

# Circular strategy wheel

## Manufacturing

Manufacturing concerns improvement of circularity, efficiency and effectiveness in the product manufacturing and you can consider the following: favour cleaner production, efficiency, processes, equipment toxicity and other environmental aspects of handling material production waste.

Finally, you can also consider social sustainability aspects, design for reduced energy consumption and prioritising renewable energy.

## Raw material & sourcing

Raw materials covers the selection of resources and materials that go into the products that is to become a part of your system.

When choosing materials, consider: durability, renewability, recyclability & secondary recyclability.

You can also consider aspects such as where the materials originate from and how the working conditions are for the people dealing with the materials (i.e. social sustainability aspects).

## Design

Design of products is considered the first circular strategy and therefore priority as well as it influences the rest of the life cycle.

Circular design/eco-design involves the application of guidelines that involves a variety of guide of how to e.g. design for/with: disassembly, timelessness, emotional attachment, easy recognition of materials, non-toxic and, renewable/recyclable materials, digital elements, as few incompatible and dissimilar materials as possible.

## Recover

Energy recovery happens by incinerating materials since the material characteristics no longer satisfy any application whatsoever.

The recovery must happen only after materials have been recycled more than once. The main problem when recovering materials is toxic smoke emitted by certain materials and additives that was added to the product.

### Cascade

When cascading, new applications of processed materials usually have a lower demand for resource quality. It is important to consider the cascading process early in the design process.

A material starts its lifetime at the highest quality possible, and the quality of the material naturally declines over time. Every step of the cascade has a certain lifetime. The resource should be used in a new application before the quality is too low.

### Recycle

Recycle concerns recovery of waste material where it is being reprocessed into (new) products, materials or substances - either for their original or another purpose. Recycling destroys the energy and value that were placed into the product originally and adds additional energy and resources for the recycling process required - even more additional energy and resources are required to transform the recycled materials back into a new product.

### Disassembly

Design disassembly make it easier for products to prolong its useful life. It can also help ensure that products are being recycled and enable entire components to be reused. In fact, the degree to which your product can be disassembled often determines how the product will end its life. You can consider: at few parts and use of tools as possible, integrated instructions and minimal time for disassembly, easy inspection, identification of materials, direct reuse of parts etc.

### Collection

Consideration about collection and sorting of products after the use stage(s). These aspects are (and will be) influenced by laws and regulations on a domestic, european and international level.

Societies are moving in a direction towards increased demands within collection and sorting of different materials e.g. textiles, plastic, metals etc.

### Resell

Strategies for reselling can e.g. involve collaborations with partners about enabling reverse logistics aiming to achieve take back systems or establishing sharing economies which are examples of business models that operate within the resell strategy.

Reselling can be placed earlier in the wheel and be a part of several steps in a circular business model.

### Upcycle

Upcycling is about resuing or redesigning products, which often involves working in a creative manner in order to identify the second use scenarios or functions that the products/materials will become a part of in its new use phase.

Upcycling is about transforming bi-products, waste materials and/or unwanted products into new materials, components or products of same or even higher quality or value.

### Distribution

Considerations about distribution are e.g.: design for effective loading and transport which concerns transport of larger quantities at a time and stackable products. It also concerns return logistics, reduction of emissions linked to transport, choosing local suppliers, minimisation of the weight of components and selection of strong, robust and durable packaging with long lifespan that do not degrade during multiple transportation.

### Care

Caring is about how to extend the lifetime of products as much as possible by (continuously) taking care of them during their use phase.

This is done by e.g. considering effective use along with procedures for caring to facilitate the extension of the lifetime of products.

Examples of this could be facilitation of emotional/personal attachment to products, educational videos, provision of care kits, manuals etc.

### Upgrade

The product is still functional, but new changes, evolution and new features are added to extend the lifetime of products. Upgrades can extend the product value by enhancing the function of an existing product to even beyond its original design condition.

Potentially, it can also reduce value loss from continued use of parts and products.

### Reuse

Reuse of (discarded) products involves that they are still in good condition and fulfill original functions aiming to keep the product attractive to as many different users as possible, and for as long as possible and preventing it turn into waste. Reuse may involve minimum cleaning and re-packaging. The reused product should still be functional, efficient, and attractive. People might reuse preowned products due to lower prices, patina or if they are better than new ones.

### Repair & maintenance

Repair and maintenance invovle thinking about how to correct, replace and/or fix broken/damaged components of a defective product aiming to maintain the original functionality to the same user and thereby extend the life time of products and reduce the need for new resources, avoiding waste and producing fewer emissions. Repairing and maintenance can happen with different frequencies and also be part of a product/service-system.

### Refurbish

Refurbishing is about repairing a returned product after a certain period of use so that it satifies certain mechanical specifications and operating conditions within the limitations of what is considered acceptable by rebuilding or repairing major components that are close to failure - even if there are no reported failures in the components. The main difference from remanufacturing is that refurbishment is usually less rigorous and costly and involves less dis/re-assembly.

### Remanufacture

Remanufacturing involves collecting and returning used products, disassembling, sorting, cleaning, inspecting, repairing and reconditioning, assembly, testing and finally combining and upgrading them with new parts to make products that both look and perform as new and can be sold as new.

Designing for remanufacturing involves considering design for disassembly aspects such as speed of disassembly, cost, etc. during product development stages

### Repurpose

Repurposing is about identifying new use phases for products (discarded/not in use) or their parts and use them in new/different contexts.

Repurposing requires thinking outside the box and possibly outside your industry. When working with repurposing aspects consider e.g.: using durable and robust components and materials, easy and non-destructive disassembly and provision of manuals and relevant documentation.

