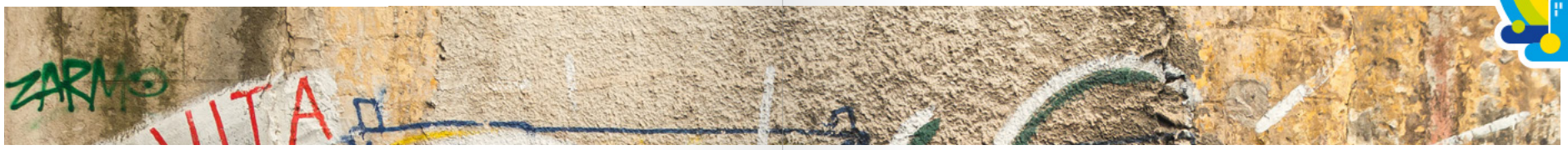
European Commission

CIRCULAR CITIES SOLUTION BOOKLET

Smart Cities Marketplace 2021

European Commission



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interactive

WHAT IS THE SMART CITIES MARKETPLACE?

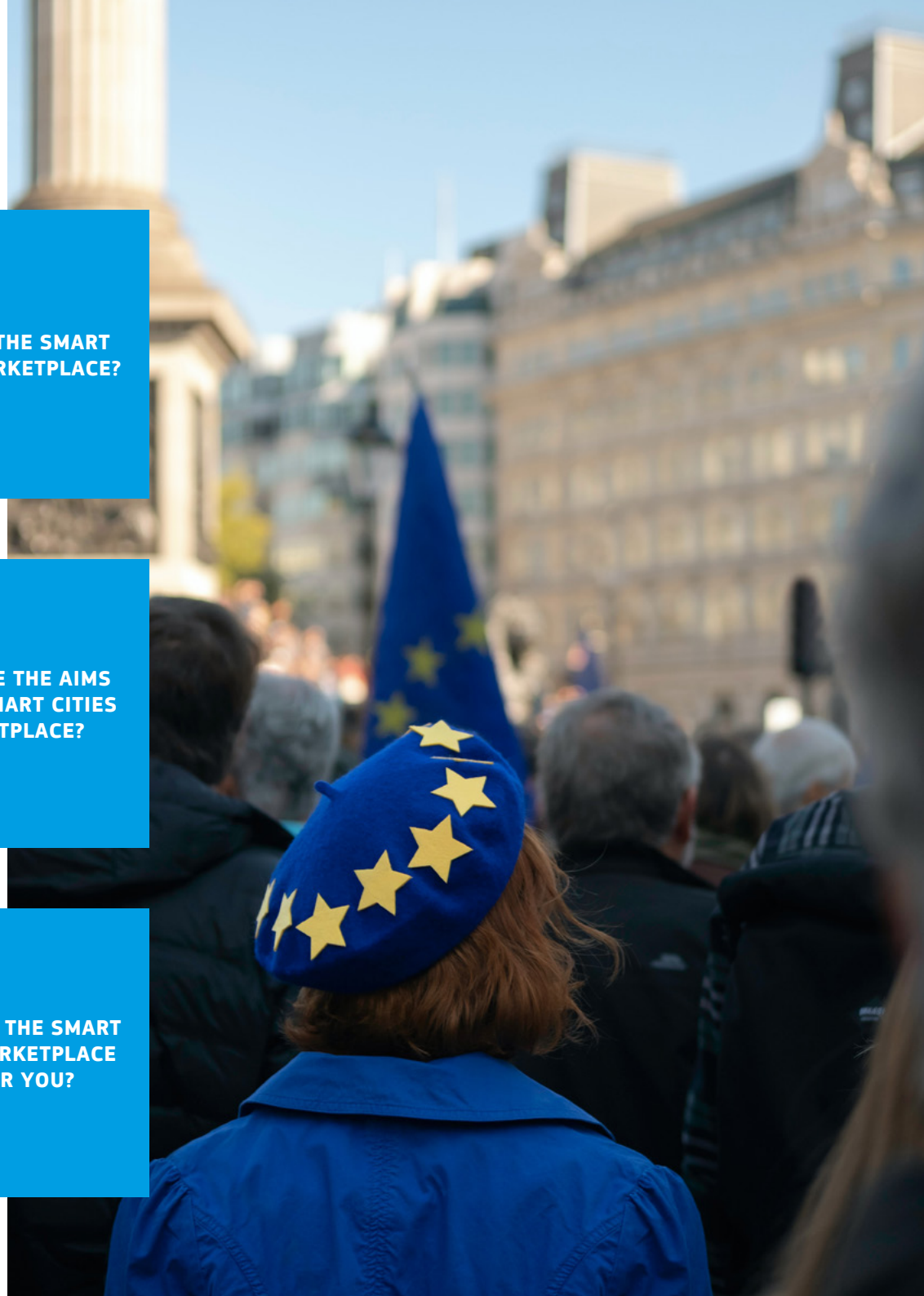
The **Smart Cities Marketplace** was created by merging the two former Commission projects "**Marketplace of the European Innovation Partnership on Smart Cities and Communities**" (EIP-SCC) and the "**Smart Cities Information System**" (SCIS) into one single platform. It is a major market-changing undertaking that aims to bring cities, industries, SMEs, investors, researchers and other smart city actors together.

WHAT ARE THE AIMS OF THE SMART CITIES MARKETPLACE?

The Smart Cities Marketplace has thousands of followers from all over Europe and beyond, many of which have signed up as a member. Their common aims are to **improve citizens' quality of life, increase the competitiveness of European cities and industry** as well as to **reach European energy and climate targets.**

WHAT CAN THE SMART CITIES MARKETPLACE DO FOR YOU?

Explore the possibilities, **shape** your project ideas, and close a **deal** for launching your Smart City solution! If you want to get directly in touch with us please use info@smartcitiesmarketplace.eu

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WHAT & WHY

WHAT & WHY

Economy is a process where society creates products that people need or want. The current economic system is often referred to as **linear economy (take-make-use-dispose)** because we **take from** available natural resources to **make** products that we **use** for a limited time and then **dispose of** waste. This economic model leads to an increasing demand for natural resources in the pursuit of growth since all new products as well as services require those resources.[1]

A circular economy is an economic system that decouples economic growth from the consumption of finite natural resources. In a **circular economy (make-use-recycle/recover)**, we **make fewer** and more durable products partially or fully from existing recovered materials or waste. We use them multiple times, refurbish them or repurpose them, and at the end of their life we **recycle** or **recover** the parts or materials they consist of, leading back to the beginning of the circle.[2]

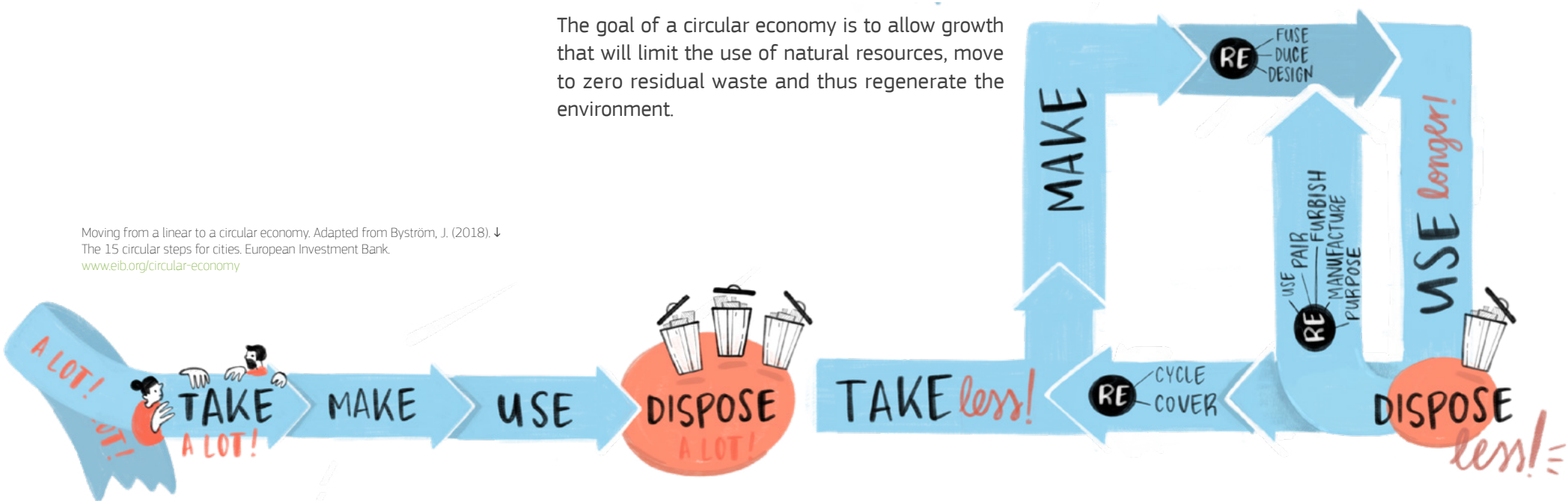
The goal of a circular economy is to allow growth that will limit the use of natural resources, move to zero residual waste and thus regenerate the environment.

To achieve this, we must **design urban systems and products**:[3]

→ **For a longer lifetime,**

→ **For reuse/recycling, and**

→ **From materials that can be reused for the manufacturing of other products and/or returned to the environment as nutrients instead of waste.**



Moving from a linear to a circular economy. Adapted from Byström, J. (2018). ↓ The 15 circular steps for cities. European Investment Bank. www.eib.org/circular-economy

1 Lopez y Royo, C., & Torregroza, G. (2018). *Economic growth and natural resource use – Breaking – up with 'Business as Usual.'* One Planet network.

2 Byström, J. (2018). The 15 circular steps for cities – Second edition. European Investment Bank. https://doi.org/10.2867/665692

3 www.ellenmacarthurfoundation.org/circular-economy/what-is-the-circular-economy

CITY CONTEXT

Cities must deal with the negative effects of the linear economy. Both in terms of citizen health deterioration due to pollution and noise but also in terms of public spending for waste management and other costs resulting from, for instance, underutilisation of buildings that cannot be adapted to a new use or congestion problems. Therefore, enabling a circular economy can help to not only decrease operational costs for city governments by requiring less resources and generating fewer waste but also achieve liveable, regenerative and sustainable cities in line with the Sustainable Development Goals.

Cities are economic, cultural, technological, and innovation centres that are closest to businesses and citizens. City governments and administrations have five categories of actions that they can use to initiate change towards a circular economy in their city:[4]

→ **Vision (roadmaps, strategies, action plans)**
→ **Urban management (public procurement, asset/resource management, urban planning)**
→ **Engagement (awareness-raising, capacity building and gathering)**
→ **Economic incentives (financial support, fiscal measures)**
→ **Legislation and regulation**

City governments typically suffer from silo-like management where **each administration sector deals with their specific policy domain** (waste, transport, public procurement, urban planning, etc.), while the transition to a circular economy in a city requires an interconnected, cross-cutting approach. To start the implementation of circularity within a city government, some cities begin with introducing changes to public procurement (e.g., London, Venlo, Ghent, Zurich), urban planning (Barcelona) or asset management (Winnipeg, San Francisco).[5]

4 Ellen MacArthur Foundation. (2019). *City Governments and Their Role in Enabling a Circular Economy Transition. An overview of urban policy levers.* ellenmacarthurfoundation.org/policy-levers
5 Ellen MacArthur Foundation. (2019). *City Governments and Their Role in Enabling a Circular Economy Transition. An overview of urban policy levers.* ellenmacarthurfoundation.org/policy-levers

Professor Greg Keeffe presenting his circular home during Smart Cities Marketplace forum in June 2021 ↑

A **circular city** promotes the transition from a linear to a circular economy. Always in an integrated way across all its functions and in collaboration with citizens, businesses and the research community, creating a systematic approach to a circular economy.

Further reading: Circular Cities Initiative

DID YOU KNOW?

As areas with concentrated resources (products, data, people, waste, capital, etc.) and needs, cities represent spaces where various sectors interact and where their synergy is tested under extreme circumstances (extreme weather patterns, pandemics etc.).

Economic activities performed in cities can be grouped into sectors based on the societal needs they cover: [6]

Housing/buildings
further reading:
"Housing/buildings" on page 15

Food/nutrition
further reading:
"Food/nutrition" on page 17

Healthcare
further reading:
"Healthcare" on page 17

Services
further reading:
"Services" on page 18

Mobility/transport
further reading:
"Mobility/transport" on page 20

Consumables
further reading:
"Consumables" on page 21

Communication/ Information and communications technology (ICT)
further reading:
"Communication/ICT" on page 22

Some cities start their transition to a circular economy by developing a vision document, such as a strategy, a roadmap or an action plan in order to map out the interplay of different economic sectors and the city government. These strategies can be the reaction to a national a circular economy initiative or a local initiative. Forerunner cities that use such strategies are e.g., Brussels, Paris and Glasgow.[7]

The initiative towards a circular economy can start from stakeholders outside of the city government, such as academia, citizen initiatives, companies, financial institutions and other.

6 Circle Economy. (2021). *The Circularity Gap Report 2021*. www.circularity-gap.world/2021

7 Ellen MacArthur Foundation. (2019). *City Governments and Their Role in Enabling a Circular Economy Transition. An overview of urban policy levers*. ellenmacarthurfoundation.org/policy-levers

SOCIETAL & USER ASPECTS

SOCIETAL & USER ASPECTS

Economic activity in cities is organised around citizens' needs. While different cultures, traditions and local circumstances bring variation in what people value, the well-being of people around the world concentrates around them being: [8]

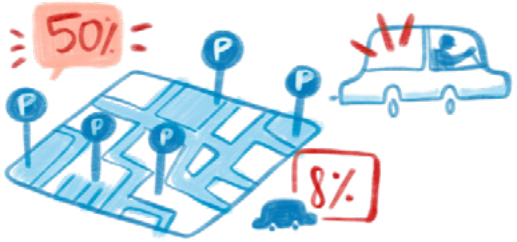
→ Healthy — **housing, food/water, health system**
→ Enabled — **services/education, energy, income/employment**
→ Connected — **mobility, communication, services/culture**
→ Empowered — **services (peace, justice, equality)**

The circular economy aims to improve the well-being of people not only within the limits of the city but also worldwide, as others are affected by the products or resources consumed within the city. This impact is linked to the extraction of resources or manufacturing of products elsewhere but also to exported waste, pollution and emissions leading to global climate change and potential health issues elsewhere.

Using the linear economy approach, we were at a point where, even prior to the COVID-19 pandemic, 60% of European office spaces were not used during working hours, while 1/3 of urban residents struggled to secure housing.[9]

While 9.9%[10] of the world population suffers from hunger, 17%[11] of food produced in the world is wasted. When it comes to other products we use, 80% of household items are used less than once a month and 75% of municipal waste is discarded consumer goods that mostly cannot be reused due to poor design or recycled due to lack of end-of-life collection points, such as recovery hubs.[12]

Finally, regarding mobility, more than 50% of the European inner-city areas are covered with roads and parking spaces, while cars are in use for only 8% of the time, with an average of 1.5 out of 5 seats occupied.[13]



All of these are showing that change towards a circular economy is needed to achieve a good quality of life for all citizens.

8 Doughnut Economics Action Lab, Circle Economy, C40 Cities, & Biomimicry 3.8. (2020). *The Amsterdam City Doughnut*.

9 Ellen MacArthur Foundation. (2019). *Urban Buildings System Summary*. ellenmacarthurfoundation.org/circular-economy-opportunity-and-benefit-factsheets
10 www.actionagainsthunger.org/world-hunger-facts-statistics
11 United Nations Environment Programme. (2021). *Food Waste Index Report 2021*. www.unep.org/resources/report/unep-food-waste-index-report-2021
12 Ellen MacArthur Foundation. (2019). *Urban Products System Summary*. ellenmacarthurfoundation.org/circular-economy-opportunity-and-benefit-factsheets
13 Ellen MacArthur Foundation (2019) *Urban mobility system summary*. ellenmacarthurfoundation.org/circular-economy-opportunity-and-benefit-factsheets

To achieve a circular economy, it is necessary to change citizens' behaviour. In general, people are either **intrinsically** or **extrinsically** motivated.[14]

Extrinsic motivation is connected to an external reward or benefit the person receives in return for their action, for instance, a cost reduction for a service. On the other hand, **intrinsic motivation** originates from within the person and it is connected to their personal experiences and values. For instance, they wish to be environmentally responsible.

This intrinsic motivation is usually the driving force for change, and it should be leveraged to spearhead the transition to a circular economy.

However, since all segments of the population need to be on board, incentives also need to be given to those who are not intrinsically motivated. Respondents in a study conducted in Spain and Scotland said that economic incentives, as well as the intervention of public administration, would motivate them to adopt more sustainable behaviour.[15]

Exchange your plastic bottles for public transport tickets!
© Photo: courtesy of Atac Roma +Ricicli +Viaggi ↑

Exchange your plastic bottles for public transport tickets!

In **Rome, Italy**, the public transport provider Atac launched in July 2019 an initiative to both promote public transport and incentivise plastic recycling. The scheme +Ricicli +Viaggi (the more you recycle, the more you travel) allows passengers to exchange PET plastic bottles for eco-bonuses, which they collect on public transportation apps and later can use as a discount to buy tickets. Each recycled bottle at one of the eight compacting machines placed in metro stations corresponds to €0.05 credit. Since the initiative was launched, other cities worldwide have followed[16].

Further reading: Atac Roma +Ricicli +Viaggi

14 www.linkedin.com/pulse/how-build-intrinsic-motivation-circularity-ralf-otto/

15 Moyano, V., & Paniagua, S. (2018). *Citizens and the Circular Economy. Current situation and prospects for the future*. Creafutur. static1.squarespace.com/static/5970906d4c0dbf748f1594a5/t/5b715834cd83663481d1b015/1534154840823/EconomiaCircular-ENG.pdf

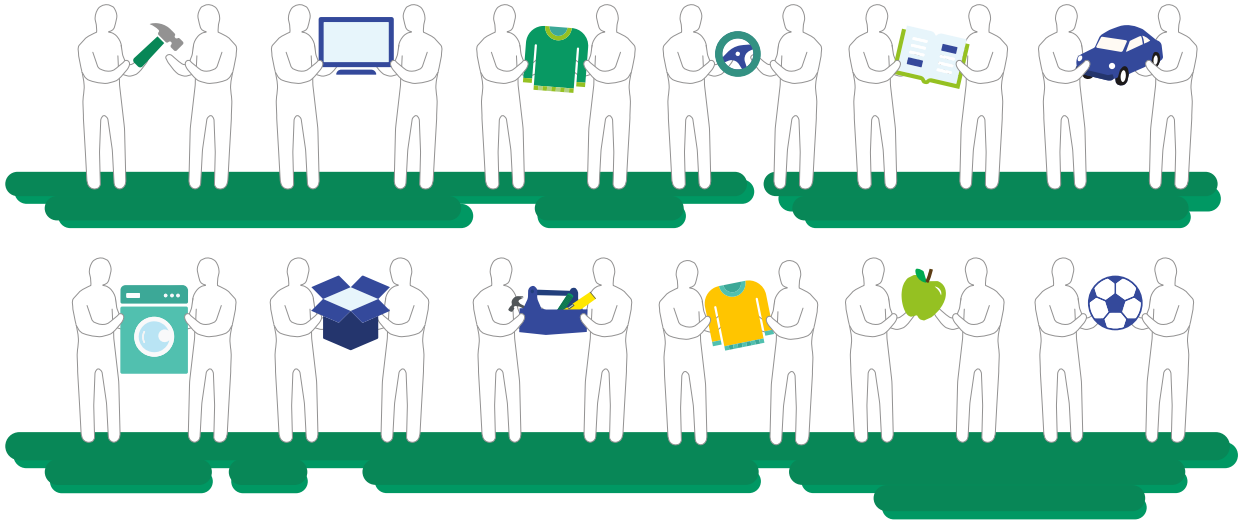
16 "+Ricicli +Viaggi" makes it possible to pay for metro rides with plastic bottles | European Circular Economy Stakeholder Platform (europa.eu)

Citizen engagement in the circular economy

The European Interreg project Citizen involvement in a circular economy implementation (CECI) wants to facilitate and increase knowledge transfer among regions in order to develop relevant policies that promote the involvement of citizens in the circular economy. Organisations from **Finland, France, Belgium, Spain, Bulgaria and the Czech Republic** are partners of the project that runs from 2019 to 2023. With thematic workshops and studies, round-table policy discussions, as well as Good Practices sharing, the project aims to raise public awareness, create demand for sustainable services and change consumption patterns, leading to the development of circular business models and job creation. Among others, the project has produced a thematic study on how to trigger and maintain citizen involvement in the circular economy.

Further reading: CECI | Interreg Europe

Citizen engagement in the circular economy © Photo Petra Oravakangas, 2019 ↑



Graph above: Oona Rouhiainen, 2020 ↑

Upcycle your waste!

Housed in a building made of recovered materials, the Upcyclecentre in **Almere, the Netherlands**, wants to inspire citizens to adopt a circular mindset because waste equals raw material in the circular economy. It is the first such centre in Europe. At the Upcyclecentre, start-ups design and create products out of the waste that citizens can bring, for instance, interior design products, clothes and jewellery. Except for the used materials the start-ups receive, they are also offered a workspace for 1.5 years. Such initiatives can be spearheaded by city governments to accelerate the transition to the circular economy by also engaging and involving citizens.

Further reading: Week of the Circular Economy #1: Upcyclecentre Almere – Amsterdam Smart City, Upcyclecentrum | Gemeente Almere

Several types of incentives that public authorities can use to promote the circular economy are summarised in a publication of the European Commission, including examples that can be applied at the local level. [17]

17 European Commission. (2021). *Incentives To Boost the Circular Economy. A guide for Public Authorities.* doi.org/10.2777/794570

It is crucial to raise awareness of the issues the current linear economy suffers from, and to inform citizens about the potential solutions. In this way, we can increase their intrinsic motivation for embracing and participating in the circular economy. City governments play a key role to play in raising awareness and increasing the knowledge of their citizens and other stakeholders to encourage the implementation of a circular economy. Some examples of cities that have been active in awareness-raising and engagement of citizens and other stakeholders include **Ljubljana**[18], **Antwerp**[19] and **Gothenburg**[20].

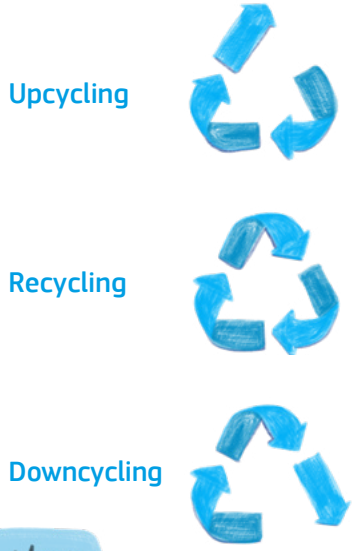
Behavioural change may be blocked, among others, by cultural barriers, for instance, regarding the acceptance of using second-hand products.[21] To increase trust in reused products, **Scotland**, for example, has established relevant standards and certification.[22]

With **upcycling**, the value and quality of the new product are **higher** than those of the original product or material, in contrast to recycling, where the value of the new product or material remains the **same or even is lower** (**downcycling**).

DID YOU KNOW?

18 Circular economy examples in the City of Ljubljana » City of Ljubljana
19 www.antwerpenmorgen.be/nl/projecten/circular-south/over
20 Municipality-lead circular economy case studies, Climate-KIC 2018
21 OECD (2020), "Governance gaps", in *The Circular Economy in Cities and Regions: Synthesis Report*, OECD Publishing, Paris, doi.org/10.1787/ccf71ccd-en.
22 www.zerowastescotland.org.uk/circular-economy/establishing-reuse-repair

Knowledge gaps are related not only to the acceptance of the circular economy but also to the know-how of implementing circular solutions. A circular economy requires skilled workers in all steps: long-lasting design, maintenance, repair, remanufacturing, refurbishing and recycling. Vocational education and training towards the circular economy should be prioritised in order to enable the transition while promoting social inclusion and offering decent work opportunities for everyone.[23]



23 Circle Economy. (2021). *Closing the Skills Gap: Vocational Education & Training for the Circular Economy.*

However, also citizen organisations and other stakeholders take initiative in circular practices, educating the community and spreading the word. Re-food in **Portugal** and Baterkáren in **Slovakia** are some examples.

Bringing the food where it's needed.

The Re-food Movement, non-profit and 100% volunteer, began in **Portugal** in 2011 with one volunteer on a bicycle rescuing good food from being wasted – and feeding needy people in his own local community. The citizen-led initiative is now supported by 7,500 volunteers rescuing millions of meals in 60 plus communities. 2,500 partners donate their excess food, and 6,800 beneficiaries are fed.

Re-food saves hundreds of tonnes of biowaste per month while strengthening social cohesion.

Further reading: re-food.org

Bringing the food where it's needed.
© Photo: courtesy of Re-food ↑

Baterkáreň: the first community reuse centre in Slovakia

Baterkáreň is a social enterprise that brings principles of the circular economy into the daily life of the community. The initiative with this unique concept was launched in 2019. "Baterka" is a place for community gathering, learning and also organising. Aiming to support active citizenship, the team consists of volunteers as well, for which they have received several awards.

The initiative is also involved in raising awareness regarding the climate crisis in a proactive rather than alarmist way. With the belief that circular economy provides answers to questions raised by the climate crisis, their aim is to provide the community with practical tools and teach them new skills for the future. Baterkáreň consists of a:

- Package free drugstore with locally produced household products that promotes minimum waste;
- Collection of items that can be rented out;
- Reuse centre, where second-hand products are sold;
- Educational space where seminars, training and workshops are held;
- Program full of regular swapping events for clothes, household goods, art or sporting goods, etc.

Each month, more than 1,500 pieces of clothes or other items are returned to use. Baterkáreň also supports the community via organising collections of items or money for families or other organisations in need. With this initiative, people are encouraged to change their purchasing habits into more sustainable and circular ones.

Further reading: baterkaren.sk

Baterkáreň: the first community reuse centre in Slovakia
© Photo: courtesy of Baterkáreň ↑

THE CORE OF CIRCULARITY IN CITIES

THE CORE OF CIRCULARITY IN CITIES

The principles of circularity can be applied to various sectors of a city's operation, covering the different needs of its citizens. All stakeholders, from individual citizens to businesses and the city government, are concerned and need to participate in the transition towards a circular economy.

Citizens need to adopt more sustainable and circular practices, and they can participate in circular initiatives and have influence through their purchasing power. Businesses and other organisations need to innovate and develop circular business models that are in line with a circular economy. City governments can use their power to enable the transition using the policy levers identified for instance in the Ellen MacArthur guide for city governments, such as developing road-maps, raising awareness, providing financial support, putting in place regulations, etc.[24]

Further details on governance are given in the "Governance and regulation" on page 32 of this booklet.

Housing/buildings

Buildings are required to cover housing needs but also offices, administration, retail, industry and other uses. However, buildings are also responsible for a large part of urban solid waste as well as material and energy resource consumption.[25] To reduce these environmental impacts, we need to treat buildings as material banks, use built area more effectively, extend the life and quality of the existing building stock, reduce the total built area, build better, more energy and space-efficient, buildings that are designed and built for change, i.e. to support changing needs of users and society.

Circularity principles need to be employed in all phases of the building's life cycle, from urban planning, design and construction, to operation and demolition.

What city governments can do:

- ✓ Collect existing and plan to acquire additional data to provide a basis for a digital construction ecosystem in your city.
- ✓ Allow multi-purpose use of city-owned buildings.
- ✓ Assure efficient, adaptable, modular, repairable, replaceable and sustainable building design and implementation for city-owned buildings.
- ✓ Create enabling framework for piloting new business models and space for the exchange of ideas.

Further reading on Building envelope retrofit ↑

24 Ellen MacArthur Foundation. (2019). *City Governments and Their Role in Enabling a Circular Economy Transition. An overview of urban policy levers*. ellenmacarthurfoundation.org/policy-levers

25 Ellen MacArthur Foundation. (2019). Urban Buildings System Summary. ellenmacarthurfoundation.org/circular-economy-opportunity-and-benefit-factsheets

Measures that can be taken include:[26,27]

- ✓ More compact living and mixed-use neighbourhoods
- ✓ Adaptable and multi-purpose building design to allow shared use or re-purposing
- ✓ Build using modular components that can be easily accessed and disassembled for reuse or recycling
- ✓ Increased standardisation and improved logistics for less construction waste
- ✓ Use of more durable materials and improved techniques for repair and replacement of components to increase the building's lifespan
- ✓ Use of local recycled materials and reclaimed (building) components
- ✓ Smart technology for efficient monitoring of use and operation
- ✓ New business models, e.g. product-as-a-service for equipment

Further, digital technologies can be leveraged to support the transition of the building sector to a circular economy, such as Building Information Modelling (BIM) and Digital Twins for improved design, planning, operation and maintenance. BIMs are currently mainly used for bigger construction projects and their use for smaller buildings and projects, as well as the use of digital twins, is being tested in pilot projects across EU[28]. In addition, collection in one (open data) place of Internet of Things (IoT) data or 3D maps of buildings[29] for improved planning, management and development of new services such as material databanks, etc.[30]

Rotor DC: reuse of construction materials made easy
© Photos on this page: courtesy of Rotor DC ↑

Rotor DC: reuse of construction materials made easy

Rotor DC is a cooperative based in Brussels that organises the dismantling, processing and trade of construction materials, promoting their reuse and reducing waste in the construction sector. This award-winning cooperative started in 2014 by dismantling materials themselves but through its collaboration with contractors, non-profits and other companies, it has grown to trade materials from other suppliers as well. Their store covers a large range of building materials, at prices competitive to new materials but of course with a tiny fraction of the environmental impacts. Furthermore, except for trading the salvaged materials, Rotor DC provides services including repair, deconstruction procedures, processing for reuse and organisation of salvaging operations.

Further reading: Rotor Deconstruction – Reuse of building materials made easy (rotordc.com)

Rotor DC: reuse of construction materials made easy
© Photos on this page: courtesy of Rotor DC ↑

26 Enkvist, P.-A., & Klevnäs, P. (2018). *The Circular Economy – A powerful force for climate mitigation*. Material Economics. materialeconomics.com/publications/the-circular-economy-a-powerful-force-for-climate-mitigation-1
27 Ellen MacArthur Foundation. (2019). Urban Buildings System Summary. ellenmacarthurfoundation.org/circular-economy-opportunity-and-benefit-factsheets

28 Digitalization of construction sector ec.europa.eu/docsroom/documents/45547/attachments/1/translations/en/renditions/pdf
29 3D map of buildings in Netherlands parallel.co.uk/netherlands/#10/52.365/4.9/0/40
30 Çetin, S., De Wolf, C., & Bocken, N. (2021). Circular digital built environment: An emerging framework. *Sustainability*, *13*(11). doi.org/10.3390/su13116348

Food/nutrition

The current food system is wasteful, polluting the environment and extracting finite resources, while it is also responsible for a large part of global energy consumption and emissions as well as municipal waste.[31,32]

These problems arise from the production practices, transport and storage of the produce, food processing, packaging, consumption habits and waste of food within the households and the supply chain.

Solutions may focus on the following:[33]

- ✓ Limiting the wasted food at the end consumer
- ✓ Reducing excess consumption
- ✓ Favouring a vegan, high-nutrition diet and unprocessed food
- ✓ Promoting local and seasonal products that limit storage and packaging needs
- ✓ Encouraging regenerative sustainable food production practices
- ✓ Promoting urban and organic farming
- ✓ Improving transport and storage logistics

What city governments can do:

- ✓ Support producers in the city or its vicinity to grow food using regenerative practices, e.g. through urban farming.
- ✓ Reduce food waste within the city by supporting practices that minimize waste and distribute the food to where it's needed.
- ✓ Create an effective collection system for organic food waste.
- ✓ Allow and support practices that utilising food by-products.
- ✓ Promote healthier food products.

© Photo: Agata Smok, Abattoir's urban farm pilot project in Brussels ↑

© Photo: Agata Smok, Abattoir's urban farm pilot project in Brussels ↑

31 Ellen MacArthur Foundation. (2019). *Cities and Circular Economy for Food*. ellenmacarthurfoundation.org/cities-and-circular-economy-for-food
32 Circle Economy. (2021). *The Circularity Gap Report 2021*. www.circularity-gap.world/2021
33 Circle Economy. (2021). *The Circularity Gap Report 2021*. www.circularity-gap.world/2021

Healthcare

In healthcare, the circular economy is relevant when considering the use of buildings, maintenance and lifespan of medical equipment, waste (in particular single-use plastics), and access to diagnosis and treatment. The topic of plastic waste management in the healthcare industry has become the focus of circular approaches that aim to recover, reuse, and recycle plastic products and packaging.[34]

Virtual healthcare service models are also an option to reduce material flows in this sector. Furthermore, the need for healthcare is influenced by many other aspects of citizen well-being in cities, and therefore interlinked with other sectors that have the potential to improve living conditions.

What city governments can do:

- ✓ Encourage virtual healthcare service and use of ICT to decrease waste generation;
- ✓ Segregate medical waste to allow for maximal reuse of material;
- ✓ Create enabling framework for testing innovative solutions in the healthcare sector, such as prescription medication reuse.

34 www.hprc.org/circularity-for-healthcare-plastics

Services

Services delivered to citizens may be found in different categories, for example, business services, financial services, communication services, retail, education, healthcare, tourism, entertainment and transport. The share of emissions and material needs of this sector as a whole is modest compared to other societal needs and is mostly related to office space, professional equipment, ICT and other infrastructure.[35]

Aspects such as buildings, transport, ICT infrastructure, consumables and food-related services are discussed in other sectors of societal needs. Tourism is one area of particular importance for some cities, given the rise in short city trips, the increasing prices of housing as a result of short-term rentals, and the fact that visitors tend to prefer comfort against sustainability during their holidays.[36]

In the entertainment industry, circular principles could be applied to the organisation of events and festivals[37] but also to art, both regarding the use of circular materials and the promotion of circular and sustainable themes.

35 Circle Economy. (2021). *The Circularity Gap Report 2021*. www.circularity-gap.world/2021
36 www.circularcityfundingguide.eu/circular-sector/tourism/
37 www.circularfestivals.nl/about/

What city governments can do:

- ✓ Provide incentives to businesses that use circular practices;
- ✓ Promote and advertise the circularity best practices (e.i. awards, exchange of best practices etc.);
- ✓ Modify taxation policy to be resources instead of labour based.

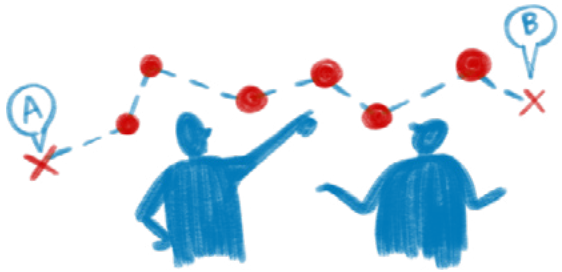
Further reading:

- Healthcare waste: what to do with it?
- Plastic waste becomes plastic again on the spot
- Prescription medication reuse

Community powered tourism.

Fairbnb.coop is a collectively-owned online platform for short-term vacation rentals that promotes a fairer, more transparent and socially sustainable alternative for tourism. Aiming to limit the negative effects of mass tourism, among others gentrification, the cooperative proposes a model where half of the booking commission is used to finance local community projects. Furthermore, the platform follows a “one host-one house” rule in some areas, as well as screening of the hosts, in order to ensure local residents remain the beneficiaries. In this way, tourism becomes regenerative for the local community, in line with the UN sustainable development goals. The initiative emerged in Venice, Amsterdam and Bologna but has now expanded to various locations in Europe.

Further reading: About us | Fairbnb.coop – Community powered tourism



Community powered tourism. © Photo: courtesy of Fairbnb ↑

Mobility/transport

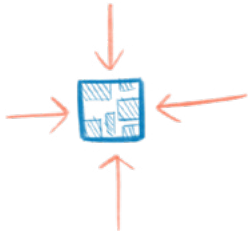
Transport of people and goods is one of the sectors with the highest environmental footprint but high potential for improvement. In particular, cities can be actors of change for the achievement of the low-emission mobility European Strategy.[38]

A circular mobility system is based on cleaner, more flexible and shared, diversified modes of transport. The first step is to reduce transport by creating local hubs that cover citizens' needs, planning more compact cities and utilising telecommunication to limit travel for work. The offer of public transport solutions, cycling infrastructure as well as shared mobility with more circular business models could reduce the total need for resources and improve utilisation of the infrastructure. Designing vehicles and transport infrastructure for low-emission, resource-efficient, low maintenance and flexible use is also an important aspect. New ICT, such as digital twins of mobility, could furthermore be used to optimise transport of people and goods, making use of extensive travel information. A more circular mobility system can deliver benefits from the perspective of material use, energy use and emissions but also reduce public costs and externalities, considering air pollution, noise, waiting times, accidents, parking costs, infrastructure and land use.[39]

38 Transport emissions | Climate Action (europa.eu)
39 Enkvist, P.-A., & Klevnäs, P. (2018). *The Circular Economy – A powerful force for climate mitigation*. Material Economics. materialeconomics.com/publications/the-circular-economy-a-powerful-force-for-climate-mitigation-1

What city governments can do:

- ✓ Incentivise use of sustainable transport options for government officials;
- ✓ Provide or promote practices that provide publicly accessible systems for sharing bicycles, electric bicycles, scooters or vehicles;
- ✓ Create Sustainable urban mobility plans to clarify short and long term city mobility plans and activities.



Compact

Cleaner

Resource-efficient

Low maintenance

Mobility as a Service.
Mobility as a Service, or MaaS, aims to provide an alternative to private car use, by offering one integrated service encompassing various forms of transport services. Instead of individual channels and different ticketing procedures, MaaS users can access all modes of transport in one application, facilitating their mobility experience. Planning of the trip becomes easier and may be part of the service, while payment could be depended on the use, or in the form of a subscription service. Furthermore, MaaS can benefit transport operators by providing them with access to more information regarding customer demand. A constantly growing number of MaaS initiatives has been implemented in Europe. Some MaaS providers in Europe include UbiGo in Sweden and Whim, present in several countries.

Further reading: MaaS Alliance website

Consumables

Consumer goods comprise a wide variety of products with a short to medium lifespan that people use and dispose of in their daily life. Short-lived consumables include products like single-use items, paper and packaging, while medium lifetime consumables comprise household appliances, electronics, clothing, cleaning products and tools, among others. The current consumption trends and production approaches are draining natural resources leaving massive amounts of waste and raising climate, environmental and social concerns.[40]

What city governments can do:

- ✓ Provide a system where collection, processing and recycling of materials are optimised and that engages citizen participation;
- ✓ Promote consumption behaviour that reduces the requirements for waste management and recycling altogether, by keeping products and materials in use for longer and avoiding unnecessary consumption;
- ✓ Provide space for development and testing of innovative circular solutions;
- ✓ Use regulatory means to eradicate the use of single-use plastics and promote relevant business models.

There is a need to **reduce consumption, extend the life** of consumer goods, use **safer** and **bio-sourced materials** and **keep products in the loop.**

The following are some of the more specific actions that should be considered:

- ✓ Reducing packaging and promoting reusable packaging
- ✓ Designing durable products with long service life (eliminate planned obsolescence)
- ✓ Designing modular products with easy replacement of parts
- ✓ Using bio-based or recycled materials
- ✓ Eliminating toxins and pollutants
- ✓ Optimising the use of electronics
- ✓ Supporting repair, refurbishment and reuse initiatives
- ✓ Promoting product-as-a-service business models
- ✓ Enforcing take-back programmes for textiles, appliances, furniture and machinery
- ✓ Increasing efforts in recycling and repurposing of discarded material

Of key importance for cities is their **waste management and material recycling system**. In a circular economy, waste is seen as a resource to be recovered and reused in other ways. Best practices for waste collection systems can be found on the website of project COLLECTORS.

Second-hand market in Vienna.

At the 48er-Tandler second-hand market in Vienna, which is run by the city's municipal department 48, people can buy, at a favourable price, intact old goods that were donated by others who didn't need them anymore. The offer covers from books to toys, electronics and furniture, and the proceeds of the sales are donated to charity. At 48er-Tandler, upcycling businesses can also exhibit and advertise their products, while the facilities are also used for information events concerning waste prevention. An estimated 300 tonnes of waste are saved per year as a result of this initiative.

✐ Further reading: 48ertandler.wien.gv.at

Second-hand market in Vienna. © Photo: Christian Houdek, courtesy of 48er-Tandler

40 Ellen MacArthur Foundation. (2019). *Urban Products System Summary*. ellenmacarthurfoundation.org/circular-economy-opportunity-and-benefit-factsheets

Communication/ICT

Communication has always been important for society but nowadays digital communication is becoming even more of a necessity, not only for personal communication but also for almost all aspects of a modern economy. Information and Communication Technology (ICT) and digitalisation have helped improve communication and replace the use of physical objects but they are also key elements of the circular economy as they allow optimising the use of different assets and thus support circular business models.

At the same time, however, the ICT supply chain itself needs to shift to a more circular model. ICT represents one of the fastest growing polluting sectors globally, due to the material needs, energy used during production and operation of hardware, and the large amounts of waste it generates.41 The new Circular Economy Action Plan of the European Commission presented a "Circular Electronics Initiative" to tackle the problem of waste from electronics by promoting longer product life and more efficient design. Several countries already signed the Circular & Fair ICT Pact aiming to make communication electronics fairer and more circular through procurement. Regional or city governments also have the power to act for more circular ICT using their purchasing policy.

The province of Antwerp in Belgium published standard contract documents and a manual for the public procurement of ICT equipment (in Dutch).[42]

What city governments can do:

- ✓ Identify the demand for ICT tools and services to facilitate the deployment of the necessary infrastructure;
- ✓ Design public procurement practices to take into account circular ICT.

Responsible management of electric and electronic appliances

In Luxemburg, Ecotrel is a non-profit association of producers and importers of electrical and electronic equipment that was founded in 2004 to ensure the legal obligations of the sector are met. Nowadays it manages and funds the electronic and electric waste processing in the country and ensures the future recycling of products currently on the market. Its operations are financed by the consumer via a recycling fee imposed on sold appliances. Ecotrel implements the concept of extended producer responsibility and contributes to the circular economy by not only recycling material but also by promoting repairing and reuse. More than 750 companies are affiliated with Ecotrel, and it is estimated that 6,300 tonnes of appliances are collected each year, with recovery rates reaching 90%.

Further reading: www.ecotrel.lu/en

41 Circularity needed in ICT supply chain to significantly reduce waste – (supplychainmovement.com)

42 Public procurement for circular ICT equipment – Detail – Aankopen Vlaanderen Circulair (vlaanderen-circulair.be)

BUSINESS MODELS AND FINANCE

BUSINESS MODELS AND FINANCE

To achieve a circular economy, the development and wide implementation of circular business models are necessary. Business model innovation goes hand in hand with innovation in technologies and processes as well as social innovation, whereby new behaviours, solutions, and relations are accepted and adopted. Furthermore, the contribution of education, awareness-raising, regulation, financial support and other policy incentives, is crucial to enable the emergence and consolidation of circular business models.[43] Circular public procurement practices, including the collaboration between public buyers and suppliers, are also fundamental to the development of new business models for the circular economy.[44]

43 Gillabel, J., Manshoven, S., Grossi, F., Mortensen, L. F., & Coscieme, L. (2021). ***Business Models in a Circular Economy***. European Topic Centre on Waste and Materials in a Green Economy – EEA. www.eionet.europa.eu/etcs/etc-wmge/products/business-models-in-a-circular-economy

44 Summary report work package 2.2 Alternative business models available for circular procurement (www.circularpp.eu)

Enablers, barriers and possible solutions

Enablers and barriers to the transition to circular business models from the perspective of European companies were identified in a 2018 survey.[45]

Enablers:

- ↳ Commitment of the top management in the company.
- ↳ Motivated and inspired employees with circular economy values.
- ↳ The perspective of increased competitiveness generated by innovative business models.
- ↳ Collaboration with other companies and stakeholders.
- ↳ Clear and standardised requirements for products and processes in the whole supply chain.
- ↳ International corporations acting as role models.

Barriers:

- ↳ Difficulties to finance innovative business models, among others due to high taxes on labour compared to virgin materials.
- ↳ The inertia of the business sector against change.
- ↳ The demand and willingness to pay for circular products are still limited.
- ↳ Not enough secondary raw material markets due to insufficient regulations or mindset towards recycled products.
- ↳ The input products for a business are not circularly designed.
- ↳ Insufficient infrastructure for material recovery and recycling.

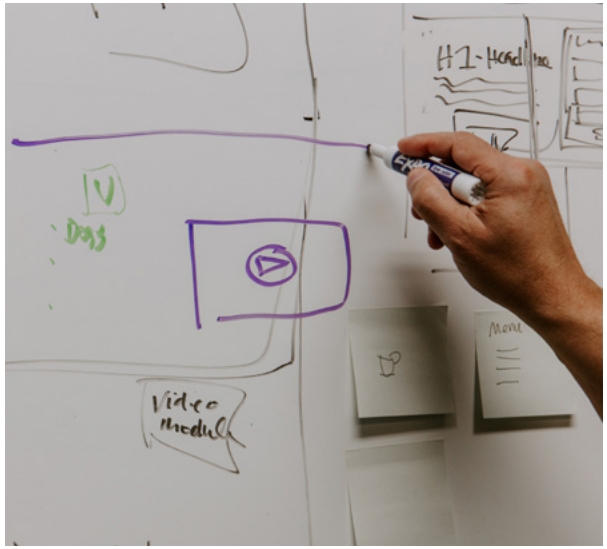
Solutions:

- ↳ Make sure the value of materials and products is understood and valued by manufacturers and other stakeholders.
- ↳ Improve terminology and related regulations, for instance not labelling products at the end of their life as *waste*.
- ↳ Increase collaboration between all stakeholders in the value chain, including customers.

45 Houston, J., Casazza, E., Briguglio, M., & Spiteri, J. (2018). ***Stakeholder Views Report: Enablers and Barriers to a Circular Economy***. http://www.r2piproject.eu/wp-content/uploads/2018/08/R2pi-stakeholders-report-sept-2018.pdf

Business models

Circular business models have been categorised in different ways in the literature. Business models can be grouped based on their strategies on value creation, value proposition and value network.[46] Here they are presented in the four main categories defined by Achterberg et al., that focus on different phases of the value chain, from design, use, recovery and finally supporting services.[47] A combination of business models from different categories is always possible and may also have a greater potential to generate value.



46 www.circulator.eu/mix-your-strategies

47 Achterberg, E., Hinfelaar, J., & Bocken, N. M. P. (2016). *The Value Hill Business Model Tool: identifying gaps and opportunities in a circular network*. docplayer.net/86718304-The-value-hill-business-model-tool-identifying-gaps-and-opportunities-in-a-circular-network.html

Circular product design

Circular design business models focus on the **design and production phase** of the supply chain, aiming to embed circular principles in the chain. It involves designing more **durable** products that are easy to maintain and repair, that are suitable for **refurbishment** or **remanufacturing**, and that can **be recycled**.

A **higher price** for products also encourages customers to buy fewer products and thus reduce consumption and the related resources needed and waste generated. In this category, **circular supply** business models specifically focus on the delivery of circular inputs to the supply chains of a circular economy, which may be **renewable energy**, or materials that are **fully reusable**, **recyclable** or **biodegradable**.[48]

Another type of business model could aim at **dematerialising**, for instance proposing software and services instead of hardware and products, reducing the need for resources if the system is well designed.[49]

48 Lacy, P., Keeble, J., McNamara, R., Rutqvist, J., Haglund, T., Cui, M., Cooper, A., Pettersson, C., Eckerle, K., Buddemeier, P., Sharma, A., & Senior, T. (2014). *Circular Advantage: Innovative Business Models and Technologies to Create Value in a World without Limits to Growth*. Accenture Strategy. accenture-circular-advantage-innovative-business-models-technologies-value-growth.pdf

49 Geissdoerfer, M., Pieroni, M. P. P., Pigosso, D. C. A., & Soufani, K. (2020). Circular business models: A review. *Journal of Cleaner Production*, *277*, 123741. doi.org/10.1016/j.jclepro.2020.123741

Reusable packaging.

RePack offers reusable and returnable packaging services for e-commerce, eliminating single-use packaging and reducing the waste generated from e-commerce. Founded in 2013, the Finnish company offers the first reusable, returnable and rewarded packaging service for e-commerce globally. The packaging is made of recycled polypropylene and is designed to be durable and foldable, such that it can be returned in the form of a letter back to RePack after delivery, through any mailbox in the world. RePack packaging can be reused more than 20 times, limiting waste, and reducing CO_2 emissions by 80% compared to single-use packaging. More than 200 web-shops are using RePack in Europe and North America.

Further reading: Reusable packaging service for ecommerce | RePack

Reusable packaging. © Photo: courtesy of RePack ↑

Optimal use

In this category, business models focus on the **use phase** of a product, with the aim to intensify or optimise its use and generally extend its life. This can be achieved with **product life extension** models that provide maintenance, repair and renovation services to the customer or that sell replacement parts. **Take-back programs** are an example where manufacturers or retailers collect used products and reintroduce them back into the production cycle. Another approach is to change the ownership of products from the customer to the provider, who sells access to the product via **renting, leasing** or with a so-called **product-as-a-service** scheme.

Product-as-a-service is a business model where the services and outcomes a product can provide are sold rather than the product itself. Usually, the producer owns and maintains the product, and the customer either leases it or pays a subscription to specific services the product delivers. Alternatives may exist where the ownership and responsibilities are specified by the license agreement or warranty.

Product-as-a-service has multiple business models which can be **product-, use- or result-oriented.**

Product-oriented includes user ownership, use-oriented includes the use of the product- and result-oriented is focused only on the use of the offered service.

The product- or result-oriented models can also be called **performance models** because the provider delivers a product performance rather than the product itself.

In all these cases, since the provider has ownership of the products, longevity and sharing are prioritised. A very common product-as-a-service use-oriented business model focusing on maximising utilisation is the **sharing platform** model, which facilitates the collaboration and shared use of products between individuals or organisations. Examples of this type of model are car-sharing and accommodation sharing apps and platforms.

Furniture as a Service.

Dutch company Ahrend has been designing sustainable and circular office furniture since the 1990s. Except for using recycled and innovative materials, developing efficient processes and designing modular and durable products, the company also offers repair, maintenance, refurbishment and remanufacturing services. An addition to the list is their Furniture as a Service offer, which allows the exchange of their products between organisations via a sharing platform. Organisations pay a monthly subscription for the furniture, which is owned by Ahrend. Given the design of the furniture and processes that are in place, the furniture is easily refurbished at the end of contract and offered for reuse at other organisations. The advantages for customers are financial flexibility, premium services for the products but also flexibility in the organisation of the working space. Some of the challenges that Ahrend faced in their process of scaling up the offer of this service in Europe were related to the low awareness about the advantages of the circular economy at the time in the market. The Dutch and Belgian markets are ahead of the rest of Europe in the circular approach. Due to the increase in demand for circular furniture from the Government, other companies are also seeing the added value in practice. Ahrend now has a fully operational Circular Hub where furniture is refurbished and circular services – as furniture as a service – are provided. This service can bring Ahrend benefits in terms of reducing future manufacturing costs, footprint reduction for their customers and potential for greater profits from the stronger relationship with the customers.

Further reading about the business case in the Ellen MacArthur case study: Bringing office furniture full circle: Ahrend (ellenmacarthurfoundation.org) or on the company's website: Furniture as a Service | Ahrend.

© Photo: courtesy of Ahrend ↑

Value recovery

These models, also referred to as **resource recovery** models, are concerned with the after-use phase of products and their aim is to recover value from used products and feed back into the value chain. Traditional recycling falls into this category, where recaptured materials from used products can be introduced in the secondary material market. Giving life to new products from recovered materials, refurbishing or upcycling, as well as second-hand shops, also represent business models that recover value. Recovery of bio-resources, treatment and reuse of wastewater, heat recovery and energy from waste are also examples of resource recovery. Finally, other solutions may use the concepts of industrial symbiosis, where the waste or by-products of one company or sector are a resource for another company, , or Cradle-to-Cradle® design, according to which products can be reused in continuous cycles or can be returned as nutrients to the natural environment.

Making the most of olive oil production by-products

The Greek family-owned business 'Klimis', since 1968, uses locally available crushed olive stones (called pomace) as a carbon-neutral fuel in its kiln. The kilns with crushed limestone are fired to produce quicklime (calcium oxide), an important chemical with many agricultural and construction applications. The olive stones are a remnant from olive oil factories produced during the process of collecting olive oil.

The partially-combusted olive stones remaining in the kiln, are then collected and compacted in moulds to create slow-burning barbecue briquettes replacing some of the environmentally damaging production of wood charcoal.

Despite the initial lack of awareness regarding environmentally friendly products in the community and difficulties in financing and certification, the company has managed to create multiple revenue streams by cascading olive by-products through a sequence of value extracting processes.

At the same time, they also contribute to the mitigation of several local and global environmental issues like GHG emissions and deforestation. In global terms, recovering energy from the by-products of locally grown food crops offers a carbon-neutral fuel alternative for industrial processes as well as a certified way for citizens to avoid inadvertently contributing to deforestation.

Further reading: www.klimiscoal.gr/en/

© Photo: courtesy of Klimis ↑

Circular support

This last category includes business models that provide different types of support along the entire value chain, which enable the implementation of circular activities or projects. This support may focus on management and coordination, marketing, awareness-raising, facilitation of material trade, optimisation of discarded product collection, etc. It may take the form of advisory services, ICT solutions, digital tools and applications, block-chain technology and others. Some examples include databases for material passports and virtual marketplaces for reused products or secondary raw materials. Some examples include the Madaster digital material library that generates material passports, and restado, one of the largest online marketplaces for reclaimed construction materials in Europe.

Further reading on From idea to implementation solution booklet

GIAB: the support you need to join the transition to a circular economy

Founded in 2010 in Sweden, GIAB now counts to just about 100 employees. With their expertise, routines and business models based on the principles of the circular economy, GIAB provides support to organisations based on a number of business areas. The first area offers consultancy services to various organisations with the aim to build a more sustainable society. The company also offers a data-driven circular platform to automate and streamline the recirculation of products, it provides return management services for e-commerce, as well as damage verification services for the insurance industry. Finally, GIAB offers circular management of IT equipment and furniture for companies and organisations, refurbishing and keeping used products on the market. The company's vision is to be an internationally recognised catalyst for the transformation to a circular economy, combining economic profitability with sustainability in business development.

Further reading: GIAB website

© Photo: courtesy of GIAB ↑

Useful tools and resources for circular businesses

- The European Environment Agency has developed an Analytical framework that supports circular business model innovation, taking into account the necessary technical and social innovation as well as the policy and education enablers needed.
Further reading: Business Models in a Circular Economy

- Circulator is a project funded by the EIT Raw Materials that provides a starting point for entrepreneurs that want to develop a circular business model, providing an overview of potential strategies and examples.
Further reading: Circulator website

- The European Investment Bank, in its Circular Economy Guide, illustrates its vision and intent to support innovative circular economy projects through financing and advisory services and outlines projects eligible for its support.
Further reading: The EIB circular economy guide: Supporting the circular transition

- The Circular City Funding Guide supports municipalities, businesses, and other urban stakeholders with information, best practices and solutions for funding and implementing their urban circular projects.
Further reading: Circular City Funding Guide

- The Ellen MacArthur Foundation offers resources for businesses, including a business model design guide and a framework that helps companies and other organisations make circular choices in their procurement.
Further reading: Business – Overview (ellenmacarthurfoundation.org)

- Circle Economy provides resources for the development and financing of circular business models.
Further reading: 3 Essential Steps to Financing Circular Business Models (circle-economy.com)


Effectiveness
1. Reco
GOVERNANCE AND REGULATION

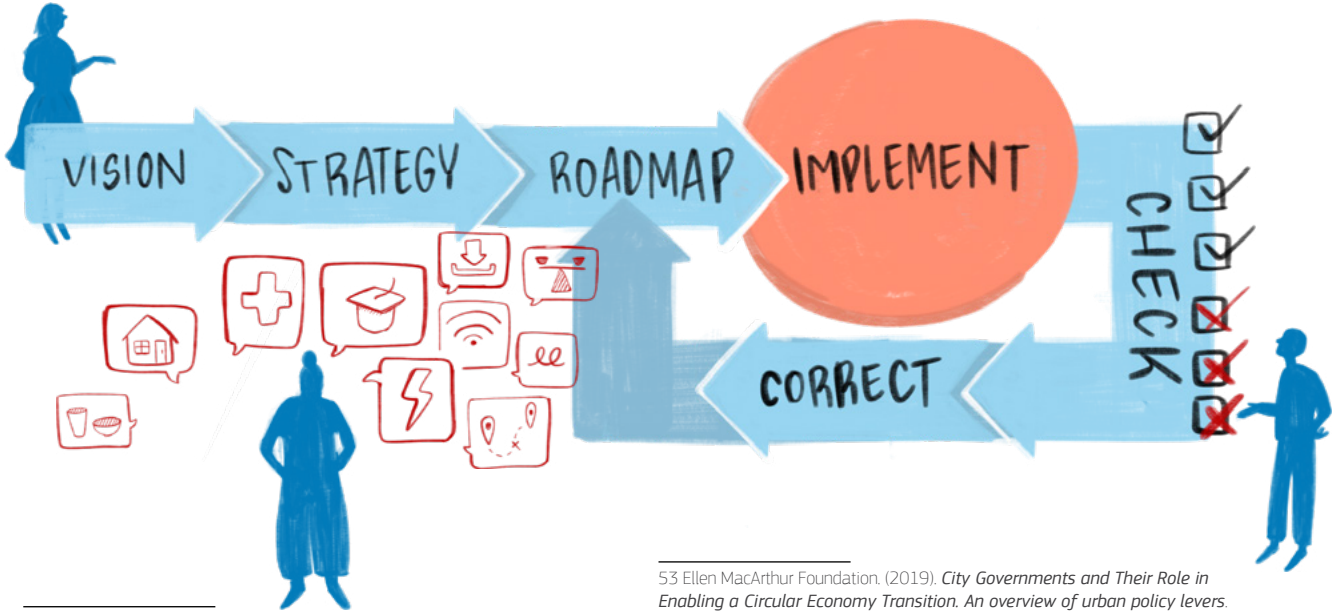
GOVERNANCE AND REGULATION

Cities should collaborate with local stakeholders to agree on the **vision** for the circular city. The vision can stem from the EU wide Circular Economy Action plan, a country's circular economy vision and strategy document, or from a bottom-up approach, involving numerous local stakeholders (Brussels and Paris)[50].

To commit to a vision, a city needs to develop a **strategy**. Shifting from the linear to a circular economy affects all sectors and stakeholders. Therefore, it is not possible to assess the full potential of the circular economy using a sectoral approach. Rather, to assess the current situation and define future scenarios, city governments should analyse material and energy flows in the city. This is often referred to as performing an **urban metabolism scan**.[51] Interdisciplinary stakeholders from within the city government and beyond should be involved from early in the process of shaping the city's vision and strategy.

The implementation of the strategy is detailed in the **action plan** that provides a roadmap with measurable key performance indicators assigned to each activity. The actual implementation is a cyclical process that includes continuous repetition of the three steps **doing** or implementing the actions, **checking** and **correcting** against the action plan.[52]

The action plan should include the **activities of the city government** and administration, as well as the **activities of other stakeholders**. Both sets of activities involve the city government — while in the former the city government applies circular economy principles to their own assets and operation (changes in organization, public procurement, municipal fleet, operations etc), in the latter actions the city government supports the implementation of circular economy principles implemented by other stakeholders through regulation, obligations, planning, awareness-raising and financial incentives. An overview of the set of actions available to city governments is given in the Ellen MacArthur Foundation publication[53] and the European Investment Bank publication on the 15 circular steps for cities.[54]



50 Ellen MacArthur Foundation. (2019). *City Governments and Their Role in Enabling a Circular Economy Transition. An overview of urban policy levers*. ellenmacarthurfoundation.org/policy-levers
51 Jonker, J., Montenegro Navarro, N., Ludwig, D., Zoon, H., Voet, J., Van Stralen, N., van Ooijen, R., & Lammes, R. (2018). *Circular City Governance: An explorative research study into current barriers and governance practices in circular city transitions across Europe*. European Investment Bank. circular-city-governance-an-explorative-research-study-into-current-barriers-and-governance-practices-in-circular-city-transitions-across-europe-2018.pdf (europa.eu)

52 Dr Bernard Gindroz, ISO Smart City standards in practice: Considering current and further cities' needs and expectations in new standards formulation and implementation

53 Ellen MacArthur Foundation. (2019). *City Governments and Their Role in Enabling a Circular Economy Transition. An overview of urban policy levers*. ellenmacarthurfoundation.org/policy-levers
54 Byström, J. (2018). *The 15 circular steps for cities – Second edition*. European Investment Bank. doi.org/10.2867/665692

Main **barriers** to a circular economy for cities include the following:[55]

→ City administration strategies and activities are typically defined in sector silos, while a circular economy requires cross-sectoral collaboration, which can be complex to manage.

→ There is confusion in regard to what circular economy is and what it includes. Often circularity is limited to waste management only.

→ Waste regulation currently makes it difficult to reuse or recycle anything that is classified as waste.

→ The taxation system predominantly taxes labour instead of virgin and non-circular materials, making new products cheaper than reused or recycled.

→ There is a lack of funding for circular projects and programmes limiting innovation needed for circular economy implementation.

→ Lack of government promotion and popularisation of circular products and best practices.

→ Lack of transparent and user-accessible information on product life cycle data.

In the process of transformation to a circular city, the city government can act as a **force multiplier** by:[56]

→ Monitoring activities and promoting best practices,

→ Creating platforms for sharing lessons learned,

→ Providing information on funding opportunities on local, national and EU levels,

→ Providing regulation that allows for the experimentation and innovation that are required for new circular business models, and

→ Improving waste regulation to allow for better material management and extension of product lifetime.

55 Jonker, J., Montenegro Navarro, N., Ludwig, D., Zoon, H., Voet, J., Van Stralen, N., van Ooijen, R., & Lammes, R. (2018). *Circular City Governance: An explorative research study into current barriers and governance practices in circular city transitions across Europe*. European Investment Bank. circular-city-governance-an-explorative-research-study-into-current-barriers-and-governance-practices-in-circular-city-transitions-across-europe-2018.pdf (europa.eu)

56 Jonker, J., Montenegro Navarro, N., Ludwig, D., Zoon, H., Voet, J., Van Stralen, N., van Ooijen, R., & Lammes, R. (2018). *Circular City Governance: An explorative research study into current barriers and governance practices in circular city transitions across Europe*. European Investment Bank. circular-city-governance-an-explorative-research-study-into-current-barriers-and-governance-practices-in-circular-city-transitions-across-europe-2018.pdf (europa.eu)

Standardisation

Sector Forum Smart Sustainable Cities and Communities CEN/CENELEC/ETSI is a platform of exchange that emits propositions for new Standardisation development at the EU level or global level. It has a strengthened relationship with the CEN TC 465 and ISO TC 268 that develop standards for sustainable development of cities and communities. In addition a specific ISO Technical Committee, ISO TC 323, is developing standards dedicated to a circular economy.

Standardisation has a key role to play, as a booster from innovation to market(s).

Standardisation is important to:

- → **Create trust and confidence among all stakeholders (citizens/consumers/decision-makers/planners, etc.),**
- → **Motivate replication and scaling-up from success stories and benchmarking,**
- → **Provide guidance for decision-makers and investors (vision, planning, strategies, investment, etc) through a full management system approach from vision creation to implementation, provide standardized performance indicators, progress follow-up and monitoring and benchmarking.**

GENERAL LESSONS LEARNED

© Brenda De Vries: Marjolein Bot during City-zen Project Closing Event in Amsterdam, April 2019

GENERAL LESSONS LEARNED

Planning

→ To define a vision and strategy for a future circular city, urban metabolism analysis is needed (analysis of material and energy flows in the city).

→ The concept of circular economy should be explained in simple terms and with tangible actions.

→ Actions should involve both the city administration and its operation, as well as other city stakeholders

→ Actions should be defined with measurable indicators so their progress can be followed over time.

→ Various stakeholders, from the city administration to the business sector and citizens, should be involved from the beginning of the planning process all the way to the implementation.

Implementation

→ The implementation of circular economy in cities requires the city administration to shift from working in silos to an approach of interconnected sectors.

→ A circular economy requires new business models that should be supported by regulation and policy.

→ Innovation in processes, materials and organization are needed for circular cities — funding of circular economy projects and providing space for testing innovative solutions is crucial.

Assessment

→ Testing innovative ideas results in best and worst practices — city government should provide platforms for the exchange of ideas and lessons learned.

→ Awareness-raising and capacity building are needed both within the city administration and with other stakeholders and citizens.

→ It is important to refine or adapt the activities in the action plan based on the implementation experience — create a cyclical process of implementation and assessment to allow for modifications.

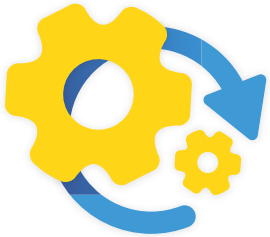
USEFUL DOCUMENTS & LINKS

USEFUL DOCUMENTS & LINKS

- European Environmental Agency
- European Circular Cities Declaration
- Green City Accord
- Circular Economy Stakeholder Platform
- Circular City Funding Guide
- Circle City Scan Tool, Circle Economy
- Knowledge Hub, Circle Lab
- Cities and a Circular Economy, Ellen Macarthur Foundation
- Urban Policy Levers for Circular Economy Transitions, Ellen Macarthur Foundation
- Circular Principles for Cities, Reflow
- Public Procurement for a Circular Economy: Good Practice and Guidance, European Commission
- Dhawan, P., & Beckmann, J. (2019). Circular Economy Guidebook for Cities. CSCP.
- Gillabel, J., Manshoven, S., Grossi, F., Mortensen, L. F., & Coscieme, L. (2021). Business Models in a Circular Economy. European Topic Centre on Waste and Materials in a Green Economy - EEA.
- Cradle to Cradle Certification
- Bio-plastics Europe project

SMART CITIES MARKETPLACE

The Smart Cities Marketplace is a major market-changing enterprise supported by the European Commission bringing together cities, industries, SMEs, investors, researchers and other smart city actors. The Marketplace offers insight into European smart city good practice, allowing you to explore which approach might fit your smart city project. Discover our digital brochure here.



Matchmaking

The Smart Cities Marketplace offers services and events for both cities and investors on creating and finding bankable smart city proposals by using our Investor Network and publishing calls for projects.

Investor network

Call for projects

Project finance masterclass

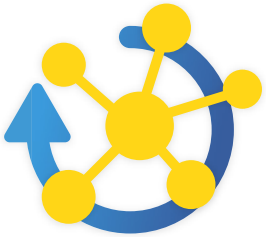
Community

The Smart Cities Marketplace community consists of a number of Action Clusters and Initiatives with a variety of activities to help shape the market for Smart Cities in Europe.

Action clusters

Initiatives

Community charter



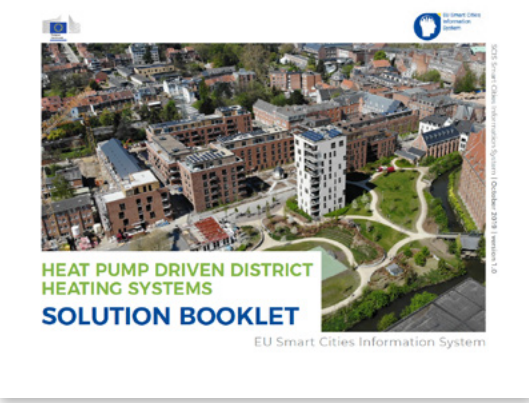
EU initiatives

Apart from the smart cities marketplace, there are a number of adjacent EU initiatives focussing on making European cities better places to live and work.

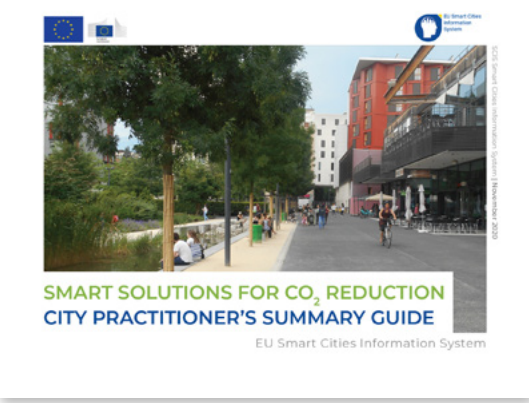
Other EU initiatives

Suggested further reading

Urban Freight Logistics
SCIS Solution Booklet



Heat Pump driven District Heating systems
SCIS Solution Booklet

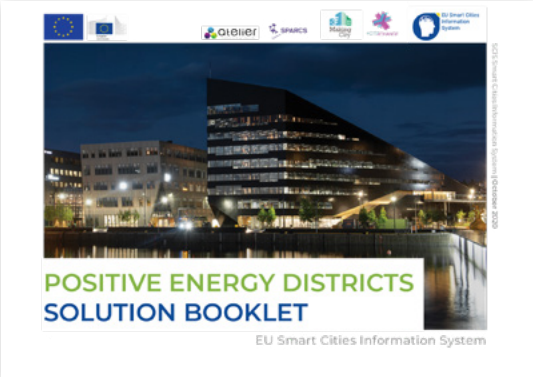


Smart Solutions for CO_2 Reduction
City Practitioner's Summary Guide

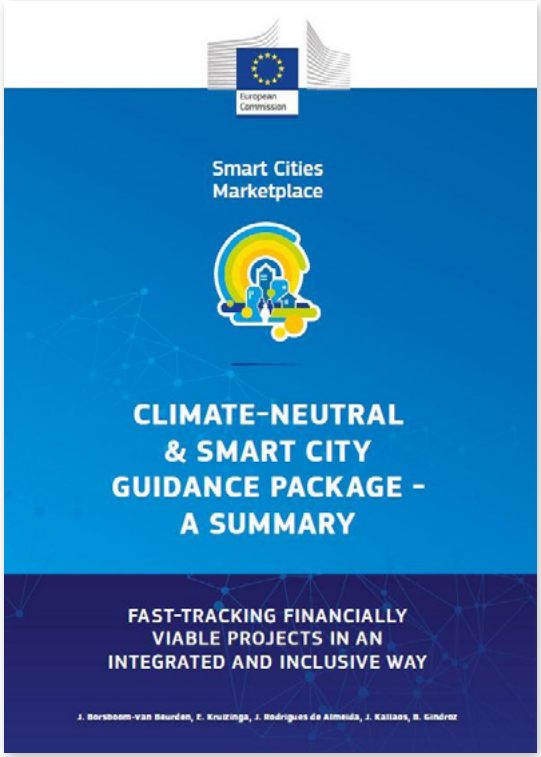
Energy Communities
SCIS Solution Booklet

Electric Vehicles & the Grid
SCIS Solution Booklet

Building Integrated PV
SCIS Solution Booklet



Citizen Engagement and Positive Energy Districts SCIS Solution Booklets



Smart Cities Guidance Package Summary

Smart Cities Guidance Package

European Commission

A circular economy is an economic system that decouples economic growth from the consumption of finite natural resources. In a **circular economy**, **fewer** and more durable products are made partially or fully from existing recovered materials or waste, they are used multiple times, then refurbished or repurposed. At the end of their life, the parts or materials they consist of are **recycled** or **recovered**, leading back to the beginning of the circle. A **circular city** is a city that promotes the transition from a linear to a circular economy in an integrated way across all its functions in collaboration with citizens, businesses and the research community, creating a systematic approach to circular economy.

This booklet provides an overview of what circularity can mean for cities and other urban stakeholders. With circular solution examples from different sectors, lessons learned and links to important resources, it aims to provide the tools that will facilitate the transition of cities to a circular economy.

Moving from a linear to a circular economy. ↑ Adapted from Byström, J. (2018). The 15 circular steps for cities. European Investment Bank. eib.org/circular-economy

CIRCULAR CITIES SOLUTION BOOKLET

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