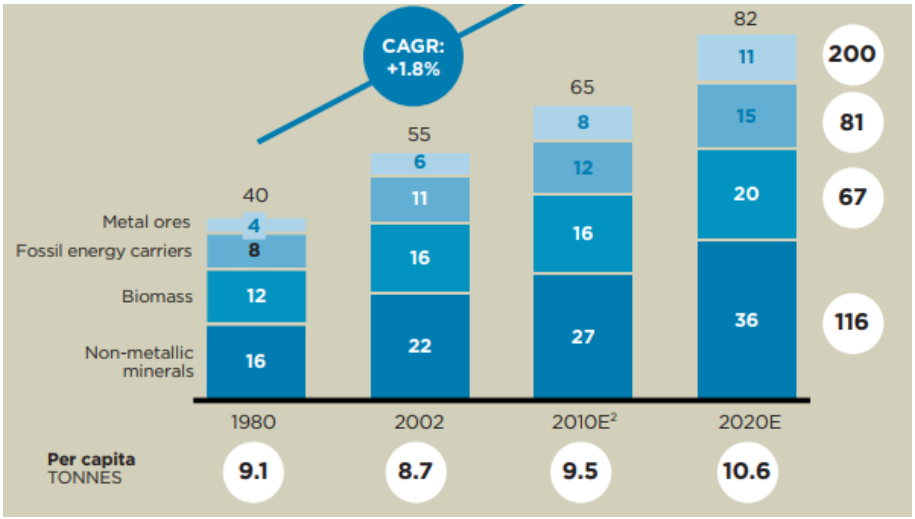
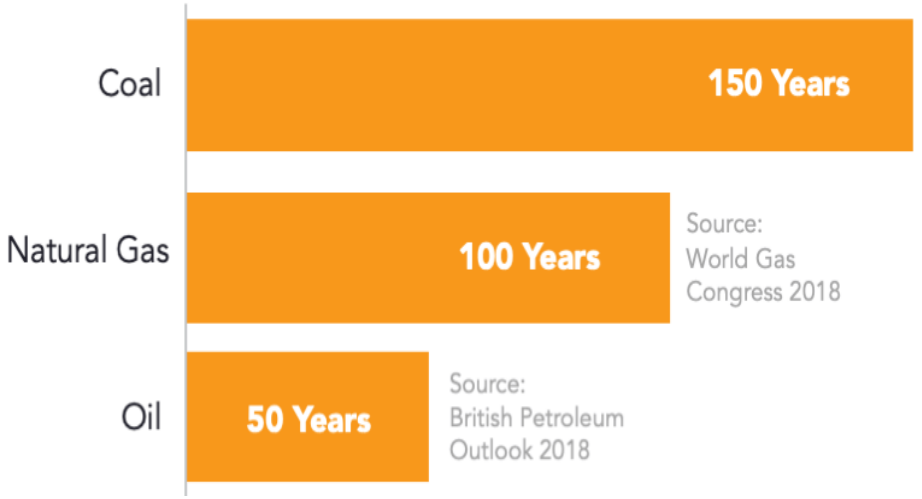
Environmental effects and impacts



Linear economy



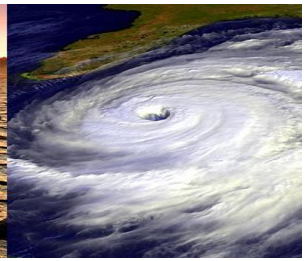


✓ **21 billion tons** of materials used in production do not get incorporated in the final product

Linear economy - limitations

- Loss of value in materials and products → non-recycled waste;
- **Exhaustion of limited resources** → Security and stability of supplies of raw materials;
- Interdependence of countries with different resources;
- **Waste generation**→ the life product is constantly declining, consumers want new products faster;
- **Environmental degradation and climate change.**




Circular economy

- ***Circular economy is an economy that tends to produce less waste (zero waste).***
- It is a new paradigm, an economic circuit in which, from the design phase, the conception of products or processes, falls into two categories: either it uses a biodegradable component or a component with 100% recycling potential.

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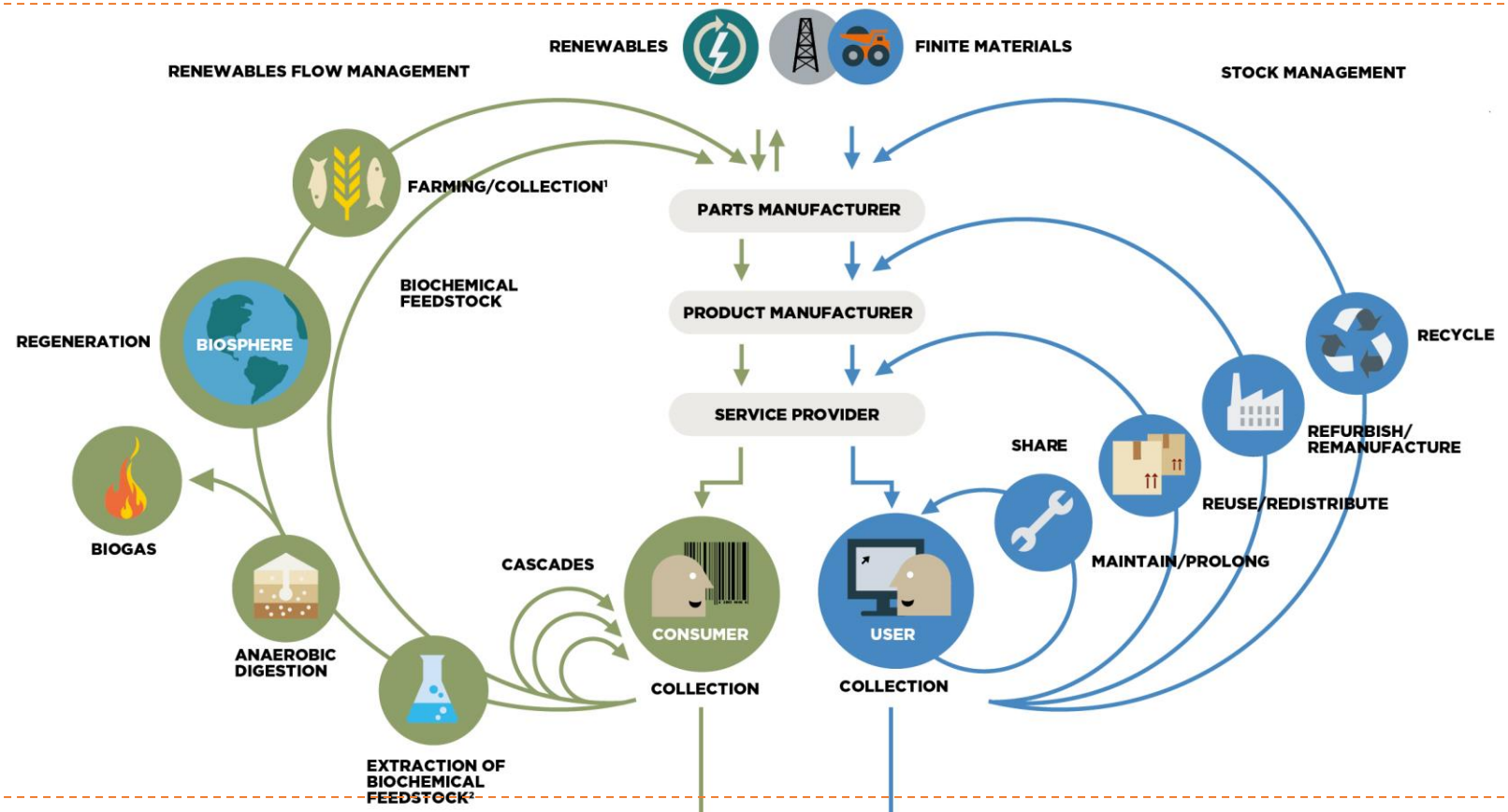
Circular economy principles



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

SOURCE
Ellen MacArthur Foundation
Circular economy systems diagram (February 2019)
www.ellenmacarthurfoundation.org
Drawing based on Braungart & McDonough, Cradle to Cradle (C2C)

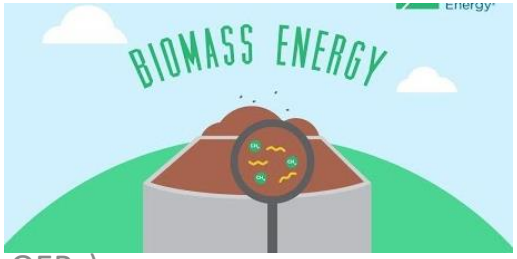
ELLEN MACARTHUR FOUNDATION

Circular economy principles

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

- When resources are needed, the circular system selects them wisely and chooses technologies and processes that use renewable or better-performing resources, where possible.
- A circular economy also enhances natural capital by encouraging flows of nutrients within the system and creating the conditions for the regeneration of, for example, soil.

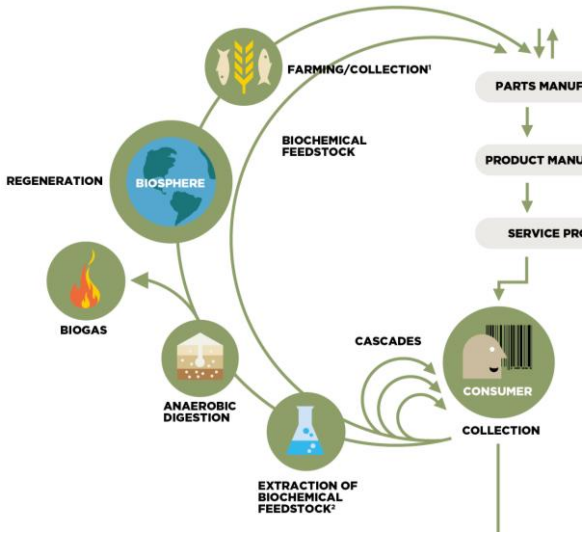




Circular economy principles

Principle 2. Resource Loops

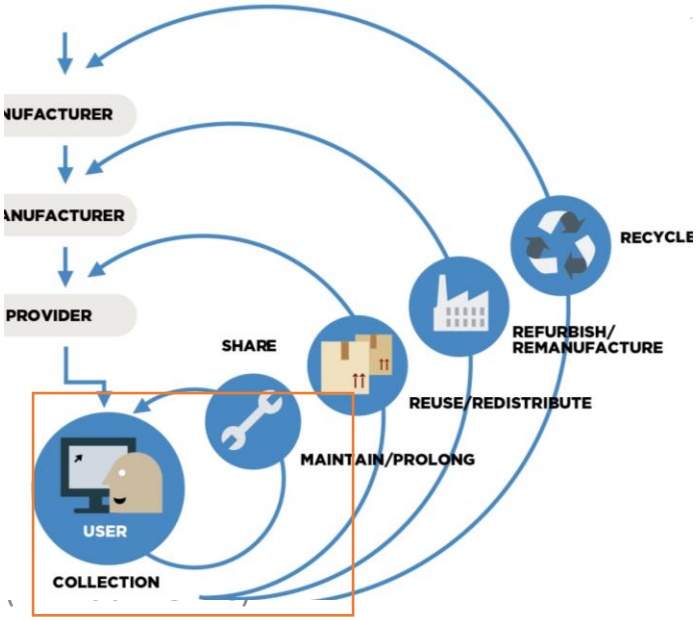
- Designing products so that they can be **repaired, recycled** to keep materials and components in circulation;
- Maximize the number of consecutive cycles and / or the time spent for each cycle, by extending the life of the products and optimizing reuse.
  - Circular systems encourage biological materials to re-enter the biosphere safely for decomposition, to become a **valuable raw material** for a new cycle.
  - In the biological life cycle, products are designed to be consumed or metabolized by the economy and to regenerate a **new value of resources**.



Circular economy principles

Principle 2. Resource Loops

- **Collection** - reverse supply chain, namely the recovery of products back from customers (through rewards for used products or refunds of deposits).
- **Maintenance / repair of products** (**service loop)** is the shortest loop of resources.



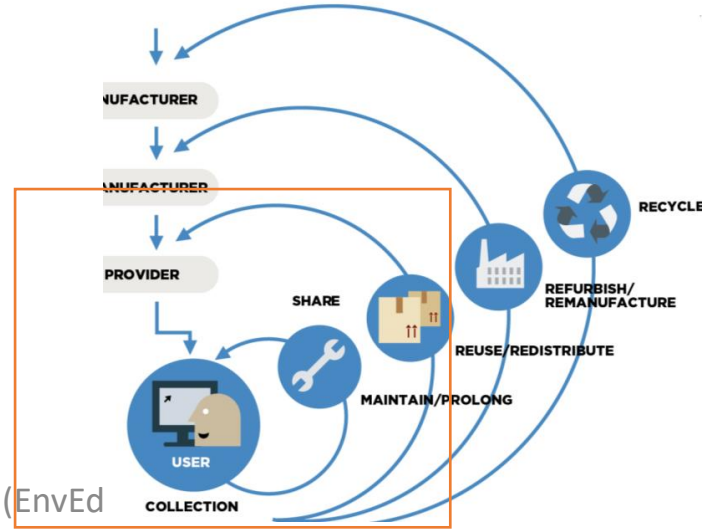
- Extending the life cycle of a product
- The maintenance loop stimulates the manufacture of durable, functional and high quality products to extend the life cycle and increase the time between two repairs.
- This loop returns the product directly to consumers.

Circular economy principles

Principle 2. Resource Loops

Reuse cycles are used to exploit the residual value of a product after the consumer no longer wants it. Ex: second hand market (second hand market).

- ✓ creates a market for consumers to generate value from purchases that are considered unnecessary or unused.
- ✓ This loop delivers the product to a service provider or distributor.

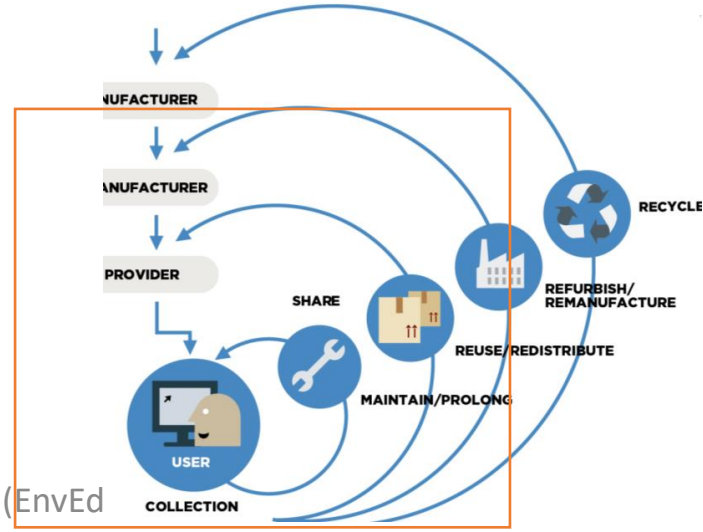


Circular economy principles

Principle 2. Resource Loops

Reconditioning - renewal, re-manufacture and restoration of a product in a new state and / or appearance. When a product has a high level of wear or consists of several components, the component parts of one product are used to repair another product.

→ The reconditioning loop delivers the product back to the product manufacturers to be reintegrated into their supply chain.

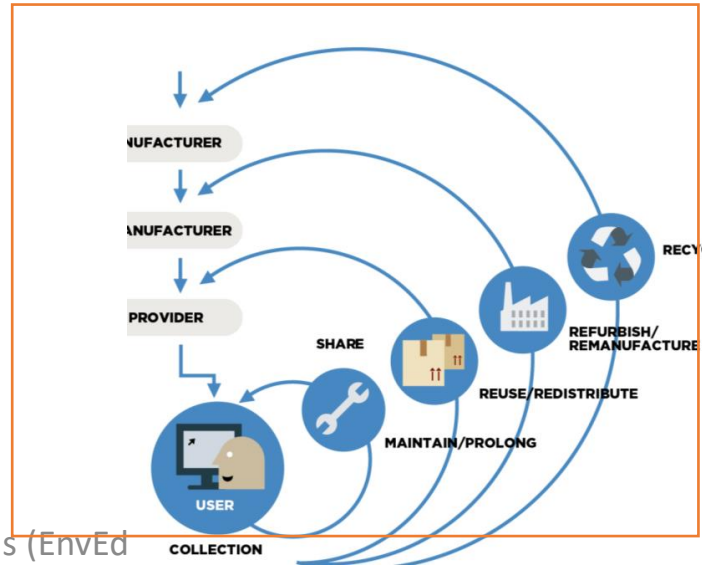


Circular economy principles

Principle 2. Resource Loops

Recycling turns waste into reusable materials

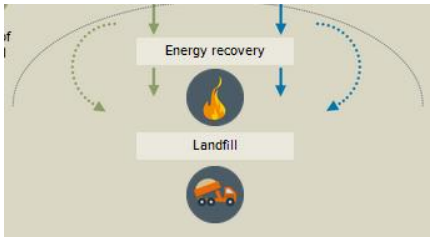
- focuses on the intrinsic value of the materials used in the manufacture of products;
- reduces the consumption of raw materials by creating alternative materials, often at a reduced price and with fewer limited resources.



Circular economy principles

Principle 3. Design for system efficiency

- ✓ refines the process of the circular economy by revealing and design negative externalities.
- ✓ Negative externalities are known as costs incurred by a third party (recovery of wasted resources).
- ✓ Efficiency and effectiveness are key factors for the success of the circular economy.
- ✓ This principle includes the reduction of damage to systems and areas such as: food, mobility, shelter, education, health and management of externalities, such as: land use, air and water pollution, noise pollution and the release of toxic substances into the environment.

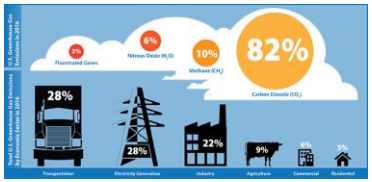


Circular economy benefits

Fewer Greenhouse Gas Emissions

The circular economy has the potential to reduce greenhouse gas emissions and the use of raw materials, optimize agricultural productivity and decrease the negative externalities brought by the linear model. When it comes to reducing greenhouse gases, a circular economy can be helpful:

- ✓ Because it uses **renewable energy** that in the long run is less polluting than fossil fuels;
- ✓ Thanks to **reusing** and **dematerializing**, fewer materials and production processes are needed to provide good and functional products;
- ✓ Because waste are seen as **valuable** and they are absorbed as much as possible in order to be reused in the process;
- ✓ Since the preferred choices will be **energy-efficient** and **non-toxic materials** and manufacturing and recycling processes will be selected.



Circular economy- benefits

- **Substantial material and energy savings** → the circular economy model has the potential to lead to a bigger (**up to 70%**) amount of material savings.
- **Increased Potential For Economic Growth**
- **Volatility Reduction And Safeguarded Supplies**
- **Fewer Negative Externalities**
- **Improved customer interactions and loyalty**
- **Healthy and Resilient Soils**
- **Conservation of nature reserves**
- **Creation of employment opportunities** (increasing recycling and repair practices, new innovation processes)
- **The possibility of influencing prices decreases**
- **The Demand For New Services**
- **Improving products and reducing production costs**

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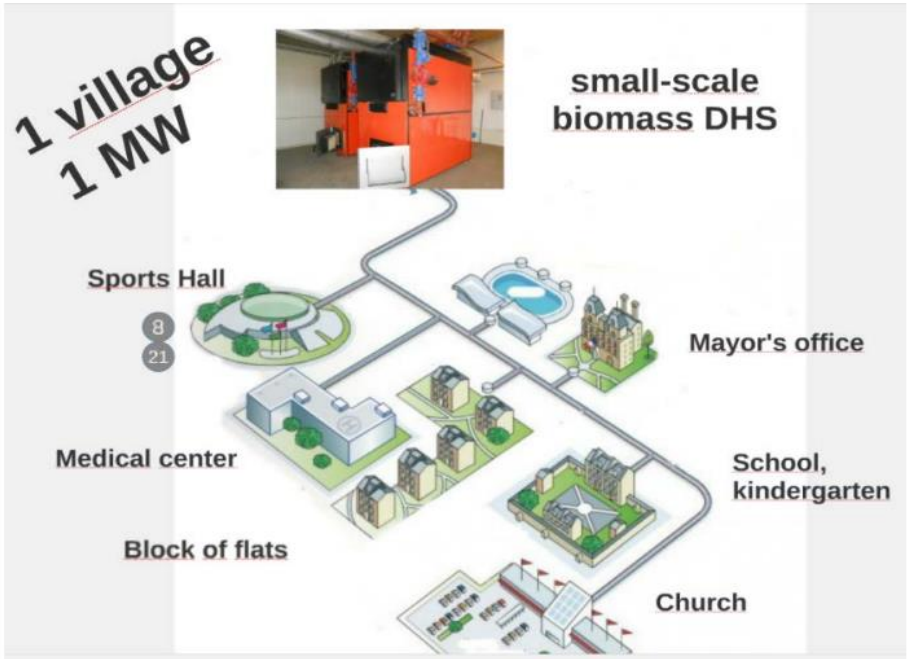
CASE STUDY 1: Bioenergy villages in Ghelinta and Estelnic Communes, Covasna County



A bioenergy village is a village, municipality, settlement or community or a part of it, which supplies most of its energy for electricity and heating from local biomass, e.g. from agriculture, forestry and waste, and from other renewable energy sources.

It usually combines several energy technologies, such as woodchip boilers, pellet stoves, logwood boilers, biogas plants, combined heat and power plants, and sometimes also solar, thermal and wind energy.
Often, a local district heating grid distributes the heat to the consumers.

Benefits of the Bioenergy Village Approach:

- Increased use of locally produced renewable resources for energy generation (e.g. heat and electricity);
- Improved development of the whole bioenergy sector;
- Strengthened local and regional economy, job creation and income generation;
- Positive effects on climate change mitigation, environmental protection and human wellbeing.

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CASE STUDY 2: Upcycle House

The house is built of processed recycled materials and Upcycle House investigates how much it's actually possible to reduce the CO_2 footprint by using upcycled materials to the extent possible.

The loadbearing structure: two prefabricated shipping containers

The roof and facade cladding is made from recycled aluminium soda-cans.

Facade panels - post-consumer recycled granulated paper.

The kitchen floor is clad in tiled champagne cork-leftovers, and the bath tiles are made from recycled glass.

Walls and floors are covered with OSB-panels consisting of wood-chips that are bi-products of various production sites, pressed together without glue.

The CO_2 emission from Upcycle House **is 0.7 KG CO_2/m^2/year** compared to **5.0 KG CO_2/m^2/year for a benchmark house**.
A potential reduction of 5590 tons of CO_2 – per year.

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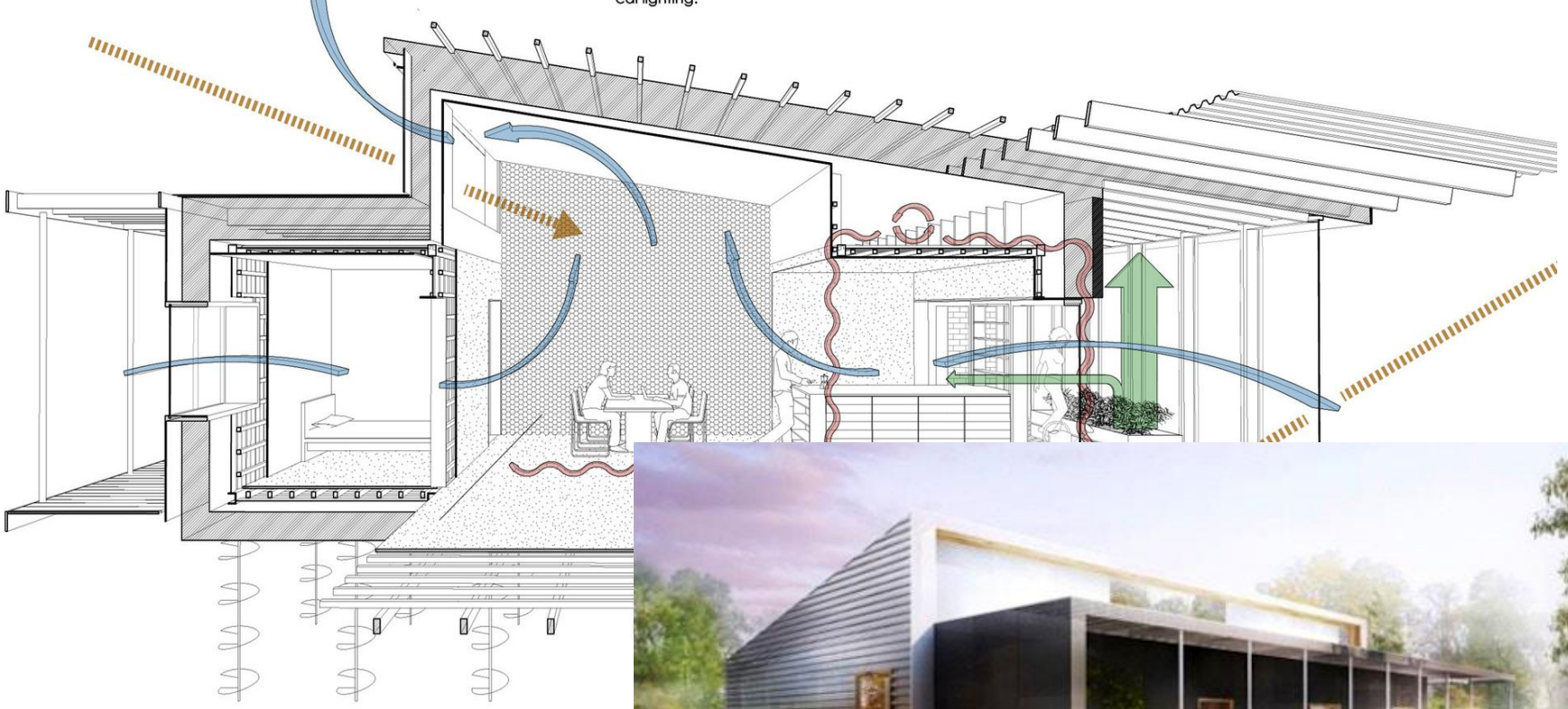
What : Passive solar energy
How : The water in the plastic bottle wall absorbs the sun's rays, which counters potential overheating during the summer.

What : Natural ventilation
How : Operable windows placed in the optimal heights enables natural ventilation, which lowers the need for mechanical ventilation.

What : Indoor climate
How : The clerestory window facing west, is dimensioned to allow for maximum light in-take without risk of overheating and glare issues.
Correct use of daylight minimizes the energy, consumed by electrical lighting.

What : Ventilation strategy
How : In the void between the container and the roof, a air-to-air ventilation system is installed, that utilizes the difference in temperature between the green house and the interior spaces.

What : Bio-diversity
How : The flora of the greenhouse results in an increase in biodiversity, and contributes with a higher understanding of natural cycles.
The plants also generate oxygen, which results in a better indoor climate.



What : Roof overhang
How : The roof overhang around the house provides covered outdoor areas, making them useable for bigger parts of the year. The overhan also shields the facade from the rain, so maintainance costs are kept low.

What : Shading
How : The roof overhang prot
house from solar rays, so the risk
heating is minimized during the su

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Thank you for your attention!

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