MOVECO WP 5 Innovation Tools

Activity 5.2 Qualification Programme

Schools of thought

Industrial Ecology

Aims of this tool

To understand the importance of different schools of thoughts for new circular design, manufacture, use and end of life with the aim to keep materials, products and components within the technical or biological cycle for longer periods, at their highest potential, and evaluate strategical circular development of a company;

To learn how to apply circular design approaches that can be implemented within a company/product lifecycle and define measures to improve the company circularity.

To define steps in developing the company circularity through new ways of thinking

Content of this tool

- Introduction of Circular Economy
- Categories of Industrial Ecosystems
- Principles
- Benefits

Figure 2

Circular economy definition

"A circular economy would benefit our environment, but it's also smart economics. The idea is to keep a given resource circulating for as long as possible. That means designing products, processes and services to optimize the use of resources, so that when something reaches the end of its useful life, we re-use, repair, or remanufacture it for another use. Or we recycle the materials it contains and re-inject them into the economy elsewhere."

- Quote by Karmenu Vella, European Commissioner for Environment, Maritime Affairs and Fisheries (www.unep.org/ourplanet/may-2016/articles/go-circular)

Industrial Ecology

- Is dealing with the study of energy and material which flows through industrial systems
- Makes a parallel between the artificial ecosystem that is the industry and the natural ecosystems
- Is trying to make more efficient the activities within the artificial ecosystems according to the natural model
- Is a frontier science

Industrial Ecology

- Proposes a sustainable economic model

- Proposes a model of development similar to the natural ecosystems

- Industry uses its own waste as a source of raw material

Figure 1

Categories of Industrial Ecosystems

- **Type 1:** - in which the resources exploited without restrictions are practically scattered and the wastes are discarded

- **Type 2:** - it has been noticed that the environment is affected by the storage of waste
  - it has been noticed that the resources are not unlimited
  - first steps are being taken for the reuse of waste
  - defining the first loops

- **Type 3:** - the reuse of the materials and the waste is made entirely
  - only insignificant quantities of raw materials and supplies are needed
  - energy used comes entirely from renewable energy sources

Figure 3

Principles

- Transforming current industrial ecosystems into new closed-loop ecosystems
- The emergence of partnerships between various industrial branches, existing or undergoing training
- Creating a balance between demand for raw materials and supplies
- Optimizing how industrial ecosystems interact with natural ecosystems

Figure 4

Principles

- Studying the mode and timing of waste dematerialization. Optimizing the management and use of all types of resources.
- Increasing the performance of all industrial ecosystems.
- The energy used in industrial ecosystems should come from renewable, environmentally friendly sources.
- A desired goal is to integrate energy generation into industrial ecology.
- Inclusion of industrial ecology in national, regional and international policies.

Figure 5

Benefits

- the quantity of waste stored in nature will decrease
- the amount of raw material required decreases and reduces environmental stress
- lower production costs per unit of manufactured wares
- by the sale of the waste the revenues obtained in a series of industrial branches will increase
- through the economic exchanges the collaboration between the industrial branches will be improved
- it improves the quality of life.

Figure 6

Case study – ROMBAT SA

Foto credit: ROMBAT SA Bistrita

ROMBAT SA

- **Rombat SA** – is a producer of lead acid batteries, collects the used batteries.
- Over 83% of the battery weight is reused in new processes of production.
- Rombat distributes batteries in more than 3000 stores across Romania
- The activity in Rebat Copsa Mica working point consists in recycling
- of used batteries.
- This provides recyclable materials
- From the social point of view, it creates jobs for about 80 persons.

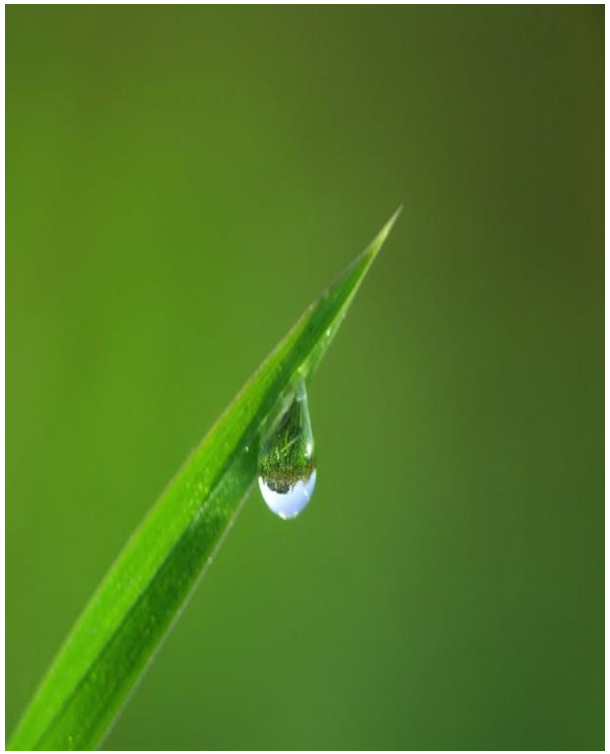
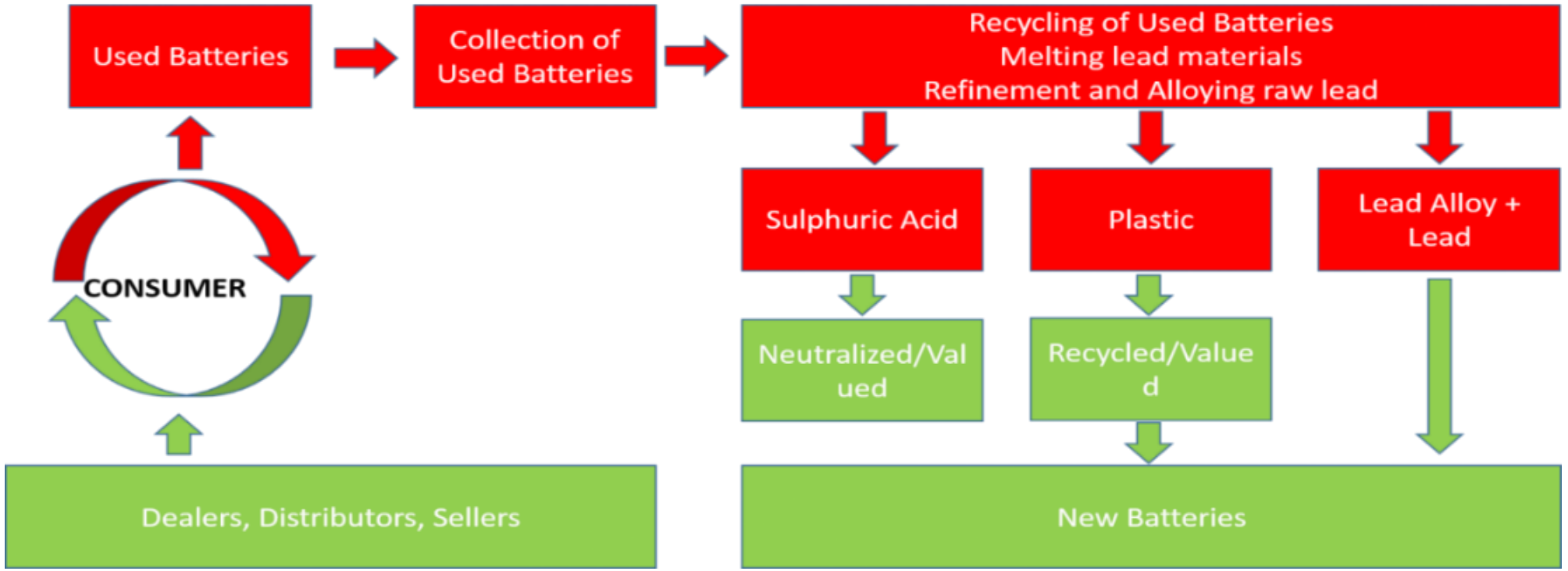


Figure 7

ROMBAT SA



The process of recovery for ROMBAT/REBAT Romania
Foto credit: ROMBAT SA Bistrita

ROMBAT SA

CYCLE OF TREATMENT

Compliance with B.A.T. requirements for the recovery of used lead - acid battery.

Foto credit: ROMBAT SA Bistrita

Exercise 1

- Identify industrial ecosystems and propose concrete measures using the principles of industrial ecology that transform them from Type 1 ecosystems into a Type 2 ecosystem.

- Think about and propose other measures to turn them into Type 3 ecosystems.

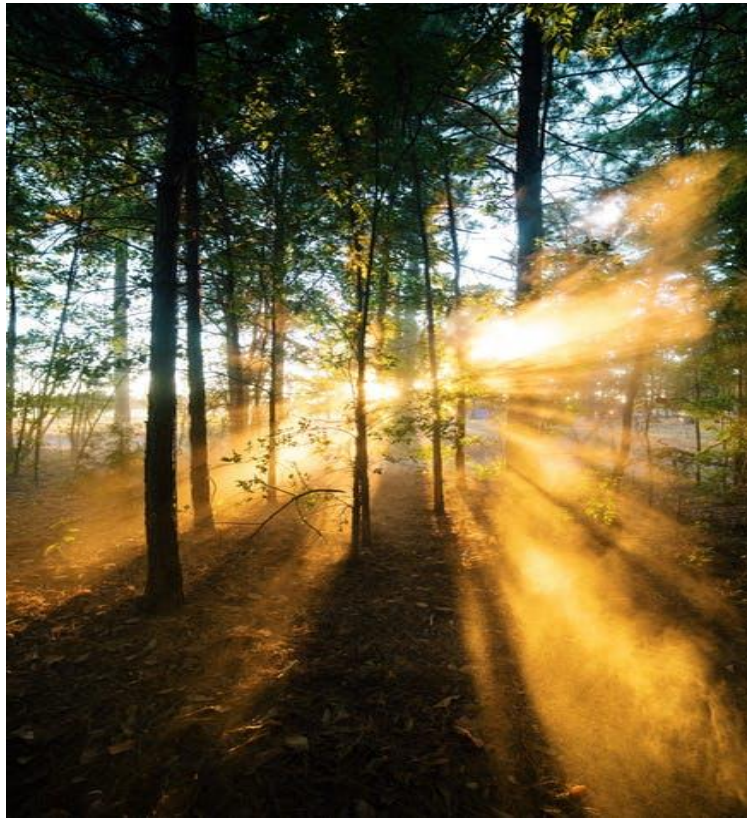


Figure 8

Exercise 2

* Choose a known product.

- Choose one or more materials from your product.

- Redesign the product in a way that will not affect comfort and mood.

- Provide constructive solutions in which a component performs several functions.

- Make as many functions as possible with fewer components.

- Use new or easily recyclable materials in the design phase to minimize the environmental impact.

- Redesign the product so that at the end of the lifetime of the finished product, as many components can be reused immediately or in short time.

Exercise 3

* For the product from the previous exercise think new solutions to make this product so:

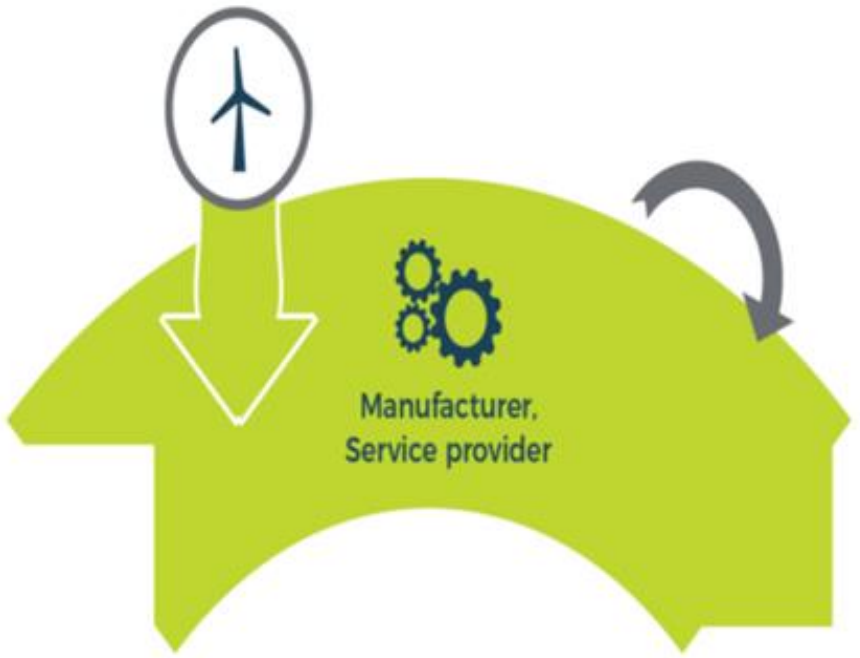
- Using energy from renewable sources in the manufacturing process.

- Remove harmful materials that affect the environment.

- If natural materials are not available, use easily biodegradable materials in the manufacturing process.

- Use modular manufacturing solutions for products so that they can be properly maintained, and damaged parts are easy to change.

- Preferred technical solutions that include the purchase of finished products with short execution times and minimal costs.



Exercise 4

The product from the previous exercise:

- Is safe for the environment during its use ?
- Can the product be repaired, refurbished or remanufactured ?

Exercise 5

- Can the product from the previous exercise, at the end of its economic life, be easily decomposed into component parts ?
- What percentage of these are reusable immediately after dismantling?
- What percentage of these are easily recyclable ?

Q & A

- What is the industrial ecology ?

- Name some of the principles of the industrial ecology (minimum 3).

- Name some of the benefits of industrial ecology (minimum 3).

Figure 9

Online video sources

Industrial ecology - *https://www.youtube.com/watch?v=_9mHi93n2AI*

Figure 10

Sources

- Figure 1 right picture credit Pexels.com, https://www.pexels.com/photo/person-s-left-hand-holding-green-leaf-plant-886521/, visited 28.05.2018
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