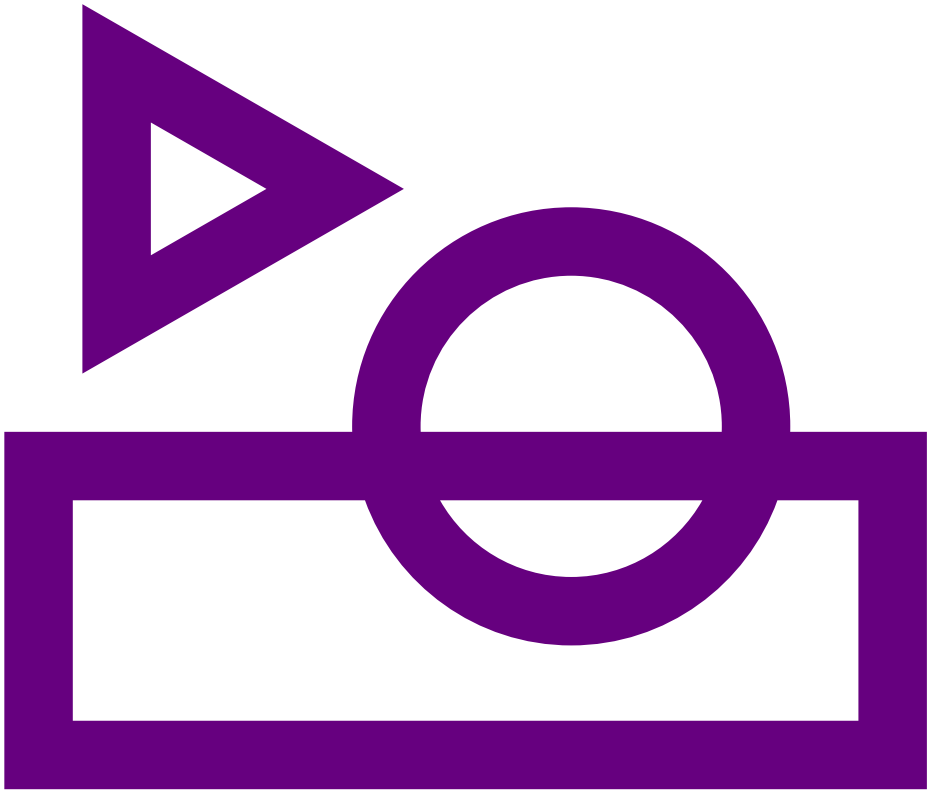
CIRCULAR
ECONOMY
IN CITIES



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PLANNING FOR PRODUCT INNOVATION AND CIRCULAR MATERIAL FLOWS

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Household goods tend to end up in municipal waste streams, where their value is lost and where they create a strain on public budgets. To address this at city level, both upstream and downstream policy measures are needed. To ensure effective resource consumption and the elimination of waste in cities, local material loops and flows must be created through two interrelated city-scale measures that address the entire product life cycle:

1. Upstream: Enabling and incentivising better production through business support and advisory services that focus on design and business development.

2. Downstream: Providing resource management infrastructure that facilitates services such as collection, sorting, reuse, and recycling.

CASE FOR CHANGE

75% of municipal solid waste is discarded consumer goods of which **80%** is burned, landfilled or dumped due to poor design and/or the lack of end-of-life collection options[1]

Solid waste management alone leads to **5%** of global CO_2 emissions[2]

Up to **20%** of municipal budgets are spent on waste management[3]

32% of plastic packaging ends up as litter outside waste collection systems [4]

One garbage truck of textiles is landfilled or incinerated every second,[5] representing a lost opportunity of more than **USD 100 billion** annually[6]

E-waste, worth **USD 107 billion**, is generated globally each year, of which only **20%** is collected and recycled under appropriate conditions[7]

"The aspiration to replace one-way products with goods that are 'circular by design' and create reverse logistics networks and other systems to support the circular economy is a powerful spur to new ideas. The benefits of a more innovative economy include higher rates of technological development; improved materials, labour, and energy efficiency: and more profit opportunities for companies."

Ellen MacArthur Foundation, Towards the circular economy: opportunities for the consumer goods sector (2013)

EXAMPLES OF CIRCULAR ECONOMY OPPORTUNITIES

Supporting and incentivising better production (upstream)

Product design decisions and new business models are key to eliminating waste and the underuse of products. For example, the way a product is designed might make it easier to repair – keeping it in use and out of landfill. A city's policies and activities related to business sutpport and economic development can be used to incentivise these methods. Support for skills and training can also help ensure that digital manufacturing, remanufacturing, and repair expertise exists.[8]

Providing resource management infrastructure (downstream)

While appropriate product design is key to enabling local material loops, there is also a need for the right resource management infrastructure to be put in place. This includes standardised collection and sorting schemes, reverse logistics services, as well as local sorting and processing facilities that can recover and redistribute materials and products for further use. Sorting infrastructure can be supported by innovations in robotics and artificial intelligence that can increase rates of recovery and purity of secondary materials.[9]

RELEVANT CASE EXAMPLES

Upstream: Circular economy business support programme in London

Advance London is a circular economy business support programme that helps qualifying SMEs develop circular economy solutions. Run by the London Waste and Recycling Board, the programme includes advisory services, an investment programme, and a business accelerator. Less than two years in, the programme has delivered 450 hours of support to 82 SMEs – one in three of which has secured grant, equity or loan funding within 18 months. The programme has helped to facilitate 20 product-market collaborations, which to date have generated five new circular products or services. (See *Cities case study: London*)

Upstream: "Policy (for) making" programme in Milan

Through the Manifattura Milano programme, Milan is promoting the development of local digital manufacturing and craftsmanship. The city is encouraging a new type of industry that is characterised by locally appropriate design, consumption with low environmental impact, and increasingly custom-made products, thanks to the use of new technologies such as 3D printers and augmented reality.[10] Today, Milan has more than 100 co-working spaces, ten Fab Labs and maker-spaces, incubators and business accelerators, and cultural and creative hubs – all with strong links to the city's universities.[11]

Upstream: An online marketplace for material exchanges in Austin

Austin's Material Marketplace is an online platform set up by the city to connect organisations that are looking to sell or buy used or surplus products and materials. The initiative supports the city's goal of zero waste by 2040 and is part of the Recycling Economic Development Program which aims to attract, retain, and grow zero waste businesses and create local jobs by fostering a resilient, zero waste production system.[12] (See *Cities case study: Austin*)

Downstream: Leapfrogging to advanced resource management in Ljubljana

When Slovenia joined the EU in 2004, the country had no proper waste separation and collection schemes in place. In less than ten years, the capital, Ljubljana, managed to become a frontrunner in waste management. The city leapfrogged the traditional waste management approach and developed a strong collection and sorting system that has proved that avoiding incineration, and reducing landfilling by 59% and waste generation by 15% is feasible in a very short time. Ljubljana's recycling rate is now 20 percentage points above the EU average and 10 percentage points above its 2020 targets. Ljubljana generates 10% less municipal waste than the EU average, and has one of the lowest waste management cost burdens in Europe. According to the city, political courage, community engagement, and effective communication campaigns have been key elements in Ljubljana's success.[13]

EXAMPLES OF WHAT URBAN POLICYMAKERS CAN DO

To ensure a city's economic development initiatives and resource management efforts are aligned, a **roadmap or strategy** setting out clear guidelines for how these areas should be connected can be beneficial. This could, for example, be in the city's masterplan. **Financial support** and **capacity building** measures can help stimulate the urban products system, both upstream through business programmes, and downstream through infrastructure investments. **Awareness raising** can be a powerful instrument to influence citizens' behaviour – for example, to embed new habits and encourage people to sort household waste for recycling. Cities can use **fiscal** or **regulatory measures** to incentivise or enforce better production and resource management practices.

To explore further see **Policy Levers**

EXAMPLES OF LINKS TO OTHER SYSTEMS AND PHASES

Mobility: Planning

In a circular products system, reverse logistic schemes will be key to support the circulation of goods and materials, which means that appropriate freight schemes will be required to meet increasing logistics demand.

Buildings: Planning

Increasing proximity through compact city development can support opportunities to circulate products and reduce travel distances.

EXAMPLES OF BENEFITS

ECONOMIC PRODUCTIVITY

Creating new profit potential

Collected and sorted clothing has a profit potential of around USD 1,300 per tonne.[14]

Reducing material costs

Circular opportunities for fast-moving consumer goods could be as much as USD 700 billion per annum in material savings.[15]

HEALTH AND ENVIRONMENT

Reducing the environmental impacts on cities of the electronics industry

Better recycling, higher-value end-of-use options (e.g. remanufacturing), and performance-based business models in urban China's electronics and electric appliances industries could reduce emissions of CO_2 by 24 million tonnes and of particulate matter (PM2.5) by 11% in 2030.[16]

Reducing similar impacts of the textiles industry

In Chinese cities, implementing all circular economy opportunities in textiles could have a significant impact on reducing environmental impact costs, by USD 64 billion in 2030 and USD 112 billion in 2040.

RESOURCE USE

Reducing reliance on raw materials for electronics

Better recycling, higher-value end-of-use options (e.g. remanufacturing), and performance-based business models in urban China's electronics and electric appliances industries could reduce reliance on key virgin raw materials, such as precious metals, by 14% in 2040.[17]

Increasing e-waste recovery

Circular economy resource management infrastructure, optimised using AI solutions, could enable the recovery of USD 24 billion of additional value from reused, repaired, remanufactured or recycled devices, components and materials. AI can help capture a significant part of the total e-waste market, which is estimated to be USD 107 billion.[18]

Reducing reliance on raw materials for textiles

Stimulating automation and 3D printing, water and energy efficiency, and textile recycling would decrease the need for virgin materials and other primary resources in Chinese cities, while generating USD 48 billion in savings by 2040.[19]

JOBS, SKILLS, AND INNOVATION

Creating jobs from utilisation of municipal waste

On a European scale, reuse can create significant local employment: on average, 80 jobs could be created for every 1,000 tonnes of collected municipal solid waste. Europe-wide, 200,000 jobs could be created if 1% of total EU municipal solid waste were to be collected and sorted.[20]

Creating jobs and training in the collection and sorting of electronics

15 jobs and 110 training opportunities could be created for every 1,000 tonnes of electronics collected and sorted for reuse. In Europe alone this could amount to between 55,000 and 93,500 jobs.[21]

Creating jobs and training in textiles collection and sorting

Around 20 jobs could be created for every 1,000 tonnes of textiles collected and sorted for reuse, adding up to 120,000 jobs in Europe.[22]

Creating jobs in packaging waste management

In France, the sorting, collection, and recycling of packaging could generate more than 10,000 jobs.[23]

Creating jobs in packaging deposit-return-schemes (DRS)

The introduction of a DRS for beverage containers in the UK could generate between 3,000 and 4,300 jobs in collection and processing as well as an additional increase in the number of higher-skilled jobs.[24] In Germany, expansion of the DRS to all drinks containers could create 27,000 jobs.[25]

Generating higher salaries

Recycling a tonne of solid waste will pay USD 101 more in salaries and wages than disposing of it in landfill.[26]

The main driver is increased water recycling and treatment, which contributes 60% of the 2040 cost reductions.[27]

COMMUNITY AND SOCIAL PROSPERITY

Increasing access by reducing cost

By 2040, China's urban electronics and electric appliances industries, upstream and downstream circular economy measures could reduce total cost of access by nearly 14% compared with the current development path. This could therefore increase access to these goods for lower-income groups.[28]

ENDNOTES

1 Ellen MacArthur Foundation, *Towards the circular economy: opportunities for the consumer goods sector* (2013) pp. 14, 86

2 Excluding transportation to and from sites and the emissions embedded in the waste products. World Bank, *What a waste 2.0: a global snapshot of solid waste management to 2050* (2018) p. xi

3 Ibid., p. xil

4 Ibid., p. xi

5 Ellen MacArthur Foundation, *A new textiles economy: redesigning fashion's future* (2017) p. 37

6 Ibid. (2017) p. 91

7 Ellen MacArthur Foundation, *Circular consumer electronics: an initial exploration* (2018) p. 5; Ellen MacArthur Foundation/ Google, *Artificial intelligence and the circular economy* (2019) p. 27

8 Ovam & Summa Circular Economy Policy Research Centre, *Employment impact of the transition to a circular economy: literature study* (2018) p. 23; McKinsey & Company, *Acquiring the capabilities you need to go digital*, (March 2015)

9 Ellen MacArthur Foundation/Google, *Artificial intelligence and the circular economy* (2019) pp. 14–15

10 M. Bianchini and S. Maffei, *'Make in Milan'*, in Fab City, *The mass distribution of (almost) everything* (2018) p. 188, City of Milan, *Manifattura 4.0: linee guida,* milanosmartcity.org (n.d.)

11 A. D'Elia, *Municipality as a platform: the case of Manifattura Milano,* Linköping University Electronic Press (2018)

12 Austin Material Marketplace

13 Snaga, *Presentation: on our way to sustainable society* (2014); Zero Waste Europe, *New case study: the story of Ljubljana, first zero waste capital in Europe!* (2015)

14 Ellen MacArthur Foundation, *Towards the circular economy; opportunities for the consumer goods sector* (2013) p. 54

15 Ibid. (2013) p. 9. Including food and beverages which otherwise is out of the scope of this project. To learn more about the role of food in cities see the Ellen MacArthur Foundation's project Circular Economy for Food in Cities.

16 Ellen MacArthur Foundation, *The circular economy opportunity for urban and industrial innovation in China* (2018) p. 113

17 Ibid.

18 Ellen MacArthur Foundation/Google, *Artificial intelligence and the circular economy* (2019) p. 27

19 Ellen MacArthur Foundation, *The circular economy opportunity for urban and industrial innovation in China* (2018) p. 101

20 RREUSE, *Briefing on job creation potential in the re-use sector* (2015) p. 3

21 Ovam & Summa Circular Economy Policy Research Centre, *Employment impact of the transition to a circular economy: literature study* (2018) p. 22

22 Ibid.

23 Mairie de Paris, *Paris circular economy plan* (2017) p. 6

24 D. Hogg *et al.*, *From waste to work: the potential for a deposit refund system to create jobs in the UK,* Campaign to Protect Rural England (2011) p. 29

25 Mairie de Paris, *Paris circular economy plan* (2017) p. 6

26 Ovam & Summa Circular Economy Policy Research Centre, *Employment impact of the transition to a circular economy: literature study* (2018) p. 23

27 Ellen MacArthur Foundation, *The circular economy opportunity for urban and industrial innovation in China* (2018) p. 100

28 Ibid., p. 113