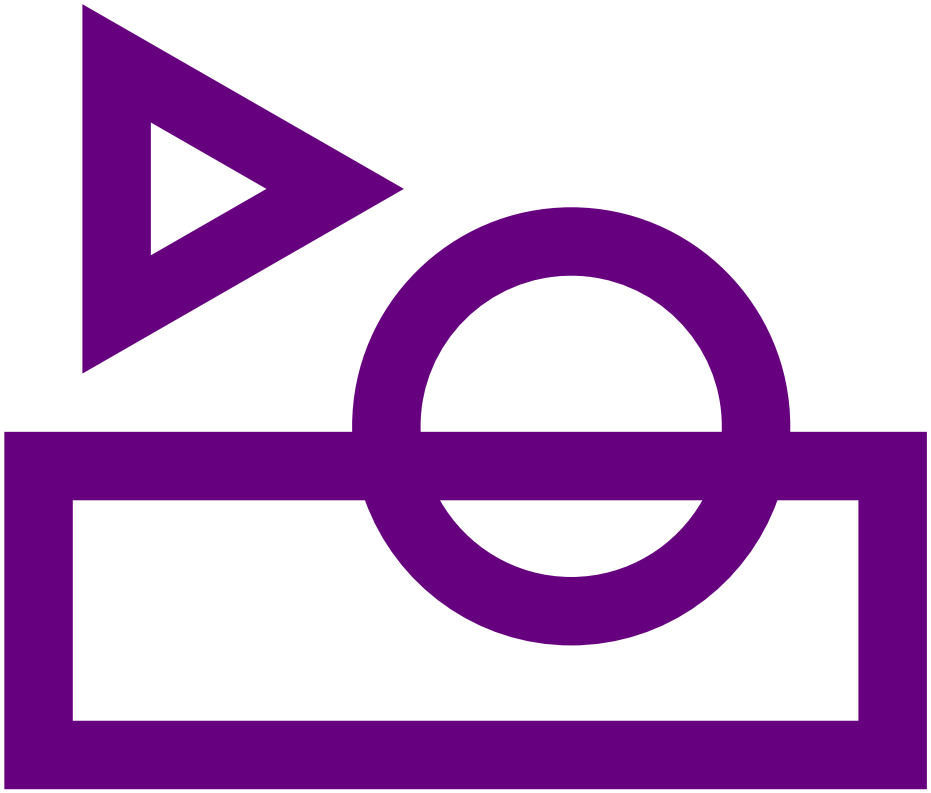
CIRCULAR
ECONOMY
IN CITIES



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DESIGNING FOR REUSE AND CIRCULATION OF PRODUCTS AND MATERIALS

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Decisions made in the design phase of a product can significantly influence how circular it is. For example, a phone can be designed to be easily repaired and its components upgraded, and a sofa can be made from locally available, non-harmful materials. Today, many products are designed to meet customer needs during the first use phase, but not thereafter. This impacts the wider system in which they are made, used, and disposed of. Combining a user-centric and holistic approach to product design is key to creating an effective urban products system that follows circular economy principles. New solutions such as artificial intelligence, block-chain, open-source, and cloud designing can further accelerate innovation within product and material design.

THE CASE FOR CHANGE

80%

More than 80% of a product's environmental impact is determined at the design stage[1]

19% of European households' energy consumption is used for lighting, electrical appliances and cooking. This could be reduced through better product design[2]

30% of plastic packaging will never be reused or recycled due to poor design[3]

2.5 Mt of toxins are generated from e-waste each year[4]

0.5 Mt of plastic microfibres are released into the ocean annually from the washing of textiles. This could be avoided with different material choices[5]

In the fashion industry, mismanagement of chemicals in the workplace is estimated to cost **EUR 7 billion** a year by 2030 in illness and early mortality[6]

"When you realise that the economy is designed, then of course you understand that it can be redesigned."

Chris Grantham, Executive Portfolio Director, IDEO London (2018)

EXAMPLES OF CIRCULAR ECONOMY OPPORTUNITIES

Designing for reuse and multiple cycles

With the introduction of performance-based business models, where the customer pays for the use of the product rather than the product outright, there is an increased incentive to design products of a higher quality that last longer. This means that product design seeks to enable repair, upgrading, component reuse, material sorting, and recycling by ensuring that the product is easy to take apart and does not contain materials that can be problematic in further use. Timeless design can also prolong the use cycle. Modular design principles that ease repair or upgrade (for example when a better component is developed) can minimise disruption and increase the product's overall resource efficiency. Products that are virtualised, or designed for 3D printing and local production, can reduce material inputs and freight transport. See also *Products: Making* or *Mobility: Accessing.*

Designs that support efficient operation and maintenance

It is important for products that consume energy and/or water during use to be designed to make the most of these inputs, leading also to reduced operational costs. Designing products to include built-in smart meters and sensors can help users to monitor and optimise energy and/or water consumption. Sensors can also predict maintenance needs before a product breaks.

Designing in supply chain and product transparency

New blockchain-based information technologies and digital watermarking (such as QR codes or chemical markers) are enabling designers and makers to provide full product and material transparency along the supply chain.[7] Users of this information can include, for example, a customer who wants to avoid certain allergens, a company that wants to repair the product, or a recycler that wants to sort and resell materials after use. This type of transparency means that products can become 'bmaterial banks' that can support more effective production, use, and end-of-use phases.

Open-source design to accelerate innovation, uptake, and customisation

Open-source design can accelerate innovation and scale the uptake of circular economy solutions. Such design also supports the uptake of distributed manufacturing (enabled by digital technologies) by allowing individuals and makers to gain access to circular economy designs and apply them. Open design platforms can connect designers, makers, and users across geographies, enabling them to share best practice while allowing them to adapt product designs to local conditions relating to, for example, user needs, available materials, and municipal recycling schemes.

EXAMPLES OF WHAT URBAN POLICYMAKERS CAN DO

By reshaping **public procurement** criteria, city governments can support the emergence of circular product designs. For example, by adding specifications on the use of non-harmful materials and on extended producer responsibilities.

Capacity building programmes for innovators and entrepreneurs on circular economy and design in relation to the local context can help stimulate innovation.

Awareness raising about the benefits of circular designs and local opportunities can support the uptake of new products and business models.

To explore further see **Policy Levers**

EXAMPLES OF LINKS TO OTHER SYSTEMS AND PHASES

Products: Making Design considerations, such as material choice and how to support distributed manufacturing and local material flows, can improve the overall quality and applicability of the design.

Products: Accessing Product-as-service business models go hand-in-hand with high-quality product design, as businesses can benefit from reduced virgin material consumption, remanufacturing opportunities, and high recyclability.

CASE EXAMPLES

Modular headphone design for service-based business models

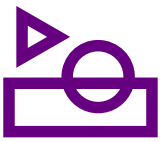
On a global scale 15,000 tonnes of headphones are discarded every year. To address the issue Gerrard Street has designed high-quality headphones that are modular and easy to disassemble for repair, refurbishment, and upgrade. The headphones are offered on a subscription basis allowing customers to get them upgraded or repaired at no additional cost. Since 85% of the headphone components are reused, Gerrard Street reduces its need for virgin materials when creating new headphones, and customers get access to a high-quality product that is affordable and has a high level of service.[8]

Packaging designed for reuse

Splosh and Replenish are companies that sell concentrated household cleaning products through a system where bottles can be used repeatedly and refilled with sachets of concentrated liquid. Their packaging is reusable and designed for long use, which results in reduced energy consumption, plastic waste, and CO_2 emissions by 80–90% compared to single-use bottles. By selling concentrated sachets that can be diluted with local tap water to create cleaning liquids, they also avoid the need to transport water over great distances.[9] RePack offers a reusable packaging service for retailers that can last at least 20 cycles. The packaging can be folded down to a letter size and returned in the post for reuse. A reward system encourages the customer to return the packaging, while strengthening the relationship between customers and retailers.[10]

Procuring furniture designed for disassembly

In 2012, Denmark's central procurement agency (SKI) established a four-year framework for sustainable office furniture for more than 60 municipalities. Technical specifications were based on environmental requirements of the Nordic Swan eco-label, and included requirements on the chemicals used in the manufacturing, treatment, coating or dyes used, and the possibility of separation and recovery of materials at end-of-use. Wood and wood-based materials were also required to come from legally harvested timber, and at least 70% of this had to be either recycled or verified as sustainable timber. By using this framework approach, savings of up to 26% compared to market prices were achieved, and the market for circular furniture products was broadened.[11]



Open source and flexible product design

Bang & Olufsen's open-source speaker solution, BeoCreate, is specifically designed to enable customers to upgrade old Bang & Olufsen speakers. BeoCreate comes with instructions on how to 'hack' and adapt the speakers. Through this combined product and service model old speaker components are kept in use while Bang & Olufsen gain useful insights on innovation from their users.[12]

EXAMPLES OF BENEFITS

ECONOMIC PRODUCTIVITY

Reducing operation costs

The most energy-efficient washing machine and electric oven designs can save the user EUR 230–250 over the lifetime of the product.[13]

Reducing product return costs

Greater product quality can ensure longer product life and can benefit retailers by reducing product returns due to failure. Product returns currently cost UK retailers and brands up to GBP 400 million every year.[14]

JOBS, SKILLS, AND INNOVATION

Supporting growth, jobs, and innovation

The European Ecodesign Directive (framework legislation that governs European product design) is expected to generate EUR 55 billion in revenue per year for industry, producing up to 800,000 additional jobs and will have a significant overall positive effect on economic growth, investment, and innovation.[15] It also ensures a level playing field in the market for companies that are developing or using better design solutions.[16]

COMMUNITY AND SOCIAL PROSPERITY

Saving households money

In Europe, ecodesign and energy labelling is estimated to result in important economic savings for end-users. For example, around EUR 100 billion per year in 2020 through lower utility bills, which is equivalent to annual household savings of EUR 500.[17]

HEALTH AND ENVIRONMENT

Reducing health risks

The negative health impacts on workers in the fashion industry has been estimated at EUR 7 billion each year by 2030. However, safe and non-toxic material inputs would reduce these health risks for the workers as well as the people wearing the textiles.[18]

Reducing CO_2 emissions

Carrying out a range of simple, already feasible design options to extend the lifetime of laptops, printers, and washing machines in the EU could lead to savings in greenhouse gas emissions of over 1 million tonnes per year – the equivalent of taking 477,000 cars off the road for a year.[19]

RESOURCE USE

Saving energy and water

With more efficient washing machines, Europe would see annual savings of 1.5 TWh of electricity and 100 million m^3 water by 2020.[20]

Increasing energy security

The European Ecodesign Directive and Energy Labelling Regulation is estimated to generate around half of the EU's energy savings target for 2020 (around 175 Mtoe primary energy per year by 2020) and reduce fossil fuel imports by 30%.[21]

Increasing product life

Good design can make even smaller products more durable, for example the longest lasting light bulb has been in use since 1901.[22]

Reducing reliance on raw materials for textiles

Dutch Awearness has developed a 100% recyclable textile fabric, which can offer energy and water savings of 64% and 95% respectively, while cutting down on raw material demand by 61% compared to standard virgin textiles.[23]

ENDNOTES

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3 Ellen MacArthur Foundation, *The New Plastics Economy: Rethinking the Future of Plastics & Catalysing Action* (2017) p. 11, 36

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7 Blockchain covers a broad range of information technologies that in general can be described as a "chain" of "information/data blocks" put together in a ledger in the cloud (a bit like a google excel sheet). All relevant stakeholders can access the ledger and submit information each time a transaction occurs. For instance, when a material or product passes hands, moves on to the next production stage or changes in some way, new blocks are added onto the end of the digital 'product information chain', allowing a complete overview of the life-cycle of that product. Blockchain has the advantage that it is a decentralised ledger and information cannot, once logged on the blockchain, be changed or modified in any way. *Source:* Design-Longevity, *Blockchain Information Technology* (n.d.) www.designforlongevity.com/videos/blockchain-information-technology

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