

CITY-LEVEL CIRCULAR ECONOMY INTERVENTIONS TO PROTECT AND ENHANCE BIODIVERSITY

Publishers

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Citation

This publication should be cited as: ICLEI (2022). City-level circular economy interventions to protect and enhance biodiversity. Bonn, February 2022.

CONTENTS

About this briefing sheet	4
Introduction	5
Why biodiversity matters for cities	6
How the linear economy contributes to biodiversity loss	8
Urban areas as drivers of the linear economy How circular cities can help steward biodiversity	9
	10
How biodiversity enables circular interventions	11
Holistic example: Turku's circular water concept maximizes biodiversity impacts	12
Concrete circular actions cities can take to protect and	
enhance biodiversity	15
What cities can do	26
References	27

About this briefing sheet

Cities are critically dependent on biodiversity for sustaining the social, economic and environmental well-being of their residents. Yet, the prevailing linear production, consumption and management practices of urban economies are driving biodiversity loss, both within and beyond local jurisdictions.

To halt and reverse biodiversity loss, transformative action is necessary through policy agendas that promote and incentivize circular economy strategies where they are most impactful - in cities.

In this briefing sheet, we outline why stewarding biodiversity is critically important for cities and we detail practical actions that cities can undertake, based on the Circular City Actions Framework - a set of five complementary strategies local governments can adopt to implement circularity to address local challenges.

This briefing sheet has been prepared as part of the Circular Turku project which aims to map the transition steps for the city of Turku (Finland) to become circular by 2040 while promoting social equity and biodiversity protection. The project is implemented with the support of Sitra, local stakeholders and ICLEI - Local Governments for Sustainability. It aims to equip local governments around the world with tools and methodologies to design their own circular transitions.

Definition

"Biological diversity" means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems."

Convention on Biological Diversity – Article 2





Introduction

The evidence base is clear: Biodiversity is declining at an unprecedented and accelerating rate and our prevailing linear consumption, production and management practices are to blame. Stopping and reversing biodiversity loss constitutes one of the most pressing challenges of our time given that human life depends on functioning and flourishing ecosystems.

The linear economic model relies on a continuous process of extraction and processing of natural resources, which is responsible for more than 90 percent of biodiversity loss (IRP, 2019). This takemake-waste model has contributed to the degradation or modification of 77 percent of land and 87 percent of ocean area and has thereby harmed habitats and contributed to the fast decline of plant and animal species (IPBES, 2019). Linear economies, which are characterized by the proliferation of disposable items, heavily contribute to the estimated 14 million tons of plastic that enter the oceans annually. These ocean plastics leach toxins as well as micro and nanoparticles that affect more than 800 species (PEW Charitable Trusts and SystemIQ, 2020). Linear economies are also characterized by substantial inefficiencies which put unnecessary pressure on natural resources. It is estimated that 1.4 billion hectares of land, roughly one-third of the world's total agricultural land area, is used to grow food that is wasted (FAO, 2013).

Addressing biodiversity loss requires transformative action at all levels and across all sectors. Most importantly, it necessitates a systemic shift to a circular economy that acknowledges planetary boundaries and safeguards biodiversity. The circular transition involves prioritizing regenerative resources, reducing the demand for primary resources and avoiding the generation of pollution and waste.

With urban areas acting as the consumption centres of our world's resources, local governments play an important role in this transformation. In fact, they are in a unique position to drive, catalyze and enable circular economy interventions in support of biodiversity protection and regeneration.

This briefing sheet outlines the ways in which urban areas are currently impacting biodiversity and demonstrates how localizing the circular economy can help cities to preserve and enhance biodiversity both within and beyond their jurisdiction.

Why biodiversity matters for cities

Biodiversity is crucial for urban areas and their residents. Healthy ecosystems outside and inside their boundaries provide them with resources encompassing food, fuels, building materials and water. In addition, healthy local ecosystems offer a range of ecological functions and social co-benefits.

Here are eight reasons why local governments should take action to promote biodiversity (ICLEI, 2021):

1. Improve air quality

Air quality is a challenge in many cities and a priority for many local governments. Increased vegetation in cities can help improve air quality by filtering and sequestering pollutants such as microparticles and harmful gases from the atmosphere, which reduces the incidence of respiratory problems such as asthma.

2. Ensure higher quality and availability of water in aquifers and reservoirs

By reducing asphalted areas and increasing permeable stretches, rainwater is able to penetrate the soil and gradually reach aquifers and reservoirs. This supports higher quality and availability of water and increased resilience in case of flooding. Roots also function as natural filters, reducing the amount of sediment and impurities that percolate in the reservoirs.

3. Protect from natural disasters

Protecting biodiversity in cities provides regulating and supporting ecosystem services that enhance resilience to natural disasters. For example, permeable surfaces, green roofs and floodplains reduce the adverse effects of severe rainfall events. Measures such as the maintenance of vegetative cover and afforestation along slopes stabilize soils which in turns mitigates landslides and avalanches. Areas suffering from coastal flooding and erosion benefit from the restoration and management of saltmarshes, wetlands and mangroves. These natural ecosystems form a natural buffer between sea and land which reduces wave intensity and prevents erosion.

4. Mitigate climate change related risks

Floral diversity is extremely important for climate regulation. The root systems of plants allow greater water infiltration in the soil and help retain moisture over time. The transpiration of the leaves increases the humidity of the air and helps in the formation of rain clouds. The



presence of biodiversity, especially trees with high-density crowns, also supports reduction in temperatures and greater air humidity, contributing to thermoregulation during heat waves. These factors, among many others, can help mitigate the effects of extreme weather events such as droughts, fires and floods.

5. Support sustainable urban food systems

Healthy soils ensure more nutritious food production in the urban and peri-urban agricultural landscape. Protecting pollinators by reducing the use of pesticides and maintaining habitats ensures the sustainability of agroforestry, green belts and urban gardens, which are essential for urban food security.

6. Prevent disease and maintain food chains

By conserving biodiversity, natural predators can control the population of pests and food chains can be maintained.

7. Support the local economy

Functioning ecosystem services in cities are key to their economic attractiveness. Thriving local ecosystems, clean air and a resilient territory support tourism and attract a highly skilled population (Carlino, G, Saiz, A, 2019). In addition, biodiversity protection provides long-term cost savings to the city. It is estimated that half of the world's GDP depends moderately or highly on nature (World Economic Forum, 2020).

8. Contribute to mental health and well-being

The number of research studies investigating the health and well-being effects of biodiversity has increased in recent years. These studies consistently show a positive correlation between the proximity of parks and green spaces, including the richness of plants and birds species locally with improved mental health and well-being (Marselle M.R., et a.l., 2019). Studies also point to a potential indirect benefit of biodiversity on mental health through the promotion of physical activity (Methorst, J.et al., 2021).

The unprecedented and accelerating loss of biodiversity threatens the supply of resources and undermines nature's ability to provide the services listed above. As we will see in the next section, the linear economy is a major contributor to this challenge.





How the linear economy contributes to biodiversity loss

Our economic systems follow a linear model in which natural resources are extracted **(take)** at a faster rate than they can regenerate. They are then used to **make** products and infrastructures through polluting and wasteful processes. The materials used in these products and infrastructure are currently only being revalorized in 8.6 percent of the cases (Circle Economy, 2022). The remaining 91.4 percent ends up as **waste** and strains ecosystems when waste infrastructure is not developed.

As a result, linear value chains contribute to all five drivers of biodiversity loss and ecosystem change (IPBES, 2019):

- Land-use change;
- Climate change;
- Pollution;
- Natural resource use and exploitation; and
- Invasive species.

IMPACTS OF THE TAKE-MAKE-WASTE ON BIODIVERSITY LOSS



Urban areas as drivers of the linear economy

75%

90 billion tonnes

50%

of the world's natural resource consumption takes place in cities of materials are expected to be consumed in cities by 2050 of global waste can be attributed to cities

Urban areas impact biodiversity both close to home and at regional and global level through their **demand for resources**, their **release of pollutants** and the **production of waste**, which is affecting biodiversity from both the start and end of global value chains.

Demand for resources

About 75 percent of the world's natural resource consumption takes place in cities (UNEP, 2013) and almost 80 percent of all food is consumed by urban residents (FAO, 2020). Between 2010 and 2050, cities' material consumption is projected to more than double from 40 to 90 billion tonnes (IRP, 2018). Humanity currently uses resources at a much faster pace than nature can regenerate. The Earth Overshoot Day - the date when humanity's demand for ecological resources and services in a given year exceeds what Earth can regenerate in that year - has moved earlier every year since the records started in 1987.

Release of pollutants

Cities are major contributors to climate change: 75 percent of global CO2 emissions originate in urban areas (Seto et al., 2014). Climate change is one of the main drivers of biodiversity loss and degradation through ocean acidification, rainfall and weather pattern change, and limitations of the bioclimatic ranges within which species can exist.

Production of waste

Urban areas also generate half of the global waste with municipal waste levels expected to double by 2050 (IEA, 2016). Where waste is not handled properly, it risks undermining biodiversity and ecosystem health, whether due to littering, runoff or landfills leaking pollutants into the natural environment. It is, for example, estimated that urban areas are responsible for 60 percent of marine plastic litter (Lebreton & Andrady, 2019) causing detrimental impacts to coastal and marine biodiversity

Cities trigger these impacts both directly and indirectly.

- O **Direct role:** Cities impact biodiversity through their jurisdictional responsibilities, including planning decisions (e.g. urban sprawl), procurement and waste management practises and trigger biodiversity impacts within their boundaries
- Indirect role: Cities impact biodiversity through the actors that live inside them the residents and businesses that consume and produce food and materials and trigger biodiversity impacts outside the city's boundaries. With respect to food, for example, only little over a third of what urban areas need is produced within their boundaries (Ellen MacArthur Foundation, 2019).

How circular cities can help steward biodiversity

Encouraging circular development principles actively fosters the conscious use of the limited resources available while stimulating stewardship of where they come from and end up. Circular development addresses the direct and indirect threats to ecosystems and enhances biodiversity through three main principles (Ellen MacArthur Foundation, 2021):

- **Prioritizing regenerative resources** that restore and protect ecosystems to ensure economic activity actively contributes to restoring biodiversity.
- **Reducing demand for primary resources** by using what already exists and circulating products and materials for as long and at the highest value as possible.
- Eliminating waste and pollution by improving design and/or ensuring waste streams are safely revalorized, thereby making sure waste and pollution do not materialize in the production and consumption cycle.

Incorporating these three principles into city practices demands holistic action that targets direct and indirect biodiversity impacts, thereby asking cities to consider both their direct and indirect roles. The Circular City Actions Framework¹, created by ICLEI, the Ellen MacArthur Foundation, Circle Economy, and Metabolic, offers intervention points for local governments to promote the transition away from the take-make-waste model.



Each R-Strategy (Rethink, Regenerate, Reduce, Reuse, Recover) consists of three interventions local governments can lead or support to shift away from the linear model. This briefing sheet presents how these interventions support biodiversity protection (see p. 12 - 25).

¹ For more information, please access: <u>https://circulars.iclei.org/action-framework/</u>

How biodiversity enables circular interventions

Closing the loop and connecting resource flows requires well-functioning ecosystem services. For example, natural nutrients cycling will not function without healthy soils. Similarly, infrastructures facilitating nutrients and energy recovery from wastewater will be at risk if stormwater is not allowed to enter the natural environment and ends up in pipes.

Circular economy interventions should have at their core the protection of the ecosystem services they depend on. This is captured by the "Regenerate" strategy of the Circular City Actions Framework which sets three pre-conditions for circular economy interventions to maximize biodiversity impacts:

- Protect and restore local ecosystems: This requires identifying and protecting a city's priority areas that support the provision of ecosystem services linked to the circular intervention.
- Promote solutions inspired and supported by nature: This demands an assessment of the value of nature-based solutions to replace or enhance a circular intervention, which may have originally been based on hard infrastructure change.
- **Prioritizing regenerative resources:** This implies sourcing low-impact, renewable resources to power circular systems.

Case study: Identifying key ecosystem services in Belo Horizonte, Brazil

As part of the ICLEI-led INTERACT-Bio project, Belo Horizonte developed an Ecosystem Service map based on a multi-criteria evaluation matrix spanning sixteen ecosystem services and allowing mapping demand and supply for these services.

The data collection and analysis method can be adapted according to the geographic location, meaning the methodology can be replicated to identify key ecosystem services necessary for a circular economy intervention.

Visit <u>interactbio.iclei.org/resource/belo-horizonte/</u> for more information.



Holistic example: Turku's circular water concept maximizes biodiversity impacts

Led by Turku's City Council, municipalities in the Turku region collaborated to design a systemic solution to water management in the area. From groundwater protection to energy positive treatment and nutrients recovery, the water concept developed in the Turku region offers a systemic circular economy solution to efficiently manage water, nutrients and energy at the local level and maximize biodiversity impacts. It also demonstrates the potential of ecosystem-based and circular approaches to mutually reinforce each other along the Circular City Actions Framework.

Context

Until 2009, wastewater was collected separately by fourteen municipalities in the Turku region. Nutrient capture was not maximized which was causing the Turku marine area to be substantially polluted with phosphorus and nitrogen. As for drinking water, it used to be produced by separate water production facilities using either groundwater or surface water obtained from small rivers nearby Turku. The quality and quantity of the river water was not sufficient.

To address these challenges, the city of Turku implemented a systemic circular economy solution that maximized biodiversity impacts.

RETHINK - Changing the governance structure of water management

Turku acknowledged the need to rethink water management in the region to both improve the water quality and protect local ecosystems. To front the investment costs related to fundamental changes in regional water infrastructures, the city partnered with nine municipalities from the surrounding regions to create the Turku Region Water Ltd. Turku also facilitated close cooperation between the wastewater treatment plant and the regional water and municipal energy companies to enable cross-sectoral synergies.

REGENERATE - Ensuring groundwater protection

To protect the condition of groundwater reserves and ensure water availability, the Turku Region Water Ltd. is implementing an innovative groundwater replenishment technique called Managed Aquifer Recharge (MAR). This technique recharges an aquifer using either surface or underground recharge techniques and thereby offers a natural means of producing high quality water and to increase the yields of the aquifer. The MAR method enables Turku Region Water Ltd. to pump 10 times more artificially infiltrated water from the aquifer that would be possible to pump naturally recharged groundwater. In addition, the groundwater levels of the aquifer have been restored to the natural levels with no effects of the drawdowns caused by the pumping of groundwater without the infiltration. This system requires only a negligible fraction of the chemicals used in traditional drinking water facilities. Turku Region Water Ltd. has also invested in carbon emission free energy production in the drinking water production process. Part of the electricity needed in the pretreatment of the river water that is used for infiltration is produced by 1,350 solar panels.

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The wastewater treatment plant uses mechanical, chemical and biological treatment processes. This combination makes the purification process very efficient: the plant removes up to 99 percent of organic matter and phosphorous and over 80 percent of nitrogen from the wastewater, far above the regulatory requirements.

Turku Region Water Ltd. also installed a turbine at the end of the large diameter feeder pipeline that utilizes the gravitational flow of water to produce clean energy. This energy is sufficient to run the pumps that provide water pressure for 230,000 consumers.

REUSE - Reusing heat at the district level

The wastewater treatment plant also features a heat pumping station. The municipal energy company uses the station to extract some of the thermal energy from the wastewater to produce heat for district heating purposes (160 GWh / year) for 15,000 households. The water that is cooled down by the pumping station is also used for district cooling (30 GWh / year, or almost all of the need in Turku city).

RECOVER - Recovering sludge

Sludge from the wastewater treatment plant is recovered and processed using anaerobic digestion, producing 30 GWh / year used in various regional transport needs. One third of the nutrients from the digestate are used as fertilizers in agriculture and two thirds in landscaping. Nitrogen products produced from the sludge are sold to chemical industries.

Biodiversity impacts

Q

- O Decreasing nutrient pollution: Centralizing all municipal wastewater treatment plants in one location and implementing nutrient recovery practices have led to an 83 percent decrease in phosphorus load in the Turku marine area, which has had a positive effect on the water quality of the Baltic Sea.
- Carbon savings: The various wastewater activities linked to the wastewater treatment plant produce ten times more energy than they consume. It is estimated that carbon emissions in the Turku region are 80,000 tons lower per year because of the use of the heat pump station.
- Water quality: The quality and supply of water has become extremely stable thanks to the use of managed aquifer recharge techniques and efficient wastewater treatment. Turku's MAR system received in 2021 the highest sustainability index ratings from the UNESCO (UNESCO, 2021).





Concrete circular actions cities can take to protect and enhance biodiversity

Turku's holistic circular water concept delivered substantial biodiversity impacts by embracing all dimensions of the circular economy at the city level: Rethink, Regenerate, Reduce, Reuse and Recover. Such systemic approaches can be challenging to implement in cities that are at the beginning of their circular journey as they demand strong political support in favor of multi-stakeholder collaboration along value chains as well as a number of other enabling conditions to be met, such as budget availability, mandates for the areas considered and availability of technical understanding and skills within the administration. As a result, cities often focus on one of the dimensions of the Circular City Actions Framework only when implementing circular economy related measures, instead of combining different interventions along the value chain.

As the following examples illustrate, each of the five dimensions of the Actions Framework has the potential to deliver biodiversity benefits that will benefit residents and local ecosystems. However, to support a shift to consumption and production patterns that work with rather than against nature, cities need to build on and expand their existing practices, in an integrated manner, and incorporate several dimensions of the Circular City Actions Framework. The city cases included in this publication aim at demonstrating the range of actions local governments have to support a holistic transition to a circular economy that maximizes biodiversity benefits.





RETHINK · Redesign the system

Objective: Lay the foundation for circular activities and enable the transition to a circular economy.



Eliminate linear incentives and incentivize circular practices

Phasing out single-use plastic in Delhi

A massive 60 percent of the plastic waste in the oceans is estimated to come from India (India Times, 2017). In Delhi, open burning of plastic waste is causing major health challenges and contributes to the city's extremely degraded air quality (Global Citizen 2016). The Government of the National Capital Territory of Delhi adopted the "Comprehensive Action Plan for Elimination of Identified Single-Use Plastic" in December 2021. The Action Plan organizes a three-steps phase out of single-use plastic such as bags, cutlery, films, banners and wrappers, which is set to be completed by the end of 2022. In addition, urban local bodies and urban development departments will provide incentives for the uptake of single-use plastics alternatives and form a scheme for promotion of high-value plastics recycling technologies. Finally, Delhi State government is developing a strategy for targeted campaigns at littering hotspots such as tourist spots, places of religious and cultural importance, weekly markets, and urban sprawls. Phasing out single-use plastic items, the vast majority of which can't be recycled, is a necessary step to minimize microplastic pollution.

Potential biodiversity benefits:

- pollution reduction, and
- minimization of natural resource use and exploitation.

Support closed-loop systems and crosssectoral synergies

Hammarby, a demonstration of closed-loop metabolism concepts

The Hammarby Sjöstad district in Stockholm (Sweden) was designed around the closed-loop metabolism concept, which embraces synergies among water, energy, and transportation services. The district is heated by purified waste water, combustion of household waste, and biofuel. When the heat has been extracted from the warm, purified waste water, the remaining cold water can be used for district cooling. This is used in e.g. the cold storage in grocery stores or as a replacement for air conditioning systems in office buildings.

RETHINK • *Redesign the system*



The sludge produced by the wastewater treatment process is recycled and used for fertilizing farmland and forestry land. The biogas produced during the process is used as fuel for vehicles such as buses, taxis and waste collection trucks, and to heat 1,000 homes in the area. The switch to biogas in these homes has resulted in a reduction of their electricity consumption by 20 percent. These measures decrease the use of fossil fuels, which harm biodiversity through polluting and contributing to climate change.

Potential biodiversity benefits:

- climate change mitigation,
- pollution reduction, and
- minimization of natural resource use and exploitation.

Incentivize the shift towards sustainable lifestyles

Thursday is "Veggie Day" in Ghent

The Belgian city of Ghent encourages citizens to eat vegetarian food one day a week with its "Thursday Veggie Day" campaign. Meat production requires more energy and agricultural land use than vegetarian alternatives, contributing to climate change and resulting in heightened land degradation and pollution. By reducing meat production, this campaign can have positive impacts for biodiversity at local and global scales. If all inhabitants of Ghent participate in "Thursday Veggie Day", the effect will be the same as removing 20,000 cars off the road.

- pollution reduction, and
- minimization of natural resource use and exploitation.



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REGENERATE · Harmonize with nature

Objective: Promote infrastructure, production systems and sourcing that allow natural ecosystems to thrive



Protect and restore local ecosystems

Restoring Brasília's watershed

Drought in Brasília, Brazil's capital city, reached crisis levels in 2016. To ensure that local water bodies remained able to naturally recharge, a diverse group of stakeholders collaborated to reforest springs in the northern urban watershed. This effort, designed to improve water security, also centred the restoration and enhancement of existing habitats for native flora and fauna. By 2019, 25 degraded water springs, rivers and lake shores were recovered. These efforts have allowed dedicating more lands to regenerative agriculture. Approximately 80 newly licensed organic farming families now produce food on these lands, mostly using agroforestry techniques, and two organic markets have been inaugurated.

Potential biodiversity benefits:

- prevention of land-use change,
- climate change mitigation,
- pollution reduction, and
- minimization of natural resource use and exploitation.



Sponge city Shenzhen

The Chinese city of Shenzhen turned a 105-acre abandoned agricultural experiment station into a park that incorporates sponge city principles. The sponge city initiative uses natureinspired water management solutions, including small swales to catch runoff, ponds with native rushes and permeable pavement, to capture, store and purify rainwater. Sponge city infrastructure functions to reduce the risk of flooding while also providing habitat for urban biodiversity. Additionally, the functions of catching, storing and purifying rainwater prevents runoff from inundating off-site habitats with excess nutrients and chemicals. The benefits of the sponge city initiative include a 50 percent reduction in annual river pollution and a reduction of more than 75 percent in total annual runoff.



REGENERATE · *Harmonize with nature*

Potential biodiversity benefits:

- prevention of land-use change,
- climate change mitigation,
- pollution reduction, and
- minimization of natural resource use and exploitation.

Prioritize renewable resources

Sourcing food from regenerative sources in São Paulo

To protect local waterways and ecosystems and increase resilience to climate change while supporting smallholder farmers, the city of São Paulo (Brazil) has implemented different measures to promote regenerative agriculture in the city-region. The city passed a decree in 2016 setting a target that by 2026, 100 percent of the 2 million school meals offered in the city every day should be organic. This decree has allowed organic farmers in the region to bid directly with the city government to supply local schools. São Paulo buys produce from these local farmers at 30 percent more than the market value to incentivize the transition to regenerative practices. São Paulo is also eager to promote organic and local food consumption across the whole city. The "Connect the Dots" program is addressing logistical barriers that hinder direct interactions between consumers and local producers. The program focuses on improving road infrastructure, facilitating access to warehouses and a network of street markets and small food retailers, which allow local farmers to sell their produce to consumers across São Paulo. Today, 160 farmers are involved in the project and close to half have fully converted from conventional to organic or regenerative practices.

- climate change mitigation,
- pollution reduction, and
- minimization of natural resource use and exploitation.



REDUCE · Do better with less

Objective: Extend and intensify use of existing resources, products, spaces and infrastructure



Design infrastructure and the built environment for resource efficiency

Redesigning construction in Auckland

Auckland (New Zealand) is committed to achieving zero waste by 2040. Construction and demolition waste, the city's largest single waste, is a priority. The city piloted deconstruction practices in several public building projects and developed methodology to minimize waste on construction projects for use by the wider construction industry. Auckland is also planning to develop a deconstruction hub that will provide infrastructure for industry to exchange key materials. Decreasing the need for new construction materials is critical for biodiversity protection. Mining or extracting materials needed for the construction industry, such as gravel, sand, iron ore or rocks, can alter or destroy habitats. The conversion process of the raw materials also requires substantial amounts of water and energy which also pose biodiversity challenges.

Potential biodiversity benefits:

- climate change mitigation,
- pollution reduction, and
- minimization of natural resource use and exploitation.



Support circular and resource-efficient business innovations

Supporting resource efficiency in Turku's chemical industry

The chemical sector plays a central role in modern economies. It allows turning raw materials into high-value products that will be used in our everyday life. Recognizing that raw materials extraction is fueling climate change, pollution and ecosystem degradation, the city of Turku (Finland), supported front-running circular innovations in the chemical sector. The Smart Chemistry Park (SCP) was created through the city-owned non-profit company Turku Science Park Ltd to offer SMEs a unified infrastructure for piloting innovative circular economy solutions aimed at recycling industrial side-streams into high-value chemical products. The SCP led to major industrial innovations including an innovative method for recycling of e-vehicle lithium-ion batteries. This method enables a recycling rate of 80 percent of these batteries

REDUCE • *Do better with less*

1 K

compared to standard recycling rates of around 50 percent. Supporting the recycling of lithiumion batteries is key to protect biodiversity as lithium extraction is linked to substantial water contamination and water insecurity challenges in producing countries.

Potential biodiversity benefits:

- climate change mitigation,
- pollution reduction, and
- minimization of natural resource use and exploitation.

Support local, low-impact circular economies

Urban agriculture in Rosario

The city of Rosario (Argentina) collaborated with NGOs to create its highly successful Urban Agriculture Program. Concerted efforts on the part of the municipality, including provision of funding, implementation of supportive policies, and forward-looking city planning, contributed to the program's success. The project helped revitalize polluted urban areas via regenerative agriculture techniques while offering residents income opportunities and reducing food insecurity. Close to 2,500 tons of fruits and vegetables are agro ecologically produced in Rosario each year. Localizing vegetable production creates 95 percent fewer GHG emissions than produce imported to Rosario (National University of Rosario et al, 2014).

- prevention of land-use change,
- climate change mitigation,
- pollution reduction, and
- minimization of natural resource use and exploitation.





REUSE · Use longer

Objective: Design infrastructure, processes and products to minimize material, water and energy use and waste generation from production to end of use



Design and regulate for extended use

Greywater reuse in Guelph

The city of Guelph is one of the largest cities in Canada to rely primarily on groundwater for its water supply. For this reason, the city has long sought to conserve water through diverse initiatives. One of these initiatives is a rebates program to support the installation of greywater reuse and rainwater harvesting systems, which reduce demand on the groundwater supply by allowing homes and businesses to use water that would otherwise enter sewage or stormwater systems and potentially pose risks to the resilience of water infrastructures. The 35 households participating in this system have allowed Guelph to reduce its water consumption by 962,350 litres yearly and reduce its CO₂ emissions by 490 kg per year.

Potential biodiversity benefits:

- climate change mitigation,
- pollution reduction, and
- minimization of natural resource use and exploitation.

Facilitate second-hand markets, sharing and exchange platforms

Enabling and scaling sharing economy practices in Seoul

Through the city-funded "Sharing City, Seoul" project, Seoul (South Korea) became in 2013 one of the first global cities to officially endorse the sharing economy. Since then, Seoul has been actively working to create a culture of sharing through different means. Seoul Metropolitan Government promotes and vets different sharing nonprofits and corporations to increase the public's trust in the sharing economy and scale up sharing practices. The government also supported the incubation of sharing startups with office space, consultation, and subsidies. Finally, over 1,200 public buildings are available for events and meetings outside regular business hours. This holistic support of the sharing economy has been successful since citizens participation in Sharing Seoul increased fivefold between 2014 and 2016 (Share Hub Korea, 2016). Sharing helps reduce demand for new products and thereby contributes to reducing demand for new materials and new production.



REUSE · Use longer

Potential biodiversity benefits:

- climate change mitigation,
- pollution reduction, and
- minimization of natural resource use and exploitation.

Support reuse, repair, remanufacturing and maintenance of existing resources, products, spaces and infrastructure

Making use of vacant city land with Pittsburgh's Adopt-A-Lot program

The US city of Pittsburgh created a streamlined process that lets residents access vacant city land for gardening, growing food and creating rain gardens under the Adopt-A-Lot program. Through this process residents participate in protecting and creating habitats that can foster biodiversity in the 27,000 vacant lots the city hosts. Rain gardens implemented on these lots also support ecosystem services such as preventing stormwater runoff, which can contain excess nutrients that harm habitats.

- climate change mitigation,
- pollution reduction, and
- minimization of natural resource use and exploitation.





RECOVER · Make waste history

Objective: Maximize the recovery of resources at the end of the use phase and reintroduce them into production processes



Design and regulate for separation and recovery

Supporting source separation in Bengaluru

Source separation - the segregation of different types of solid waste at the location where they are generated - is a cost-efficient way to recycle materials at a high value, as it avoids contamination by other waste materials. It also avoids resorting to temporary sites for waste segregation which contribute to biodiversity challenges such as air, water and land degradation. In India, the Mandur and Mavallipura landfills, where Bengaluru's waste was converging, were posing severe environmental and health threats. After the Mavallipura landfill closed, several citizens groups started working with Bengaluru Urban District to implement decentralized waste management practices so that there is no need for landfills. The flagship initiative "two bin one bag" offers households and businesses three color-coded containers to collect organic waste, dry waste and sanitary waste on a daily basis. Following national regulation mandating source separation in 2016, the High Court of Karnataka, the state's highest judicial authority, mandated the "two bins, one bag" system be adopted by all waste generators (households and businesses) in Bengaluru and prohibited citizens from using plastic bags or covers to dispose of wet and hazardous wastes. As a result, over 200,000 households benefit from this system and 180 tons of waste are currently being diverted from landfills in Bengaluru everyday.

- climate change mitigation,
- pollution reduction, and
- minimization of natural resource use and exploitation.

RECOVER · Make waste history

Collect and sort waste to facilitate recovery

The Quelimane Limpa composting facility turns market waste into fertilizer

The high organic fraction of Mozambique's municipal solid waste poses substantial waste management challenges. The city of Quelimane composts waste from urban food markets at the "Quelimane Limpa" composting facility. The waste is then turned into compost for distribution in neighboring gardens. The initiative promoted the use of compost to improve the quality and quantity of urban agriculture harvests by increasing soil fertility. Building on this success, the Quelimane Agricola initiative was launched to promote urban agriculture and closed-loop food systems.

Potential biodiversity benefits:

- prevention of land-use change,
- climate change mitigation,
- pollution reduction, and
- minimization of natural resource use and exploitation.

Process waste and ensure its re-entry into industry at its highest value

E-waste recycling for increased value in Accra

The Agbogbloshie Market in Accra, Ghana, is one of the world's largest electronic waste dumps. Informal e-waste recycling practices there were widely recognized as unsafe and inefficient. In response, the city of Accra convened multiple national and international partners to create an e-waste recycling pilot facility. Workers learn how to disassemble items safely and cleanly so valuable parts can be sold at higher value. Effective recycling of e-waste is critical for biodiversity as the dangerous metals and toxic chemicals that e-waste contains do not organically break down and can, over time, seep into the environment around landfills and contaminate local ecosystems.

- climate change mitigation,
- pollution reduction, and
- minimization of natural resource use and exploitation.





What cities can do

Cities are critically dependent on biodiversity for socio-economic development and numerous ecosystem services. Yet, prevailing linear production and consumption practices are driving biodiversity loss, both within and beyond local jurisdictions. Cities, where production and consumption practices often meet or converge, have a key role to play in addressing the root causes of biodiversity degradation through circular economy interventions.

This briefing sheet and the city practices it features offer five learnings to get started today with circular economy interventions that maximize biodiversity impact.

- Choose a relevant starting point for your city: Knowing where to start can be challenging, especially since local biodiversity challenges might not link to a single sector within the city. As demonstrated by the city examples above, circular economy interventions can be applied to a variety of sectors to induce positive biodiversity impacts: plastics and packaging, land, food and agriculture, water, construction, consumer products and industrial processes. Start with a sector in which circular initiatives already exist and for which the city has a certain level of agency. Start small to demonstrate results and then expand to other sectors.
- Address vulnerabilities along the take-make-waste model: Impacting value chains from a city perspective demands to intervene along the take-make-waste model. Biodiversity impacts of circular economy interventions will be maximized when the city's interventions span each of the 5Rs-strategies of the Circular City Actions Framework, as demonstrated with Turku's systemic circular water concept (see p. 12).
- Tap into your city's role as public actor and convener: Policy mixes will need to include measures under the direct agency of the city (e.g. procurement and planning practices) as well as initiatives that aim at supporting or incentivising change across other actors to maximize biodiversity impacts. For instance, São Paulo leveraged its procurer role to strengthen the market for organic food while offering support services for local farmers to reach their consumers more easily (see p. 19).
- Ensure biodiversity protection goes hand in hand with circular economy actions: Circular economy actions should have at their core the protection of the ecosystem services they depend on in order to ensure their sustainability. This demands to map relevant ecosystem services (see p. 11) and monitor biodiversity impacts locally. We encourage cities to report their impacts of biodiversity via the CitiesWithNature platform so that they can inform and engage their respective national governments as well as the international community.
- Learn from your peers: As of yet, no single city has implemented a holistic circular economy plan spanning different sectors to maximize biodiversity impacts. However, many good practices exist that can be learnt from. Reach out at <u>circular.development@</u> <u>iclei.org</u> to be paired up with and learn from similar cities.

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