

# SUSTAINABLE DESIGN PRINCIPLES

## FACT SHEET

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**This fact sheet provides a brief summary of selected sustainable design tools and principles that can be applied to products and services to increase resource efficiency.**

Sustainable design principles invite us to rethink the perceived value of a product or service and consider the social, environmental and economic impacts of our design choices. Resources are used thoughtfully and efficiently and retain their value across the product/service lifecycle. This is referred to as 'eco-design' or 'eco-value'.

### **Lifecycle Assessment (LCA)**

Lifecycle Assessment considers the inputs and outputs at each stage of the product lifecycle; from extraction of raw material to end-of-life disposal.

LCA assesses environmental impacts, including natural resource usage, waste to landfill, land disturbance, impacts on flora and fauna, and greenhouse gas emissions.

Impacts are estimated, based on large data sets, and are represented in flowcharts. Various scenarios for materials, processes and end-of-life can be compared to inform product/service design.

### **Dematerialisation**

When approaching any design problem, we first ask ourselves if we can deliver value without materials. For example, sending an email instead of posting advertising materials.

In product design, use of specific features and approaches can reduce material use; for example, 'honeycomb' structures reduce material mass while optimising strength and endurance.

Processes are designed to eliminate material waste. For example additive manufacturing adds material as needed, eliminating 'offcuts' and trim.



Fiona Turner from Jinglers Creek Vineyard designed a drone swarm service as a substitute for plastic nets, to deter birds from ripening fruit.

### **Substitution**

A physical product is substituted with a service or 'collaborative consumption'; for example, sharing a forklift with neighbouring businesses or hiring equipment, as needed.

Sustainable alternatives are sought for materials and components in physical products and local sources are identified for imported product.

### **Design for Disassembly**

A product is designed with the end in mind. Component parts are easily disassembled for repair or replacement of failed parts, or for separation into material streams for recycling.

Treatments that cannot be easily separated, such as composites, laminates, glue or paint, are avoided.

Assemblies are held together by 'snap-fits' or removable fasteners and fixings. Sub-assemblies are used to isolate points of failure for quick-changeover of replacement parts.

## Cradle to Cradle (C2C)

Cradle-to-Cradle (C2C) originates from McDonough and Braungart's book, *Cradle-to-Cradle: Remaking the way we make things*, first published in 2002. It is an alternative to the linear 'cradle-to-grave' product lifecycle and is commonly understood as 'closed loop' manufacturing.

Products are reclaimed and returned to the production system to produce the same or higher quality products. This is called 'up-cycling' - as opposed to 'down-cycling', where secondary products are of lower value.

The underpinning philosophy of C2C challenges the designer to go further. Beyond being "less bad", it asks us to "figure out how to be good"; designing products and processes that enhance the natural environment, generating nutritious food for biological systems or refining and improving technical systems, across the entire product lifecycle.

### Servitisation (or Product Service Systems)

Servitisation is more than offering services to 'value-add' to product offerings; it relates directly to dematerialisation. By identifying the true value of products in the eyes of the customer, we can design services to deliver value without the need for personal product ownership.

An example is leasing a colour photocopier, with a service agreement that includes consumables. The value for the customer is being able to print documents on demand; a reliable machine, with toner and paper ready to produce copies.

The manufacturer retains ownership, repairs the machine, supplies consumables, takes away the waste and replaces the machine when it is no longer usable.

Servitisation provides total stewardship of materials and components for reclaim and return to the system. It also gives the manufacturer direct feedback on customer requirements and product performance for continual improvement.



Envorinex in George Town has 'closed the loop' on soft plastics recycling. Waste film is collected from local farms and recycled into pellets, which are exported for manufacture back into plastic film.

## THE HANNOVER PRINCIPLES

In 1992, McDonough and Braungart prepared a series of sustainable design principles for the City of Hannover in Germany, to inform the design of Expo 2000, The World's Fair.

These nine principles form a living document and underpin many of the sustainable design strategies presented here.

Learn more at:

<https://mcdonough.com/writings/the-hannover-principles/>

The Business Resource Efficiency Program (BREP) is delivered by Business Action Learning Tasmania (BALT) in partnership with the Tasmanian government.

#### For more information about BREP

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