Complex challenges. Circular solutions.

Jobs and opportunities for New York City
in the circular economy

New York
Circular City
Initiative

CONVENED BY

Freshfields

Proud to be supported by

Participants

ARUP
BSR
CIRCLE ECONOMY
CISCO
CLOSED LOOP partners
DANISH CLEANTECH HUB
ELLEN MACARTHUR FOUNDATION
Freshfields
Goldman Sachs
H&M
HSBC
IDEO
ING
NYC EDC
NYC Climate
NYU STERN
QUEEN OF RAW
THE RECYCLING PARTNERSHIP
SIMS RECYCLING SOLUTIONS
TERRACYCLE
Unilever

Project convening, coordination, research and writing

Freshfields Bruckhaus Deringer US LLP:

Jon Bowd	Nathan Crosby	Fiona Gifford	Alanay Sir
Nicola Brady	Oliver Dudok van Heel	Theresa Gigov	Alex Tzimas
Edward Braham	Hannah Fraser Howes	Sephora Ochou	Timothy Wilkins

Lead author:

Oliver Dudok van Heel Freshfields Bruckhaus Deringer

Co-authors of job creation benefits section:

Joke Dufourmont, Circle Economy | **Joyce Jauer / Bertrand Teirlinck**, NYC Economic Development Corporation

Participant contributions:

Tom Kennedy
ARUP

Daniel Shurey
ING

Shubha Chandra
BSR

Lindsay Clinton
NYC Economic Development Corporation

Faith LeGendre
Cisco Systems

Lara Croushore
NYC Mayor's Office of Climate Policy

Kate Daly
Closed Loop Partners

Marianna Koval
Center for Sustainable Business at NYU Stern

Tone Søndergaard
Danish Cleantech Hub

Stephanie Benedetto
Queen of Raw

Ashima Sukhdev / Michelle Tulac
Ellen MacArthur Foundation

Rachel Kipar / Stephanie Kersten-Johnston
The Recycling Partnership

Kevin Smith
Goldman Sachs

Tom Outerbridge
SIMS Group

Abigail Kammerzell
H&M

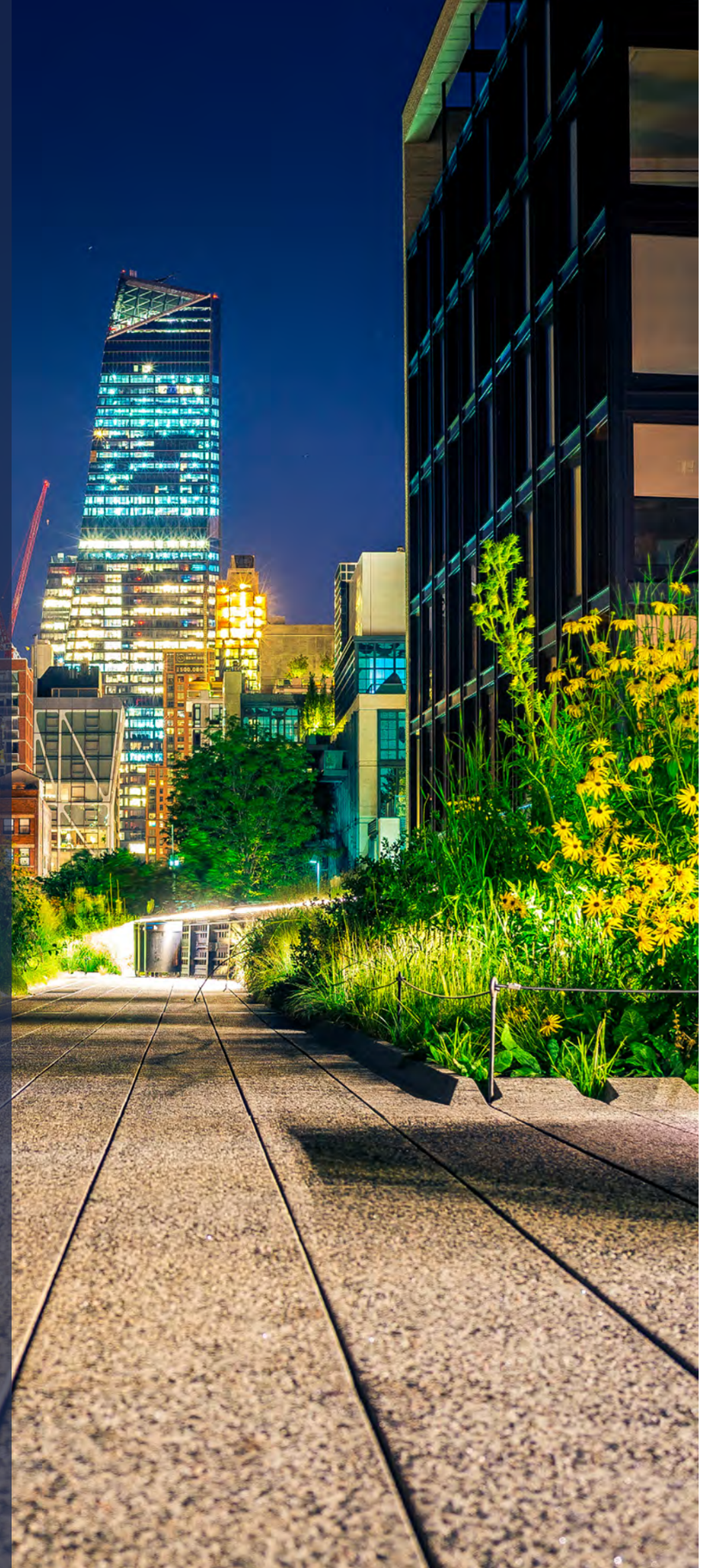
Brian Matuszewski
TerraCycle

Andrew Greenspan
HSBC

Viviana Alvarez Sanchez
Unilever

Randy Plemel
IDEO

New York City 2030: The world's foremost circular city



We live in extraordinary times. We are in the midst of a global pandemic that has had a devastating effect on our lives, health and livelihoods and changed the way we live, work and play. We are finally seeing serious attempts to address centuries of social inequality and racial injustice. And we are grappling with an environmental crisis that is threatening our way of life and the natural world.

The New York Circular City Initiative seeks to offer a positive vision of the future, one that can help answer some of the questions raised by the extraordinary times we live in.

The global economy has operated as a linear system for centuries. We extract raw materials and use them to produce goods that are thrown away at the end of their useful life.

In a time of plentiful resources and relatively few people, this system worked well. But now the global population has passed 7.5bn, a new model is required – one that makes better use of our dwindling reserves and helps society respond to the challenges of climate change.

In the 1970s, "circular" thinking began to develop as an alternative to linear structures. Circularity reimagines the global economy as one in which obsolescence is designed out of goods, the producer/consumer relationship is replaced by one of service provision and use – and no waste is dumped in the ground.

The New York Circular City Initiative, convened by Freshfields, applies circular thinking to one of the great cities of the world. Its vision is to create the first truly circular urban economy, one that would drive job creation and growth and elevate New York City as a global beacon for sustainability.

Cities are the perfect incubator for circularity because of the rapid rise of urban populations. They consume 78 percent of the world's energy and produce 60 percent of its emissions. If *sustainable* cities can emerge, they would have a disproportionate impact on humanity's environmental footprint.

Our research considered more than 50 potential levers that could create circularity in New York. Each was assessed for its impact on jobs, economic growth and the environment.

Through this work we have developed an approach that could create over 11,000 new jobs across the income spectrum, deliver over $11bn in economic benefits and reduce waste to zero.

Circularity – and the economic recovery – requires multi-sector collaboration, which is why the New York Circular City Initiative is such a powerful vehicle for change. It brings together representatives from city government, business and civil society to form a group with unique influence on the future direction of New York. Its members can be found on page 2, and we would like to extend our heartfelt thanks to each of them. From Mayor de Blasio's Office of Climate Policy to the New York City Economic Development Corporation, the Ellen MacArthur Foundation, Circle Economy, Freshfields Bruckhaus Deringer and the many businesses involved in the initiative, the circularity model set out in this report is supported by those with the power to make it a reality.

This is the first step on a journey that we believe will lead to a circular New York City. We are delighted that the Economic Development Corporation will host the New York Circular City Initiative and take this important work forward.

If you would like to join us, visit www.circularnyc.org.

Contents

The vision of the circular city initiative

Imagine a New York City where no waste is sent to landfill, environmental pollution is minimized, and thousands of good jobs for people of all social and economic backgrounds are created through the intelligent use of products and raw materials. In other words a city that is thriving, green and just. This is the vision of the New York Circular City Initiative, which can be achieved through creative collaboration between city agencies, businesses and the public sector.

The initiative, convened by international law firm Freshfields, seeks to identify the most effective levers to help the City of New York make the transition toward the circular economy. The members of the initiative each brings a unique combination of expertise and influence that will be critical to delivering a circular New York City.

Our research approach (see page 15) analyzed 10 levers for change that can help the city, its businesses and financial institutions make the transition toward the circular economy.

In conducting our research we have uncovered a range of potential approaches that can deliver jobs and economic opportunities, and address critical environmental challenges. These are explained in detail in the report, but the table below highlights the potential offered by each of these levers.

LEVER	JOB CREATION	ECONOMIC BENEFITS	ENVIRONMENTAL BENEFITS
CIRCULAR MARKETPLACES	●●●	●●●	●●●
CIRCULAR PROCUREMENT	●●●	●●●	●●●
EXTENDED PRODUCER RESPONSIBILITY	●	●	●●●
JOBS PLAN	●●●	●●	●
PLANNING	●●	●●●	●●
ENABLING LEVERS			
FINANCE	●●●	●●●	●●●
POLICY	●●●	●●●	●●●
INNOVATION	●●	●●●	●●
COMMUNICATION	●●	●●	●●●
EDUCATION	●●	●●	●●●

KEY: ●●● = high impact | ●● = medium impact | ● = limited impact

Recommendations

Realizing the vision of a circular New York City requires concerted effort and collaboration, and the leadership of policymakers, businesses and financial institutions. The recommendations outlined below provide some guidance on how this can be achieved. Each of these recommendations mutually supports the others in achieving a circular New York City.

HOW CIRCULARITY CAN BE ACHIEVED

FOR THE CITY

Develop and implement circular procurement guidelines

Ensure planning processes and applications integrate circular principles for industrial, commercial and residential developments

Develop a city-wide communications campaign to inform, inspire and engage residents and businesses about the benefits of the circular economy in NYC

Identify areas where extended producer responsibility can reduce waste streams while providing economic opportunities

FOR BUSINESSES

Develop and implement circular procurement guidelines

Identify and commercialize "product-as-service" opportunities

Develop and purchase from materials marketplaces

Equip current workforce with skills needed to better prepare for the circular economy

FOR FINANCIAL INSTITUTIONS

Mobilize capital toward circular economy investments

Recognize resilience to resource scarcity and climate change as factors in assessing value and risk of financing and investment

Develop financial products that are appropriate for non-traditional circular behaviors and business models

FOR ALL

Identify opportunities to collaborate through multi-stakeholder partnerships geared toward achieving the circular economy in NYC

We would also like to invite all candidates in the 2021 mayoral election to support our vision for a circular New York City.

Circularity and the city

The biggest sustainability challenges to urban areas can be split into three groups, all of which can be alleviated by circular thinking.

1 Climate change

CLIMATE CHANGE AFFECTS CITIES IN A NUMBER OF WAYS ...

- Temperature increases
- Sea level rises
- Higher precipitation
- More extreme weather events

... BUT CITIES THEMSELVES ARE MAJOR CONTRIBUTORS.

78% Urban areas consume **78%** of the world's energy

60% Cities produce **60%** of greenhouse gas emissions

(These figures are significantly higher if consumption-based emissions are taken into account)

IN NEW YORK, THE EFFECTS ARE ALREADY BEING FELT ...[1]

2.4°F Average annual temperature up **2.4°F** since 1970

Sea levels along New York's coast have risen by more than a foot since 1900

Seasons starting earlier, bird and fish populations migrating north

Rising (and more unpredictable) precipitation state-wide

... WHILE CIRCULAR THINKING COULD BRING MANY BENEFITS.

Significantly higher productivity per unit of carbon; lower emissions

2 Waste and resource use

WASTE AND RESOURCE USE IS ANOTHER MAJOR CHALLENGE ...

50% In some developing countries, managing and collecting waste can consume **50%** of municipal budgets[2]

$375 billion Annual global cost of managing solid waste is expected to reach $375bn by 2025[3]

... IN WHICH CITIES PLAY A BIG ROLE.

Quantity of materials consumed in the world's cities will **more than double by 2050**

1990: 14% of the world's population lived in cities
2050: Expected to rise to **66%**

Due to their size and concentration, cities have a significant environmental footprint[4]

2012: Cities generate **1.3bn** metric tons of solid waste
2025: Expected to hit **2.2bn** metric tons

NEW YORK FACES MANY CHALLENGES ...

$2.3 billion Spending on residential and commercial garbage disposal in New York City in 2014

76% of **3.8m** metric tons of solid waste collected each year goes to landfill

... THAT CIRCULARITY CAN HELP ADDRESS.

Circular thinking can cut waste by **60%** and reduce air, water and noise pollution, as well as land lost to waste management facilities or infrastructure

3 Rising inequality

FINALLY, INEQUALITY IS A BLIGHT ON CITIES ...

Influx of people puts pressure on resources and jobs and widens income inequality

The COVID-19 crisis has been particularly felt by New Yorkers on lower incomes with little job security and financial independence who have as a result been more exposed to the virus. This has disproportionately affected Black and Latino populations[5]

Higher income inequality is linked to higher rates of infant mortality, incarceration, mental health disorders and obesity[6]

... AND NEW YORK IS NO EXCEPTION.[7]

2006–2014: Median income for top 50% of earners grew **14.8%**

2006–2014: Median income for bottom 50% of earners fell **13%**

ONCE AGAIN, CIRCULARITY CAN BE PART OF THE SOLUTION.

Higher productivity and job creation lead to improvements in wellbeing, social inclusion, skills development, income and expenditure, with the provision of skills training and workforce development

What is the circular economy?

FROM LINEAR TO CIRCULAR

The global economic system has developed in a linear fashion. Resources are extracted to produce goods, which are then distributed to markets, consumed and thrown away at the end of their useful life. This system was appropriate in a world of less than one billion inhabitants where resources were abundant and waste was not a particular problem.

However, over the last century as the global population has grown and our consumption patterns have become more resource-intensive, this model has had some significant, if unintended, consequences.

GROWING SCARCITY OF NON-RENEWABLE RESOURCES

If current trends continue, our ability to continue meeting global demand will be affected. As this graph below shows, reserves of many critical minerals and fossil fuels are estimated to run out in the next 50 years. This will affect the production of a variety of goods across a range of sectors unless alternatives can be found.

INCREASING WASTE GENERATION

At the same time the amount of waste we produce is growing and becoming increasingly difficult to dispose of, putting pressure on local and global ecosystems. Over the next three decades, global waste production is set to rise by 70 percent, from 2.01bn tons in 2016 to 3.4bn tons of waste per year by 2050.[8]

These challenges call for a more circular way of thinking, where industrial and agricultural systems are designed to maintain value, preserve resources and restore ecosystems.

The Ellen MacArthur Foundation describes a circular economy as **AN INDUSTRIAL SYSTEM THAT IS RESTORATIVE OR REGENERATIVE BY DESIGN. THE FOUNDATION SUGGESTS THREE PRINCIPLES THROUGH WHICH CIRCULARITY CAN BE ACHIEVED**[9]

1

DESIGN OUT WASTE AND POLLUTION:

changing our mindset to view waste as a design flaw.

2

KEEP PRODUCTS AND MATERIALS IN USE:

design products and components so they can be reused, repaired and remanufactured, ensuring no materials end up in landfill.

3

REGENERATE NATURAL SYSTEMS:

aim to enhance natural resources by returning valuable nutrients to the soil and other ecosystems.

RESOURCE EXTRACTION

PRODUCTION

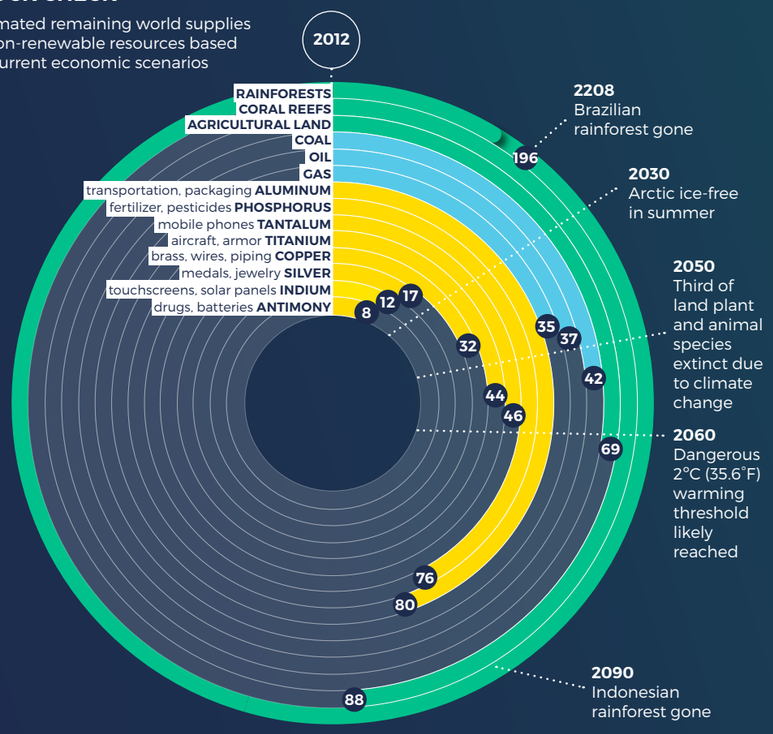
DISTRIBUTION

CONSUMPTION

WASTE

STOCK CHECK

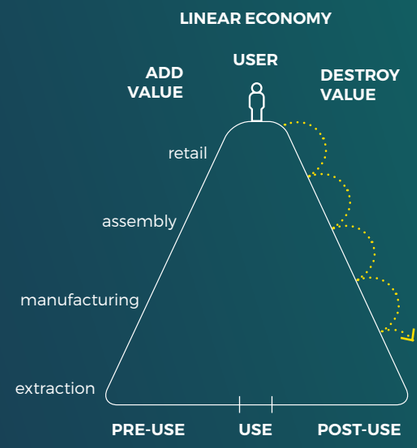
Estimated remaining world supplies of non-renewable resources based on current economic scenarios

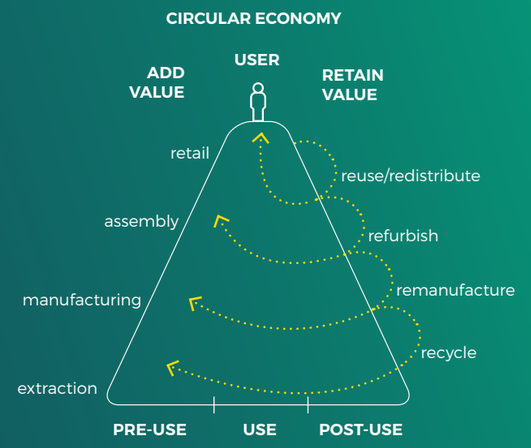


ECOSYSTEMS FOSSIL FUELS MINERALS 8 YEARS LEFT

Sources: UN TEEB, US Geological Survey, BP, Worm et al. (2006), London Metal Exchange. Figures are worldwide. Living natural resources dates are worst-case based on published estimates. Minerals and fossil fuel data based on known reserves currently economical to extract, assuming fixed percent increase in usage per year. No provision made for changes in demand caused by new technologies, discoveries of new reserves or market forces. Agricultural land means land suitable for rainfed cultivation not for other land usage. Thirty-year historic agricultural expansion rates are applied.

IN ITS VALUE HILL DIAGRAM, CIRCLE ECONOMY SHOWS HOW THE CIRCULAR ECONOMY RETAINS VALUE AT EVERY STAGE OF THE PRODUCTION PROCESS, RATHER THAN DESTROYING IT AS IN A LINEAR MODEL.[10]





IN PRACTICE WHAT DOES THIS MEAN?

While many might associate a circular economy with recycling, this is one of the least circular (and value-generative) activities. Circular thinking is about a fundamental reevaluation of the way we manufacture and use products so that their useful life is extended. Examples include the following.

Sharing and product-as-service models, such as Zipcar or Rent the Runway.

Increasing the useful life of a product through more durable design and easier repair, applying circular design guidelines.

Enabling the trade of second-life products, parts and raw materials, using approaches such as DonateNYC and Queen of Raw.

Hierarchy of circularity[11]

The table below, developed by academics from the University of Utrecht, highlights the most value-adding activities in the delivery of a circular economy.

Circular economy ▲ Increasing circularity ▼ **Linear economy**	Smarter product use and manufacture	R0 Refuse	Make product redundant by abandoning its function or by offering the same function with a radically different product
		R1 Rethink	Make product use more intensive (e.g. by sharing product)
		R2 Reduce	Increase efficiency in product manufacture or use by consuming fewer natural resources and materials
	Extend lifespan of products and their parts	R3 Reuse	Reuse by another consumer of discarded product that is still in good condition and fulfills its original function
		R4 Repair	Repair and maintenance of defective product so it can be used in its original function
		R5 Refurbish	Restore an old product and bring it up to date
		R6 Remanufacture	Use parts of discarded product in a new product with the same function
		R7 Repurpose	Use discarded product or its parts in a new product with a different function
	Useful application of materials	R8 Recycle	Process material to obtain the same (high-grade) or lower (low-grade) quality
		R9 Recover	Incineration of material with energy recovery

"An urban circular economy is one in which cities keep resources in use for as long as possible, extract the maximum value from them whilst in use, then recover and regenerate products and materials at the end their life." [12]

Why cities are critical in delivering the circular economy

New York City is the world's second largest city in terms of consumption (after Tokyo). In 2015 the city consumed products and services worth $1tn, a figure that is expected to rise to $1.4tn by 2030. More than half the world's population lives in cities, and as a result most consumption takes place there. According to a McKinsey study, large cities[13] will account for 81 percent of global consumption and 91 percent of consumption growth between 2015 and 2030.[14]

It therefore follows that any attempts to achieve a circular economy will need to be supported – if not led – by cities and the businesses driving their economies.

Supporting the recovery

Can the circular economy help the economic recovery and address inequality?

New York City has suffered disproportionately from COVID-19 with over 20,000 citizens dying from the virus.[15] This has particularly affected lower-income communities and communities of color as reported by Governor Cuomo in May 2020.[16] More than half of the deaths in NYC were from people of Latino ethnicity or Black racial background.[17] At the same time, by June 2020 the city had seen over 500,000 people become unemployed since the crisis started, which disproportionately affected Asian, Black and Latino people.[18]

With such a significant public health and economic crisis exacerbating racial and wealth disparities, we must be confident that launching a new initiative to promote New York City's transition to the circular economy will play an important role in both supporting the city's COVID-19 recovery as well as addressing these inequality challenges.

We believe the circular economy can play such a role on a number of fronts:

1 **increase economic resilience by reducing import dependency:** One of the consequences of the COVID-19 pandemic is that our confidence in global supply chains has wavered. In a world that can shut down international transport in a matter of weeks, an overreliance on globalized supply chains is a significant risk to business continuity and national resilience. As a result, nations and businesses will seek to build supply chain resilience by increasing the local purchase of raw materials, many of which can already be found in existing products that have reached the end of their useful life.

This will in turn provide greater opportunities for local business to thrive. Guided policy interventions will need to ensure these opportunities are also accessible to minority-owned businesses, many of which were particularly hard hit by the pandemic.[19] Given that the City purchases close to $20bn of goods and services annually, shifting some of this spend toward circular and locally owned business can create significant demand and have a powerful ripple effect.

2 **reduce costs by making resources go further:** Another consequence of the pandemic is the drop in revenue many organizations have experienced. As a result, businesses and public bodies need to reduce their expenditures to offset the lost revenue and remain solvent. As the Partnership for New York City's *Call for Action and Collaboration* report[20] highlighted, "*Going forward, governments will need to spend less and depend more on leveraging private financing and expertise.*" There is an urgent need to make resources – financial and physical – go further. The World Economic Forum estimates that material savings of over $1tn can be achieved from reuse, recycling and upcycling.[21] The circular economy offers several different ways to achieve this:

- Extending the life of existing products, materials and resources so less is spent on purchasing new ones.
- Getting better at securing raw materials from resources that might be considered waste.
- Developing leasing and sharing models can extend the productivity of products while reducing individual spend.

> **As we emerge from the COVID-19 health crisis, New York is committed to a green recovery that puts equity, fairness, and confronting our climate crisis at the center of our city's rebuilding efforts.**
>
> NYC COVID-19 Green Recovery[22]

As a recent OECD report described, city governments should "*encourage more efficient use of resources, and more sustainable consumption and production patterns, notably by promoting circular economy to keep the value of goods and products at their highest, prevent waste generation, reuse and transform waste into resources.*"[23]

3 **secure and create jobs:** As many previous studies have highlighted, and this report will show, the circular economy has the potential to create local jobs in a number of different sectors, including: waste diversion and recycling; small-scale remanufacturing and repair; and servitization through physical and digital services. Jobs that support the circular economy will also be created in education, logistics and public sector services. Many of these new jobs have the potential to redress existing economic inequalities as they will be accessible to lower-skilled workers with minimal additional training required.

4 **address environmental injustice:** Pollution tends to impact poorer populations disproportionately as they are more likely to live in close proximity to areas of higher air, water and soil pollution where the cost of living is lower. Research by the NAACP and the Clean Air Task Force showed that Black Americans are 75 percent more likely to live in areas situated near facilities that produce hazardous waste.[24] This population also suffered more during the COVID-19 crisis, in part because their immune systems were affected by previous and consistent exposure to pollutants.[25]

Circular economy solutions can help reduce this by contributing to a reduction in pollution. According to research by the Ellen MacArthur Foundation and Material Dynamics, "*circular strategies for cities have the potential to reduce the societal costs of harmful emissions from particulate matter (PM2.5 and PM10) by 61%,*" while "*circular mobility solutions can reduce the societal costs of harmful emissions by 20–30%.*"[26]

What can cities do?

The *C40 Mayors' Agenda for a Green and Just Recovery*[27] identifies three types of action cities can take to support a green and just recovery:

- **Jobs and an inclusive economy**: Create new, good, green jobs fast, support essential workers and massively expand training to facilitate a just transition.
- **Resilience and equity**: Provide fundamental public services for all, underpinning a fair society and strong economy, resilient to future shocks.
- **Health and wellbeing**: Give space back to people and nature, rethink and reclaim our streets, clean our air and create liveable, local communities.

The circular economy can play an important part in delivering some of these actions.

It's not all good news

However, we should also acknowledge that COVID-19 also presents some challenges to more circular approaches. The most prominent one being the resurgence of single-use items that had seen a drop in recent years, in particular in relation to single-use plastics. *The Economist* described this as a "*pandemic of plastic pollution.*"[28] This is due to the growth in demand for personal protective equipment (PPE), the increase in online shopping and the packaging that comes with it, the temporary appetite for take-out food and a drop in recycling discipline.

It goes without saying that public health needs to take precedence in these extraordinary times and single-use PPE may be the best solution, but when it comes to consumer use, the hygiene benefits of plastics over reusable products are not proven. A June 2020 statement from a group of 119 scientists and experts confirmed that reusable containers are safe to use during the COVID-19 pandemic, provided hygiene measures are followed.[29]

This recent trend is worrying but the circular economy has an important role to play. The World Economic Forum has identified this challenge[30] and suggests the circular economy can be a long-term solution, by favoring "*a sustainable model of living and working that will benefit us long into the future – one that will create a healthier, more equitable and more livable future for all.*"

The levers that can drive change

In evaluating the potential for New York to become a circular city, the members of the initiative chose to focus on the levers of change. Specifically, we wanted to identify actions that the city, its businesses and financial institutions could take that would generate positive impacts, individually and collaboratively, across a range of sectors.

Through a brainstorming exercise we identified more than 50 potential levers that were then put to a vote for further analysis.

This process resulted in the following 10 levers being selected. In researching these levers, it became apparent that each brings different benefits to the city. Some have a great potential to create jobs, others to deliver wider economic or environmental benefits. Finally, some act as "enablers" in that they don't deliver direct benefits but instead contribute to the success of others.

THE 10 LEVERS

Enabling levers

Markets	Build on, develop and promote existing materials marketplaces around the city.
Procurement	Develop procurement guidelines and set a target for circular public procurement.
Extended producer responsibility (EPR)	Ensure manufacturers take financial or physical responsibility for the treatment or disposal of post-consumer products.
Jobs	Develop a jobs plan to identify, facilitate and promote circular jobs around the city and boost net employment.
Planning	Incorporate circular economy principles into zoning and land development policy.
Finance	Develop mechanisms and policy incentives to support the financing of circular economy (CE) technologies, projects and start-ups.
Policy	Develop policy to incentivize good (e.g. reduced sales tax, circular goods marketplaces) and disincentivize bad (e.g. "pay-as-you-throw") practices.
Innovation	Promote circular innovation in product design, production processes and business models and through bespoke projects and ideation programs.
Communication	Develop campaigns to communicate the benefits of circularity to residents and businesses and highlight the good work already being done.
Education	Integrate circular thinking into the curriculum for vocational training and at universities and business schools.

OneNYC 2050 is a strategy to secure our city's future against the challenges of today and tomorrow. With bold actions to confront our climate crisis, achieve equity, and strengthen our democracy, we are building a strong and fair city.

OneNYC 2050 Plan
nyc.gov/onenyc

How the circular economy supports New York City's goals

"New York City will become a center of excellence for sustainable product design by partnering with the private sector to design and market products that are reusable, repairable or recyclable. We will create incentives and infrastructure for city businesses and consumers to use recycled materials to support the growth of closed-loop recycling. Through the power of policy, advocacy, procurement and regulation, we will take a leadership role in driving brands and product manufacturers to design for returnability, reusability, repairability, recyclability and compostability. We will also expand the use of extended producer responsibility measures to keep more products out of our landfills. We will raise consumer awareness, explore new business models and incorporate technological innovations."

OneNYC 2050 "A liveable climate"

As this report shows, the circular economy can deliver environmental and socio-economic benefits, including the creation of jobs. These are all priorities for New York City, as set out in the OneNYC 2050 Plan that offers a compelling vision for a sustainable future. More recently, the city's COVID-19 Green Recovery highlights that "*a green recovery that prioritizes clean energy, resilient infrastructure, and environmental justice will help accelerate economic recovery while enhancing social equity.*"

New York's OneNYC 2050 strategy seeks to deliver a number of socio-economic benefits and build a "*strong and fair city.*" The New York Circular City Initiative can support this strategy by contributing to a number of OneNYC goals:

- by 2025: lifting 800,000 people out of poverty;[31] and
- by 2050: eliminating, reducing or offsetting 100 percent of greenhouse gas emissions.

The OneNYC Plan also has as a goal to transition New York City toward a circular economy,[32] while the Industrial Action Plan launched by Mayor de Blasio in 2015 includes a commitment to invest in developing industrial and manufacturing businesses for the long term. Establishing eco-industrial parks in the city and promoting the remanufacturing and refurbishing sectors would be fully in line with this ambition.

A circular approach to municipal waste could generate many thousands of jobs. Increasing the city's waste diversion rate from 21 percent to 70 percent would add 3,300 jobs in processing recyclables and organic waste, while further manufacturing jobs would be created by supporting recycling-reliant industries.[33] These would range from high-end professional roles (for instance in the shift from product to service as explained on page 21), to skilled refurbishing jobs and lower-skilled positions in the recycling sector.

Cities such as Paris, London and Amsterdam already have implemented circular strategies, and New York City has many circular initiatives in place. By building on these and creating a city-wide approach based on collaboration between key stakeholders, New York City can become a global leader in the circular economy and deliver jobs, growth and environmental benefits that will be felt by all its residents.

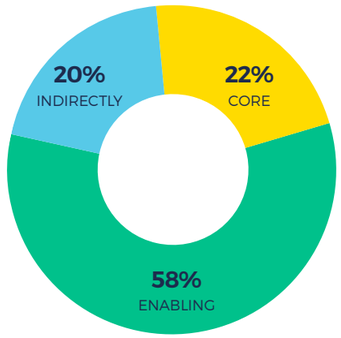
This section was co-authored by Circle Economy, New York City Economic Development Corporation and Freshfields.

Creating thousands of jobs through circularity

One of the more compelling cases for the circular economy in New York City is that it can deliver a variety of good jobs for the city's residents. Numerous studies have shown the job-creating potential of green recovery plans if policy packages are carefully designed and target low-carbon and circular sectors.[34] Our research suggests the circular economy can create over 11,000 jobs in New York City by 2030. Alongside roles created by the transition to renewable energy, a New York circular economy could significantly boost the outcomes of the New York Works plan, which aims to create 100,000 good jobs.[35]

In this section we assess the employment potential of the circular economy and the key levers that can foster a balanced labor market, increase innovation power and competitiveness and create opportunities for both the most vulnerable and high-skilled workers.

The circular economy creates a wide variety of jobs. From an architect designing buildings to enable resource recovery after use, to an appliance technician repairing products to extend their useful life, to a courier picking up used products as part of a reverse logistics scheme, all make an essential contribution to the circular economy.



Core, enabling and indirectly circular jobs in New York City

In New York City, thousands of jobs have been created by the circular economy to date. Employment in the circular economy reflects the broad nature of the system, and can be divided into three layers.

1. A first layer of core circular employment includes jobs that ensure material cycles are closed, such as renewable energy, repair and maintenance, and waste and resource management (22 percent of circular jobs).
2. A second layer of enabling employment includes jobs that enable the acceleration and upscaling of core circular activities, such as leasing, engineering, digital technology and collaboration. These activities create the lion's share of circular employment in the city (58 percent of circular jobs).
3. A third layer of indirectly circular employment includes jobs that provide services to core and enabling circular activities, such as education, logistics and public sector services (20 percent of circular jobs).

The method that was used to estimate the percentage of circular economy jobs is explained in detail in Annex I, which is available on our website.

Three scenarios for future employment

The circular economy has the potential to create jobs in both existing and emerging sectors.[36] Most growth in employment is expected in repair and maintenance activities in the short to medium-long term of the circular transition.[37]

New York City Economic Development Corporation and Circle Economy developed three scenarios for the development of the circular economy in NYC. These scenarios include a business as usual, a moderate and an ambitious context. They are based on an analysis of the potential of the circular economy for Great Britain by WRAP and Green Alliance, and have been adapted to the current situation of NYC and the city's existing ambitions.

	WASTE DIVERSION TO RECYCLING	REPAIR	SERVITIZATION	REMANUFACTURING	POTENTIAL JOBS
	Waste diversion to recycling rates of waste represent the share of materials diverted from the waste stream to recycling, averaged out for all waste streams. The current diversion rate for New York City is at 17 percent for residential waste.[38, 39]	**Repair** consists of extending the lifetime of a product by reusing it for its original function, in the same state or after being restored or updated.[41]	**Servitization** refers to business models that increase the effective use of resources, goods and products by means of financial incentives. When goods and products are rented or leased, the producer retains ownership over these assets, and is as such incentivized to keep them in circulation for as long as possible.[42]	**Remanufacturing** consists of restoring end-of-life products to their original working condition, by using parts of a discarded product in a new product. Currently, remanufactured products make up 2 percent of all sales of the manufacturing sectors.[43, 44]	
1 **BUSINESS AS USUAL**	**30%*** **DIVERSION RATE** The current ambition of the Solid Waste Management Plan, as adopted in 2006, is to achieve a 35 percent diversion rate by 2026, which was readjusted downward.[40] Reality trails back on the ambitions though, and continued efforts between 2020 and 2030 would be required to achieve a 30 percent diversion rate.	**5%** **SLIGHT GROWTH** Current trends of reuse through repair, maintenance and second-hand trade continue into 2030, showing a slight increase in the repair of electrical equipment and machinery.	**5%** **EXPERIMENTAL** Servitization is standard practice with current product groups such as automotive vehicles and heavy machinery. It remains experimental for other goods and services.	**7%** **REMANUFACTURING RATE** The business as usual scenario constitutes a continuation of the current growth rate of remanufacturing activities in the manufacturing sector.[45] A slightly increased remanufacturing rate does not significantly impact New York City, as it mainly takes place in the metropolitan area and state.	**2,874**
2 **SOME PROGRESS TOWARD CIRCULARITY**	**50-60%** **DIVERSION RATE** A moderate diversion rate entails an overall increase in recycling rates, among other things through increased composting. Absolute tons of recycled waste will be lower due to a decrease in waste production (mainly packaging and single-use consumer goods).	**15%** **MODEST GROWTH** Current trends of reuse through repair, maintenance and second-hand trade continue into 2030. More consumer goods show a modest increase in reuse rates, such as textiles and furniture. Reuse rates in the manufacturing industry continue to grow.	**15%** **COMMON** Servitization becomes more common in sectors related to the manufacturing industry and the B2B market, for heavy machinery and all equipment. It remains marginal for other goods and services.	**15%** **REMANUFACTURING RATE** This constitutes a significant increase in remanufacturing rates in sectors with more immediate opportunities for remanufacturing, such as machinery, electronic products, electrical equipment and printing. Remanufacturing does not yet transpire to all manufacturing sectors, overall remanufacturing rates remain low and the impact on New York City is limited.	**6,990**
3 **CIRCULAR TRANSFORMATION**	**85%** **DIVERSION RATE** An overall high recycling rate is necessary to achieve the city's 2030 Zero Waste goals. Structural changes are required throughout the value chain, mainly in the design process, to enable better recycling. Absolute tons of recycled waste will be lower, due to a decrease in waste production and an increase in high-value reuse such as remanufacturing and repair.	**25%** **SUBSTANTIAL GROWTH** The transformative scenario shows greater reuse rates for all goods and products. This entails a transformation of the retail landscape, which shifts toward online platforms that offer renting, leasing and sharing services over single sales.	**25%** **MAINSTREAMED** Servitization is mainstreamed across industry, including chemical leasing for industrial cleaning and maintenance. It is also mainstreamed toward end consumers for household goods and equipment. The transformative scenario requires a significant change in the financial and accounting sectors, requiring a shift in, among other things, risk calculations and balance sheets.	**30%** **REMANUFACTURING RATE** Remanufacturing is mainstreamed in the high potential sectors, and transpires to other production sectors. Remanufacturing of wood products, furniture, textiles, apparel and leather products increases. This results in an increase in the B2C market of remanufacturing and brings back such activities to the city. This transformative scenario requires structural changes at the design stage of the value chain, as well as the retail stage, toward service-based business models (see servitization to the left).	**11,634**

*The percentages represent the expected growth under each scenario that will deliver the jobs increase for that scenario.

For each scenario, the effects on the number of jobs were calculated using the dimensions of circularity relevant to NYC. Each dimension is approximated using low-, medium- and high-level multipliers representing the amount of circular activity undertaken in the local economy that parallels similar scenarios in previous work by WRAP. The method employed to estimate the job creation potential of these scenarios, including the use of the Regional Economic Model, Inc. 70-sector model for New York City, is explained in more detail in Annex II, which is available on our website.

The circular economy can create over 11,000 jobs in New York City by 2030. Almost half of these jobs would be created in and by servitization activities, followed by recycling and repair. Next to the expected job creation of the renewable energy transition, and additional job creation in the wider New York State, the circular economy could significantly boost the outcomes of the New York Works plan.[46]

At the same time, early analysis points to the potential renewal and reboot of the labor market by creating inclusive and high-quality jobs.[47, 48]

The circular economy creates jobs for a wide variety of workers; it needs practically skilled workers for recycling and repair activities as well as highly skilled labor for enabling circular activities. The expected change in the labor market entails a change in skills demand, which is shown in the table below. The overview shows that the need for technical skills is as prevalent in the circular economy as it is in the rest of the economy. The same holds for complex problem-solving skills.

KEY: Empty cell: the difference is not statistically significant; −: sector requires lower levels of skill; +: sector requires higher levels of skill (0 < coefficient > 0.4); ++: sector requires much higher level of skill (coefficient > 0.4)		Remanufacturing and repair	Recycling	Servitization	Design and engineering	Digital technology	Rest of the economy
Basic skills	Developed capacities that facilitate learning or the more rapid acquisition of knowledge	−	−	−	+	+	+
Complex problem-solving skills	Developed capacities used to solve novel, ill-defined problems in complex, real-world settings			−	++	+	+
Resource management skills	Developed capacities used to allocate resources efficiently				+	+	+
Social skills	Developed capacities used to work with people to achieve goals	−	−	−			+
System skills	Developed capacities used to understand, monitor and improve socio-technical systems		−	−	++	++	+
Technical skills	Developed capacities used to design, set up, operate and correct malfunctions involving applications of machines or technological systems	++	++		+	+	+

Skills needs for circular economy jobs.[49]

Sectors that are central to, and will undergo transformative change in, the circular economy are currently facing considerable challenges in relation to non-unionized and unregulated work, precarious working conditions and vulnerable workers.[50, 51, 52] These challenges are inherent to sectors that are part of, and closely related to, the circular economy, and will need to be monitored and addressed throughout the circular transition.

The circular economy offers an opportunity to address these challenges and improve the quality of work in NYC, as the involvement of the public sector can regulate, and the revaluation and reshoring of manufacturing activities can create and improve, jobs for mid-skilled workers. This is particularly relevant given the need for more resilient, local supply chains as a result of the disruption from COVID-19.

Procurement for inclusive recovery

Governments play a central role in supporting the transition to the circular economy, and ensuring the jobs this creates are accessible to all workers.

Evidence from past crises has shown the job-creating potential of green recovery packages, in both the short and the long term.[53, 54] When it comes to the circular economy, regulatory and economic policies are the two most powerful job-creating policy instruments for city governments.[55]

The fact that governments are highly involved in circular economy sectors such as recycling through procurement makes public procurement one of the main policy levers to advance circularity. The same holds for infrastructure and urban development projects. Social housing agencies, for example, are ideally placed to implement circular economy strategies, as a focus on long-term and inclusive value creation is a necessary condition.

This makes public procurement a particularly relevant instrument for the city to use to invest in both sustainable and inclusive recovery efforts.

Programs such as the Minority and Women-owned Business Enterprise Certification Program also demonstrate that procurement can create opportunities.

Planning in remanufacturing for good and resilient jobs

Promoting remanufacturing as a development pathway for NYC's economy can positively affect the quality and resilience of local jobs in a number of sectors. As remanufacturing takes place during or after consumers use products, these activities occur around customers and the city. Planning decisions can ensure these markets, in the shape of decentralized remanufacturing storefronts and refurbishment centers, can grow across all boroughs of the city. As such, localized remanufacturing induces a redistributive effect among local business owners.

Remanufacturing jobs are embedded in local material flows and less reliant on imports and are therefore more resilient.

Remanufacturing is also an opportunity to develop a new generation of craftspeople. Remanufacturing activities create mid-skilled jobs, as working with secondary resources and products requires an increased level of complexity and vertical integration of tasks.

The craftsmanship skills of these workers need to be complemented by digital technology activities in order to scale them up.[56] The type of craftsmanship skills needed in the repair and garments industry sit with vulnerable workers, whereas digital technology skills sit with highly educated workers. An upskilling of traditional manufacturing and craft workers and further integration with the digital technology sector will ensure the circular economy creates good jobs locally.

CASE STUDIES

ReTuna: Eskilstuna Municipality in Sweden developed the first circular shopping center comprising reuse and upcycling shops. This also provides new opportunities for local entrepreneurs, jobs in skilled trades such as textiles or electricals, and retail work. In 2018 ReTuna created more than 50 new jobs and generated more than $1m (SEK11.7m) in sales of recycled products.

Liquid Technology, based at the Brooklyn Army Terminal, is a prime example of remanufacturing, taking outdated or unusable electronics, removing all data from the devices, and then remanufacturing salvageable components of the product and carefully recycling any remaining components. Liquid Technology extends the life cycle of usable devices and effectively recycles any e-waste as needed, creating a safe and sustainable model for e-waste.

Rent the Runway is a subscription-based fashion rental service. Customers can rent designer clothing for a four- or eight-day period for as low as 10 percent of the retail price. The company also rents children's clothing and accessories (including jewelry and handbags), and sells "essentials," including lingerie, tights, shapewear and cosmetics.

Generating profit through a circular economy

"The City will continue to promote economic growth policies that tackle income inequality head-on by leveraging private-sector growth and the City's own investments in technical assistance and workforce development to improve economic opportunity for all."

OneNYC 2050

The circular economy can benefit New York City by increasing potential revenues through circular solutions, reducing costs through greater resource efficiencies and enhancing productivity by maximizing the embedded value of goods. This is particularly relevant as the city and its businesses recover from the economic fallout of the pandemic, being forced to make resources go further and "do more with less."

Many studies have shown the wider macro-economic potential of the circular economy, and the levers outlined below can help deliver this.

- London's research estimated a £7bn net benefit per annum by 2036 through the adoption of a more circular economy, focusing on the areas of the built environment, food, textiles, electricals and plastics.[57]
- The Netherlands and Amsterdam estimated a €7bn uplift for the Dutch economy, 25 percent less imports of primary raw materials, 20 percent water saving in the industry and the creation of more than 50,000 jobs.[58]
- Scotland's research suggests that adopting the circular economy could be worth up to £1.5bn to Scotland's economy and save around 11m tons of greenhouse gases per year by 2050.[59]

Extrapolating these numbers on a per capita basis for New York City means the circular economy could deliver benefits of between $11bn and $21bn, assuming a significant transition to the circular economy. A more precise figure would require bespoke research.

Procurement

In addition to driving employment benefits, circular procurement will also support business growth. In 2018 the City of New York procured goods and services worth $19.3bn.[60] Applying circular criteria to a fraction of that spend would enable circular businesses to thrive and promote circular supply chains.

Circular procurement involves purchasers of goods seeking to maximize the lifespan of products through repair and reuse, and by repurposing or recycling items once they reach their end-of-life stage. Circular public procurement is defined as "*the process by which [public authorities] purchase works, goods or services that seek to contribute to closed energy and material loops within supply chains, while minimizing, and in the best cases avoiding, negative environmental impacts and waste creation across their whole life-cycle.*"[61]

Using such a definition, circular procurement can deliver significant economic benefits by taking a "life cycle value" approach to procurement rather than a short-term, cost-driven approach. This is because in most cases the life cycle approach reduces operating costs by minimizing the use of energy and raw materials.

While there is not yet enough data to carry out a meta-analysis of the wider economic benefits of circular procurement, we can gauge its potential by using sustainable procurement as a proxy. According to the World Economic Forum, companies applying sustainable procurement practices can increase revenue by up to 20 percent, reduce supply chain costs by between 9 percent and 16 percent and increase brand value by between 15 percent and 30 percent.[62]

Finance

It goes without saying that the transition to the circular economy will require finance. However, accessing this capital is not straightforward because banks may perceive circular economy business models as unconventional, hence of uncertain credit risk, and may therefore be reluctant to engage. This demand for capital has seen the growth of alternative capital providers and innovative forms of financing, including the addition of circularity to use of proceeds criteria for green projects, under the Loan Market Association's Green Loan Principles. For a more detailed analysis of the potential of finance to drive the circular economy, please see pages 37 to 39 in the Enabling levers section.

Planning

Planning can also play an important role in delivering economic benefits. One way is through the development of eco-industrial parks: communities of businesses located on a common site that seek to achieve enhanced environmental, economic and social performance by working together to manage environmental and resource issues.

According to a study by the United Nations Industrial Development Organization (UNIDO) that looked at 18 eco-industrial parks in seven countries, a total of over $7m of savings was achieved in one year. The sites involved 180 companies that between them identified 1,685 industrial synergy opportunities, delivering almost 1,000 of these. This resulted in a 21,000-metric ton cut in waste and a 60,000-metric ton reduction in greenhouse gas emissions.[63]

CASE STUDIES

In 2016 **Paris** introduced a responsible procurement scheme with a strong emphasis on the circular economy. The responsible public procurement scheme engages the city by creating an indicator to assess the environmental footprint of its purchases and new resource-efficiency criteria for future procurement contracts. By 2017 39 percent of the contracts awarded by Paris's finance and purchasing departments included a circular economy dimension and 61 percent of the contracts included an environmental clause and/or criterion.[64]

London, **Toronto** and **the Netherlands** all also have circular procurement policies in place, while in **San Francisco** the city government has adopted circular principles in its procurement criteria for carpets installed in municipal buildings and construction projects. These purchasing requirements, set into regulation, include that all future publicly procured carpets are cradle-to-cradle silver certified, use no polyurethane and include 45 percent recycled content.[65]

The ConstructNYC program provides exclusive opportunities to work on NYCEDC projects for small-to-mid-sized minority/women-owned and otherwise disadvantaged business enterprises. This could be expanded to businesses applying circular economy principles.

CASE STUDY

Mipo and Onsan Eco-Industrial Parks are part of South Korea's Eco-Industrial Park Initiative, which seeks to transform traditional industrial complexes into sustainable eco-industrial parks (EIPs). Firms in Ulsan Mipo and Onsan have invested some $520m in energy-efficiency measures, industrial symbiosis, waste management and other eco-friendly improvements. To date, the investment has yielded savings of $554m.

Spurred by government investment of $14.8m, companies in the parks cut their CO_2 emissions in 2015–16 by 665,712 tons, reused 79,357 tons of water and saved 279,761 tons of oil equivalent in energy use. The investment also created 195 new jobs.[66]

> **... the World Economic Forum has estimated there could be materials saving of over $1tn, from material reuse, recycling and upcycling.**

Markets

Sixty-five billion tons of raw materials entered the global economic system in 2010, a figure expected to grow to 82bn tons this year.[67] This increasing pressure on natural resources is leading to resource scarcity in several areas and presents a genuine risk to future economic growth. Minimizing waste and making the best use of materials available within existing products will help alleviate these pressures. Materials marketplaces, where used raw materials are traded, are one way to secure the long-term availability of these critical reserves.

By transitioning to a circular economy, the World Economic Forum has estimated there could be materials saving of over $1tn, from material reuse, recycling and upcycling.[68] The Ellen MacArthur Foundation estimates that circularity in manufacturing could yield net materials cost savings of up to $630bn per year in the EU alone.[69]

CASE STUDIES

Loop is a partnership led by **TerraCycle**, the private US recycling business, that involves leading consumer goods brands including PepsiCo and Unilever and logistics partner UPS. It was developed to reduce reliance on single-use packaging by offering a convenient and circular solution to consumers. Through the Loop model, consumers can responsibly consume products in refillable packaging, which is collected, cleaned and reused. This generates consumer loyalty and a more regular revenue stream for the participating brands.

British entrepreneurs **Elvis & Kresse** have also created a successful luxury brand using only rescued raw materials such as used leather offcuts, coffee sacks, fire hoses and parachute silks, while preventing 300 tons of material from being sent to landfill.

For materials marketplaces to be effective in New York, several factors need to be in place. First, they require a steady supply of goods and materials, which would be facilitated by extending the markets beyond the five boroughs. Then, transparency of origin of the materials traded, possibly facilitated through blockchain. Finally, strong logistics, including reverse logistics, to facilitate access to – and distribution of – materials.

Improving New York's environment

In this section we review the ability of our levers to deliver environmental benefits for New York and help the city achieve its OneNYC ambitions related to carbon and waste reduction.

According to the Ellen MacArthur Foundation, a circular economy offers a systemic and cost-effective approach to tackling the challenge of reducing emissions. A focus on four key industrial materials (cement, steel, plastic and aluminum) and the food system could bring outputs of greenhouse gases in these areas 45 percent closer to net-zero targets.

Markets

Materials marketplaces, in addition to driving economic benefits, can also drive wider environmental benefits. Excess materials valued at more than $120bn are stored in warehouses across the globe.[70] If unused, these materials will be burned or sent to landfill rather than generating profit for sellers and reducing waste.

Marketplaces, either physical or online, are growing in popularity around the world as a perfect conduit to match oversupply of materials with demand.

Some are commercial in nature, where second-life products and raw materials are bought and sold. Others are free exchanges where individuals give goods to anyone willing to take them. DSNY's DonateNYC ("Give Goods. Find Goods. Do Good") is an example of the latter, as is the NYPL Grow Up Work Fashion Library, which enables the lending of professional clothes for interviews.

During the COVID-19 crisis the city set up the GetFoodNYC program to provide food delivery for people who cannot afford existing food delivery programs, who are at high risk to go out shopping and who do not have friends or family members who can deliver groceries.

Circular marketplaces can only function if there is a sufficient supply to match potential demand. This can be facilitated by communications campaigns to increase awareness of a marketplace and by having the right infrastructure to support the creation of a stream of second-life materials. For instance, Brooklyn's Cooper Recycling has developed a plant that can separate out construction waste, thus ensuring materials such as metals, wood, glass and concrete can reenter the resource stream.

Marketplaces, either physical or online, are growing in popularity around the world as a perfect conduit to match oversupply of materials with demand.

CASE STUDIES

Every second, the equivalent of one garbage truck of textiles is either dumped in landfill or burned.[71] **Queen of Raw** – an online marketplace where suppliers can sell their excess material – provides a place for suppliers to profit from items that would otherwise be dumped or burned, and customers to benefit from reduced-rate, high-quality goods. Stephanie Benedetto, Queen of Raw's founder and CEO, estimates that by 2025 her company can save 4bn gallons of water and 2m pounds of chemicals.[72] This business model could be replicated to change the way people procure raw materials across various sectors.

Online exchange platforms can also facilitate circular behaviors by promoting the donation, sale or exchange of goods that are no longer required by one organization but can meet the needs of another. **WarpIt** and **Globechain** are online platforms dedicated to circular procurement. With a number of well-known users, WarpIt has saved its customers more than £20m since it was founded in 2013.[73]

FABSCRAP, based in New York, offers a recycling and reuse service for the textiles industry, enabling surplus materials from fashion houses such as Rent the Runway and Eileen Fisher to live on.

The Dutch online platform **EME (Excess Materials Exchange)** matches demand for raw materials with suppliers of excess or waste materials. It has generated more than €63m of financial value in its pilot phase. Similar exchanges can be found in Michigan, Ohio, Tennessee and Texas.

CASE STUDY

While an EPR act may at first appear to be a burden on business, opportunities to extract value from end-of-life products can generate new revenue streams for manufacturers. For example, as a result of the ELV directive, **Renault** created in 2008 a specialized subsidiary to take control of automotive waste materials and parts, recycling copper, steel, aluminum and plastics from end-of-life vehicles. A plant outside Paris refurbishes tens of thousands of engines and transmissions each year, delivering energy, water and chemical savings of 80 percent and generating more than $500m in revenues for the company annually.[77]

Extended producer responsibility (EPR)

EPR policy aims to incentivize producers to internalize environmental costs throughout the product life cycle. It does so by shifting accountability for waste from governments or municipalities to producers, and encourages the latter to take environmental considerations into account during the design and manufacture phases of product development.[74] This encourages producers to (re)design products and packaging to facilitate their end-of-life management, and to avoid using materials that may pose risks to human health or the environment. Without this, some products can require significant resources before they can be recycled.[75]

One of the areas where this has been most successful is in the automotive industry. Following the introduction of the "End of Life Vehicles Directive" by the European Commission in 2000, most EU member states have achieved the target to reuse and recover 95 percent of vehicles.[76]

New York State law already has a number of successful EPR acts in place.

- The New York State Rechargeable Battery Recycling Act of 2010 in which manufacturers have the responsibility to arrange for and finance the recycling of all used rechargeable batteries collected by retailers.
- The New York State Electronic Equipment Recycling and Reuse Act 2010, which requires manufacturers to manage and fund programs for the collection and recycling of electronic waste in New York State. The act has reduced New York City's electronic waste stream by 60 percent.

> **Waste and pollution can be "designed out" of products and urban systems.**

Rethinking procurement to deliver value

Circular procurement can not only deliver jobs and business growth, but can also play a significant role in helping reduce waste and extend product value. The procurement industry is gradually moving beyond a "capital cost only" approach to one that takes full life cycle costs into account, predominantly by focusing on operational costs (such as energy and water use) during the useful life of a product. A circular approach also requires purchasers to consider the longevity of products, their repairability and their potential use for others once the purpose for which they were bought has been served.

One way to drive greater integration of circular thinking within procurement is to seek out "product-as-service" opportunities (see the Innovation section on pages 40–41). Achieving this may require a change in the way procurement budgets are allocated, from single large purchases to a subscription model or management fee.

The growth of circular procurement also requires the development of clear guidelines. While there is not yet an accepted standard, a good starting point is the EU's guidance document "Public Procurement for a Circular Economy," which identifies several circular procurement models.

The UN Environment Programme has highlighted four sectors that are likely to drive a circular and just recovery from COVID-19: **construction**, which can create jobs rapidly and reduce costs through reuse of materials; **public transport**, through creating a high-quality and affordable infrastructure and investing in cycling and walking routes; **high-impact electrical products**, by mandating energy-efficiency criteria for the procurement of items such as lighting, refrigeration, air conditioning and electric motors that together represent more than one third of global energy consumption; and **health products**, to ensure that the need for PPE integrates reuse rather the single-use solutions.

Planning

Incorporating circular economy principles into city planning can deliver economic benefits as the previous sections have shown, but they can also deliver significant environmental benefits.

The rationale for incorporating circular economy principles into zoning and land development policy is as follows.

- Waste and pollution can be "designed out" of products and urban systems.
- Materials can be kept in use, thereby maintaining their value.
- Economic zones can be developed for circular economy businesses.
- Asset utilization is improved.
- Natural systems in and around cities are regenerated.

Two areas where this is likely to deliver such benefits are industrial symbiosis and commercial developments.

Industrial symbiosis, whereby surplus resources generated by an industrial process are captured then redirected for use as a "new" input into another process by one or more other companies, can deliver several benefits.

- Businesses reduce their costs and generate new revenue streams, for example through shared services, reduced regulatory burden and increased competitiveness.
- Communities enjoy a cleaner, healthier environment; businesses generate growth and new jobs, and become more attractive to talent.
- Governments receive increased tax revenues, and cut the cost of dealing with environmental damage and health impacts, as well as reducing demand on municipal infrastructure.

While industrial symbiosis is often associated with individual sites, its principles can also be applied at a city-wide level, as the vision of a circular construction chain in Amsterdam shows.[78]

Applying circular principles to commercial sites can also deliver wider gains. Creating new developments that combine homes, business premises, mobility links and a decentralized energy supply can result in significant increases in resource productivity.

Finally, circular thinking can be incorporated into the planning phase for construction projects. New York City is currently redeveloping the Brooklyn Navy Yard, a $1bn project that will create over 11,000 new jobs.[79] Applying circular principles to the development could result in greater resource sharing and the creation of local value chains.

The levers that enable circularity to thrive

In this section, we focus on the role of enabling levers: those levers that support the achievement of the core levers and play a critical role in facilitating the transition to a circular New York City. Our research has identified five key enabling levers: Policy, Finance, Innovation, Communication and Education.

Enabling levers
The levers that enable circularity to thrive

Policy

Policy levers

Policymakers have a central role to play in achieving the transition to a circular economy. According to research by the Ellen MacArthur Foundation (*City Governments and Their Role in Enabling a Circular Economy Transition*[80]) and Circle Economy (*The Role of Municipal Policy in the Circular Economy: Investment, Jobs and Social Capital in Circular Cities*[81]), municipalities can create the right conditions for the circular economy to thrive using a range of approaches.

Vision

Circular economy city roadmaps and strategies can set a direction for a city and inform the development of other policy levers, such as urban planning standards or material and waste classifications and regulations. Major cities such as Amsterdam, London, Paris, Auckland and Charlotte have such frameworks in place, which combine aspiration with practical guidance.

Financial incentives

City governments can use financial support to help foster innovation and establish markets, while fiscal measures such as taxes, penalties and charges can help incentivize circular, or discourage linear, production practices. Through loans, subsidies and grants for circular economy activities, cities can help overcome the financial barriers related to establishing a business, servicing immature markets or taking office space in a city. Such measures encourage long-term thinking and collaboration. For instance, economic instruments (including public procurement) harness market dynamics to influence behavior and decisions by changing prices, imposing or exempting taxes, or mandating carbon accounting.

FINANCIAL INCENTIVES IN ACTION

To stimulate the construction and purchasing of green buildings in the city, **Cleveland** and **Cincinnati** have offered 100 percent tax abatements for 10–15 years for new construction and existing building retrofits that are Leadership in Energy and Environmental Design (LEED) certified.

San Francisco is one of many cities to **charge waste fees by volume**, and has managed to divert 80 percent of its waste from landfill.

A number of European countries **have reduced sales tax** (VAT) for the repair of clothes, bicycles, leather goods, shoes and linen in order to stimulate the repair economy.

In New York State, donating used goods such as textiles, toys or furniture to a charitable non-profit organization can be rewarded with tax deductions at the end of the year. On donation the recipient organization issues a **tax deduction receipt**.

REGULATION IN ACTION

New York City's Styrofoam ban has helped reduce urban litter and alleviate pressure on waste management services. The city has also **established a rule** to expand the organic waste treatment requirements for large commercial food retailers and food service establishments, with the aim of increasing the amount of organic waste diverted from landfill that can be put into beneficial use.

Meanwhile, in Scotland a ban on the landfilling of biodegradable municipal waste will be put into effect from January 2021, with the aim of stimulating the recovery and recycling of food waste in cities, among other things.

Regulation

Developing regulatory, economic and soft instruments is a core domain of government and can play a vital role in shaping markets, influencing behavior and removing barriers to progress. Regulation can both be prohibitive (such as bans) and prescribe specific behavior, but also give a clear strategic direction for the incentivization, coordination and implementation of policies. Other examples of regulatory instruments include performance standards, monitoring, strategy, and targets or labeling.

Engagement

City governments have a unique ability to engage with multiple stakeholders from across sectors via information campaigns, education programs, matchmaking platforms and institutional design, among other things. In doing so they can enable networks and information sharing that can catalyze action. This is key to the emergence in cities of circular economy opportunities, which require understanding, collaboration and action within and between industries.

Urban management

Municipal governments have a strong influence over the physical development of cities, the management of their assets and the procurement of public goods and services. This lever relates strongly to the choice, design, use and flow of materials, making it key to the transition to a circular economy.

URBAN MANAGEMENT IN ACTION

In California, the City of Palm Desert has issued an ordinance stating a building permit can only be given if a **Waste Management Plan** has been submitted demonstrating "*maximum reuse and recycling of debris and other waste generated during demolition, new construction, roofing, landscape and other construction projects.*"

New York City's **Commercial Zones Bill** was passed in October 2019 to facilitate much more effective waste management practices in the commercial waste sector.

In Amsterdam, the city is facilitating the development of Buiksloterham into a **circular district**. Underutilized city-owned land is being leased for construction projects linked to the circular economy and that satisfy certain sustainability criteria.

Finance

Support from the financial services industry for the circular economy creates two mutually reinforcing benefits.[82]

1. Financial institutions can capture part of the upside potential generated by a circular economy, a growing market that is estimated to generate 1 percent to 4 percent economic growth over a 10-year period, while also hedging the risks from their portfolio of linear businesses.
2. Better access to funding accelerates the growth of the circular economy and improves the economic performance of circular businesses. This, in turn, alleviates investment and credit risks and provides more sustainable returns.[83]

As a result, financing the circular economy is becoming a strategic interest for many financial institutions. HSBC released *Waste Less, Grow More*, an in-depth research report, in September 2019 highlighting why the circular economy matters and how this can help drive significant economic activity. It states that "*the transition to the circular economy could unlock $4.5tn of global GDP by 2030 as a result of resources being better utilized and more jobs being created in higher-skilled industries away from resource extraction and waste disposal.*"[84]

As a report by the FinanCE working group of financial institutions highlights, the benefits for the sector are clear. Understanding the circular economy enables financial institutions to:

- understand the economic impact of a circular economy;
- accelerate value creation through innovation;
- anticipate linear risks in the economy;
- contribute to economic growth opportunities and other positive macroeconomic impacts;
- mitigate economic instability; and
- be responsible entrepreneurs and contribute to sustainability goals.[85]

According to a recent report from the Club of Rome, it is estimated that an additional 3 percent of GDP per annum needs to be invested from now until 2030 to deliver a circular economy. According to the report, this would primarily be required in the following sectors.

- Installation services and construction/renovation to promote energy efficiency and the use of renewable energy sources.
- Sustainable energy and transport infrastructure, for example mass transit systems and electric vehicles and charging stations.
- Maintenance and repair, recycling and development to promote the efficient use of materials.
- Agriculture, forestry, timber, pulp and paper to promote biofuels and to develop new bio-based products.[86]

Circular finance

Delivering this level of investment in circular initiatives will not be straightforward for many financial institutions. This is largely because circular business models are different to traditional ones as they don't seek to maximize the sale of goods but instead seek to deliver alternative revenue models focusing on sharing, leasing and extending the life of products. In a recent report on the topic, ING draws the following conclusions.

- The circular economy will lead to a rethink of business models, which will require multiple forms of capital from different providers, including non-traditional ones such as crowdfunding.
- Cash flow optimization increases the financeability of circular business models by delivering varied revenue streams.
- The underlying legal contracts become pivotal in financing circular business cases to compensate for the fact that the user often doesn't own the product.
- Creditworthiness deserves more attention as "pay-per-use" models run the risk of attracting less creditworthy users.
- Value creation in second-hand markets can increase financeability.
- Design for disassembly can increase the residual value of products.
- Supply chain finance unlocks untapped financial resources. One such example is the partnership between Walmart and HSBC to peg a supplier's financing rate to its sustainability standards.[87]
- Financial implications can be manifold, ranging from increased working capital demand to balance sheet extension. There is no one-size-fits-all solution and circular business models require an integral financial approach as a result.[88]

CIRCULAR ECONOMY FINANCE GUIDELINES

To address some of these challenges and promote the financing of circular solutions, Dutch banks ABN AMRO, ING and Rabobank published the Circular Economy Finance Guidelines (CEFGs) in 2018. They are designed to create and stimulate a common understanding of circular economy finance in the European market, and in turn accelerate financing and investing in circular business models. The CEFGs, which apply to all equity and debt products, have four core components.

1 A framework for assessing the circularity of investment opportunities. Only those that have a circular business model and generate long-term positive impacts should be considered circular propositions.

2 A process for project evaluation and selection, to support financiers in communicating how financial products are eligible under the use of investment criteria.

3 Management of investments to ensure that the investments from circular economy financing are tracked to verify that they continue to contribute to the shift toward a circular economy during the lending/investment period.

4 Reporting – financiers that want to prepare their finance administration for traceability and auditability should make, and keep, readily available up-to-date information on their debt and equity activities to support the transition toward a circular economy.

One example of the application of these is the **Green Innovation Bond**, which Philips issued in 2019.

Circular investments

Focusing investments toward circular initiatives will not only deliver circular benefits and returns to investors but will also drive economic activity. For example, Closed Loop Partners – a dedicated investor in the circular economy, which has $86m of assets under management, has deployed $50m to date and its co-investors, which include Goldman Sachs, have invested more than $200m – estimates that every dollar invested will have a 1:1 economic benefit to the communities in which the business operates by 2030. To date its activities have delivered $9m in economic benefit and wages to communities, as well as 400 jobs.

In October 2019 BlackRock, the world's largest asset manager, set up the BlackRock Global Funds Circular Economy fund to invest in companies dedicated to the circular economy and capitalize on the opportunities created for companies that are seeking to develop circular solutions.[89]

CASE STUDY

Closed Loop Partners – investment in the Emerald Coast Utilities Authority

When the Infinitus materials recycling facility (MRF) in Montgomery, Alabama, closed suddenly, the Emerald Coast Utilities Authority (ECUA) and its neighbors were left without a replacement facility within a five-hour drive. Rather than wait for another privately owned MRF to enter the market, ECUA decided to build its own single-stream facility. A loan from Closed Loop Partners provided about **30 percent** of the required capital, and the site opened in September 2016.

Since then, the ECUA MRF has become a regional asset for an area that had not previously had a long-term or reliable solution for processing recyclables. Escambia County has continued to expand its own collections and has entered into collection contracts with 11 municipalities in Florida and Alabama as well as three private hauliers. The facility is processing close to 39,000 tons of materials a year and, in doing so, **generating three primary economic benefits:**

1 savings to ECUA in the form of avoided tipping fees;

2 tipping fees collected from other municipalities and hauliers; and

3 revenues from commodity sales.

As of September 2018 ECUA has **avoided $2.3m in tipping fees and generated $1.9m in revenue**, for an average total economic benefit of $96 per ton. An additional **30 jobs were** created as part of this process.[90]

Innovation

A culture of innovation is critical to develop the technologies and processes required to reshape business models, design and production methods, and mechanisms for the reuse and recycling of materials. It is also vital to generate the new policies, regulations and financing structures necessary to foster a circular economy.

While these individual pockets of innovation will matter, given the large interdependencies required to deliver the circular economy a broad systems approach is required as well as a willingness to review the entire production paradigm, including at city level.

New York plays host to a broad range of talents and technology-savvy markets. High volumes of materials pass through the city round the clock. This combination of factors makes it a potential incubator of innovative circular solutions at scale. Cities can facilitate innovation because of the proximity of stakeholder groups, making it easier to share success stories across sectors and to incubate ideas. Events can be a good forum for sharing, but so can innovation hubs and public–private partnerships.

INNOVATION IN ACTION

Designed through a collaborative process that began in late 2016, the **NYC Zero Waste Design Guidelines**[91] are both a tool and an inspiration for those who plan, construct and manage buildings, streets and neighborhoods. They educate stakeholders about the role of design in managing waste materials and recognizing waste as a design flaw.

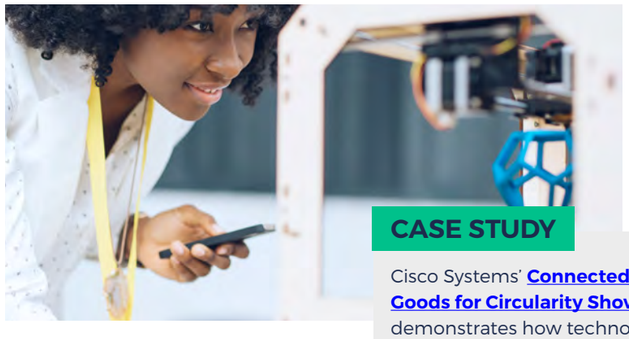
In 2018 NYCEDC and New Lab launched the **Circular City**, a program that tests solutions designed to address the increasingly complex and urgent challenges facing cities. This year, the program will feature technology pilots that support NYC's transition to the circular economy.

Most innovations will require financing to become viable and achieve scale. This is typically beyond the remit of traditional banks because of the non-traditional revenue models used. This therefore requires innovative forms of finance.

Achieving meaningful scale is a typical barrier for start-ups with a proven concept, which is where accelerators can provide invaluable access to advice, finance and markets.

ACCELERATORS IN ACTION

Closed Loop Partners' Center for the Circular Economy's **Circular Business Accelerator** brings together industry experts, academic researchers and entrepreneurs to develop and scale circular solutions. **London** has also created a Circular Economy Accelerator to support circular start-ups in growing and commercializing their innovations, while the European Commission is developing "Innovation Deals" to support circular innovation and address regulatory obstacles to that innovation.[92, 93]



Technology innovation will also play a significant role in enabling the circular economy. Access to data will help consumers and businesses understand where products are being sourced and how they are being used, while blockchain technology can enhance supply chain transparency and reduce the volume of waste sent to landfill.

CASE STUDY

Cisco Systems' **Connected Goods for Circularity Showcase** demonstrates how technology can be used to create data assets, scale circular value chains and engage customers. It features three main elements.

1 Technology – making goods uniquely identifiable (and thus traceable) through their life cycles so they can be returned for refill or brought back for their next life.

2 Business – fostering an ecosystem of partners that touches every step in a product's life cycle.

3 Human – providing a kinesthetic experience for the people who interact with the products, keeping them engaged throughout that product's life cycle.

Innovation in business models

Business model innovation is arguably one of the most important developments required to achieve the transition to the circular economy. Accenture has identified five specific business models that will help deliver this change.[94]

Circular supplies – provide renewable energy, bio-based or fully recyclable input material to replace single-life cycle inputs.

Resource recovery – recover useful resources/energy out of disposed products or by-products.

Product life extension – extend the working life cycle of products and components by repairing, upgrading and reselling.

Sharing platforms – enable increased utilization rate of products by making possible shared use/access/ownership.

"Product-as-service" – offer product access and retain ownership to internalize benefits of circular resource productivity.

One of the most exciting potential developments is the transition from a product-based model (selling goods as the single interaction between producer and consumer) to one based on services (leasing a service as a continuous relationship). This can deliver a significant improvement in resource efficiency; doubling the average use of a product by providing it as a service can reduce resource pressures and carbon footprint by half, if not more.[95]

There is a strong business case supporting this transition. In the face of commoditization and increasing competitive pressure, services can generate revenue growth for business by:

- offering a stable and recurring revenue stream stemming from activities such as support, maintenance and repair, which can extend well beyond the useful life of a product and generate high profit margins;
- facilitating deeper relationships with customers due to longer contractual agreements;
- providing manufacturers with a better idea about their customers' needs and the conditions under which their products operate, potentially leading to circumstances where they can customize their offerings; and
- offering manufacturers more accurate feedback about the performance of their products in the field, which can lead to product improvements and redesigns.[96]

PRODUCT-AS-SERVICE IN ACTION

IKEA, the world's largest furniture retailer, is testing **furniture rental models** and has had early success with students and short-term expatriate workers, according to chief executive Jesper Brodin. **Volvo Cars** has started a subscription service that covers everything related to a vehicle except fuel, and where customers can choose to change cars after 12 months. Elsewhere, **Lego** is exploring the introduction of a rental service for its building bricks.[97]

Communication and Education

Communication

Successful communications campaigns and knowledge-sharing initiatives can act as a catalyst for circularity in New York City, particularly if they are targeted toward behavioral change. The narrative most likely to achieve the required mindset shift is one that identifies the circular economy as a positive step forward for the city – one that creates jobs and generates growth while minimizing the risks inherent in linear production models.

Communications campaigns for the circular economy should be targeted at a range of audiences and focus on several key messages:

- the impacts of the linear economy on the environment, people and the economy, and the benefits of a transition to circularity;
- how decision makers can use their influence for maximum leverage; and
- what residents can do to minimize their impact.

Communicating the benefits and improving understanding of a circular economy in New York can be done through resident awareness campaigns that showcase current best practice, initiatives and market opportunities. However, there are several other options.

Circular economy vision

It is important to create a shared narrative and vision of the circular economy that will guide activity in the city. As examples, the London Circular Route Map and the Amsterdam Circular Vision microsite showcase the vision and ambition of both cities and signpost residents to local best practice examples.

Data and information

Providing (online) access to information will enable residents and organizations to get a clear picture of barriers, future potential and progress against targets, while also offering practical solutions.

Bespoke events

These can help spread information on existing circular activities, opportunities and challenges and create a network effect. One example is the New York Circular City Week, run by the Danish Cleantech Hub, which is an open collaborative festival for circular economy-related events and was held in New York for the first time in March 2019. The event brings together key thought leaders, investors and businesses to share best practice, and includes activities emphasizing how circular practices such as reuse, recycling and upcycling are transforming urban industries and the city as a whole.

Showcasing

The development of new projects to showcase the circular economy's potential and provide practical circular economy training, such as Envision Charlotte's "Innovation Barn." Envision Charlotte is a public–private collaboration leading Charlotte's progress as a smart city, and it uses the barn to showcase how it is driving the shift toward a circular economy. The center is focused on upcycling and has a collaboration space for entrepreneurs as well as a zero-waste restaurant (which uses food that is near its sell-by date), a composting station and a 500-capacity events space. With support from the Ellen MacArthur Foundation, the barn acts as an education space for the community.[98] It is estimated that its activities will help generate $2.3bn in profits for the city by 2040, as well as hundreds of jobs.[99] The city council is thought to have supported the project with $2m.[100]

CASE STUDIES

New York City has created the **DonateNYC** website to connect businesses, schools, university campuses and non-profit organizations looking to donate and receive donated goods. However, **DonateNYC** is currently not that well known among New Yorkers and needs a strong communications push to help it achieve greater impact.

NYC's **#WearNext Campaign**, a partnership involving the city's Economic Development Corporation, Department of Sanitation, the Ellen MacArthur Foundation, H&M and others in the fashion industry, created an online **interactive map** that marks more than 1,100 public and private collection points across the city where people can return clothes they no longer wear. As a result of the campaign (which ran from March to June 2019), clothing collection volumes increased by an average of 15 percent across seven drop-off locations in 2019. Of the sites that shared data, an increase of 583 tons of collected clothing was recorded across the city compared to the same time period in 2018.

Love Food Hate Waste led by WRAP, the UK's Waste and Resources Action Programme, raises awareness of the need to reduce food waste. The campaign provides recipes that use leftovers and food that usually goes to waste. Reducing food waste can save each household over $80 per month.

Education

> **"The circular economy is about preparing students for jobs that don't exist yet."**[101]
>
> *The Guardian*

This quote from an article in the UK's *Guardian* newspaper sums up both the challenge and the opportunity in delivering the circular economy. The challenge is to identify and develop the capabilities that can generate more circular practices, including new business models and innovative infrastructure alongside the skills to repair, refurbish and remanufacture goods.

This will create significant opportunities for employment in these areas and in the new businesses that will emerge to meet the demand for more circular practices.

With its focus on practical applications, education activities should be targeted toward higher education, including universities and business schools. The good news is that capacity already exists, with 138 higher education institutions around the world offering circular learning opportunities (including Columbia University, which runs a "Circular Economy for Sustainability Professionals Course" as part of its MS in Sustainability Management).[102]

Vocational training is also required to help develop new approaches to design, inspection, cleaning, remanufacturing and repair. Reskilling may also be important to allow people to move from one (linear) industry to another (circular) industry as opportunities develop.

EDUCATION IN ACTION

In its Circular Economy Strategy for Scotland, the Scottish Government has highlighted its **approach to skills development**, which includes modern apprenticeships and support for innovation centers.

New York City already has strong examples of vocational training programs that focus on green jobs, which could be adapted to embrace circular skills. They include:

- **Solar One**, a not-for-profit organization whose mission is to design and deliver innovative education, training and technical assistance that fosters sustainability and resilience in diverse urban environments.
- **The Hope Program**, which empowers New Yorkers to build sustainable futures through comprehensive training, jobs, advancement and lifelong career support.

1 https://www.dec.ny.gov/energy/94702.html
2 Wilkinson, R., and Pickett, K., *The Spirit Level: Why more equal societies almost always do better* (2009)
3 https://www.politico.com/magazine/story/2017/06/30/biggest-challenge-american-cities-policy-experts-215308
4 World Economic Forum, white paper, *Circular Economy in Cities* (2018)
5 https://anhd.org/blog/frontline-communities-hit-hardest-covid-19
6 Wilkinson, R., and Pickett, K., *The Spirit Level: Why more equal societies almost always do better* (2009)
7 https://ibo.nyc.ny.us/cgi-park2/2017/04/how-has-the-distribution-of-income-in-new-york-city-changed-since-2006/
8 World Bank Group, *What a Waste 2.0: A global snapshot of solid waste management to 2050* (2018)
9 https://www.ellenmacarthurfoundation.org/circular-economy/what-is-the-circular-economy
10 Achterberg, E., et al., *Master Circular Business with the Value Hill* (2016). Available online via: https://publish.circle-economy.com/financing-circular-business
11 Kirchherr, J., et al., "Conceptualizing the Circular Economy: An analysis of 114 definitions," *Resources, Conservation and Recycling* Vol. 127 (2017)
12 C40, *Municipality-led Circular Economy Case Studies* (2018)
13 Large cities include metropolitan areas with 150,000 or more inhabitants in developed regions, and 200,000 or more inhabitants in developing regions
14 McKinsey Global Institute, *Urban World: The global consumers to watch* (2016)
15 https://www1.nyc.gov/site/doh/covid/covid-19-data.page
16 https://www.youtube.com/watch?v=vLK0JWh1jOU
17 https://www1.nyc.gov/site/doh/covid/covid-19-data-deaths.page
18 https://comptroller.nyc.gov/reports/the-new-york-city-employment-situation-in-may-continued-deterioration/
19 https://www.mckinsey.com/industries/public-and-social-sector/our-insights/covid-19-investing-in-black-lives-and-livelihoods
20 https://pfnyc.org/research/a-call-for-action-and-collaboration/
21 https://reports.weforum.org/toward-the-circular-economy-accelerating-the-scale-up-across-global-supply-chains/?doing_wp_cron=1595435261.0040829181671142578125
22 https://www1.nyc.gov/site/cpp/our-programs/covid19-green-recovery.page
23 https://read.oecd-ilibrary.org/view/?ref=126_126769-yen45847kf&title=Coronavirus-COVID-19-Cities-Policy-Responses
24 NAACP and Clean Air Task Force, Fumes Across the Fence-Line: The Health Impacts of Air Pollution from Oil & Gas Facilities on African American Communities (2017)
25 https://www.nytimes.com/2020/04/07/us/coronavirus-race.html
26 Ellen MacArthur Foundation and Material Economics, Completing the Picture: How the Circular Economy Tackles Climate Change (2019)
27 https://www.c40knowledgehub.org/s/article/C40-Mayors-Agenda-for-a-Green-and-Just-Recovery?language=en_US
28 https://www.economist.com/international/2020/06/22/covid-19-has-led-to-a-pandemic-of-plastic-pollution
29 https://storage.googleapis.com/planet4-international-stateless/2020/06/26618dd6-health-expert-statement-reusables-safety.pdf
30 https://www.weforum.org/agenda/2020/05/plastic-pollution-waste-pandemic-covid19-coronavirus-recycling-sustainability/
31 OneNYC 2019 Indicators
32 nyc.gov/onenyc
33 Transform Don't Trash NYC, *Clean City, Green Jobs: How smart recycling policies can build NYC's economy* (2016)
34 Among others: International Energy Agency, *Sustainable Recovery: World Energy Outlook Special Report* (2020); and Hepburn, C., et al., "Will COVID-19 fiscal recovery packages accelerate or retard progress on climate change?" Oxford Smith School of Enterprise and the Environment (2020)
35 City of New York, Mayor Bill de Blasio, *New York Works: Creating good jobs* (n.d.)
36 Studies point to the anticipated net positive employment growth of the circular economy. See, for example: European Commission, *Impacts of Circular Economy Policies on the Labour Market* (2018); and Wrap and Green Alliance, *Employment and the Circular Economy: Job creation in a more resource efficient Britain* (2015)
37 Bachus, K., et al., *Quickscan jobpotentieel van de circulaire economie* [Quickscan employment potential of the circular economy] (2015)
38 NYC Open Data, Recycling diversion and capture rates (2019). Available online via: https://data.cityofnewyork.us/Environment/Recycling-Diversion-and-Capture-Rates/gaq9-z3hz/data
39 The diversion rate of waste involves NAICS sectors 221310; 221320; 562219; 562991; 562998; 562111; 562119; 562112; 562212; 562213; 562219; 562211; 488390; 562920; 562910; 238910; 423930; 424990
40 New York City Independent Budget Office, *Ten Years After: Assessing progress on the city's Solid Waste Management Plan* (2017). Available online via: https://ibo.nyc.ny.us/iboreports/ten-years-after-assessing-progress-on-the-citys-solid-waste-management-plan-2017.html
41 Repair involves NAICS sectors 811310; 811490; 811212; 811219; 811310; 811411; 811490; 443142; 811211; 811212; 811213;811219; 811310; 811310; 336611; 441222; 488390; 811490; 488190; 488210; 811310; 811490; 711510; 811310; 811490; 423110; 423910; 425110; 425120; 441110; 441120; 441228; 423110; 425110; 425120; 441110; 441120; 441210; 441228; 811111; 811112; 811113; 811118; 811121; 811122; 811191; 811192; 811198; 811310; 423110; 423120; 423130; 423140; 423730; 425110; 425120; 453310; 453998; 811212; 811211; 811213; 443142; 811211; 811213; 443141; 444210; 811411; 811412; 811490; 448320; 811430; 442291; 811420; 448310; 451110; 451140; 811490; 812990
42 Servitization involves NAICS sectors 236210; 238110; 238120; 238130; 238140; 238190; 238220; 238310; 238390; 238910; 238990; 561790; 532284; 532282; 532210; 532281; 532283; 532289; 532310; 532412; 238910; 532412; 532420; 532411; 532411; 532120; 532284; 532310; 532411; 532490; 561740; 812310; 812320; 812331; 812332
43 United States International Trade Commission, *Remanufactured Goods: An overview of the U.S. and global industries, markets, and trade* (2012). Available online via: https://www.usitc.gov/publications/332/pub4356.pdf
44 Remanufacturing involves NAICS sectors 31–33; 561990; 113310; 811121
45 Wilkins, J., "The economic and environmental benefits of remanufacturing," *Industry Today* (February 2019). Available online via: https://industrytoday.com/article/the-rise-of-remanufacturing/
46 City of New York, Mayor Bill de Blasio, *New York Works: Creating good jobs* (n.d.)
47 HIVA, *Sectorstudie circulaire economie, Impact van de circulaire economie in Vlaanderen op de sociale economie en de tewerkstelling van kansengroepen* [Sector study circular economy, Impact of the circular economy in Flanders on the social economy and employment of vulnerable workers] (2018)
48 Green Alliance, *Job Quality in the Circular Economy* (2016)
49 Burger, M., et al., "The heterogenous skill-base of circular economy employment," *Research Policy* Vol. 48(1) (2018)
50 Brennan Center for Justice, "Unregulated work in the construction industry in New York City," chapter from *Unregulated Work in the Global City* (2007)
51 Economic Policy Institute, *Diversity in the New York City Union and Nonunion Construction Sectors* (2017)
52 Gany, F., et al., *Urban Occupational Health in the Mexican and Latino/Latina Immigrant Population: A literature review* (2014)
53 Pollin, R., et al., *Green Recovery: A program to create good jobs & start building a low-carbon economy,* Political Economy Research Institute, working paper (2008). Available online via https://www.peri.umass.edu/publication/item/292-*green-recovery-a-program-to-create-good-jobs-start-building-a-low-carbon-economy*
54 Popp, D., et al., *Green Stimulus, Jobs and the post-Pandemic Green Recovery* (July 2020). Available online via https://voxeu.org/article/green-stimulus-jobs-and-post-pandemic-green-recovery
55 Stavropoulos, S., et al., "Urban circular policies and employment through greenfield FDI," *Sustainability* Vol. 12(4) (2020). https://doi.org/10.3390/su12041458
56 Moreno, M., and Charnley, F., *Can Re-distributed Manufacturing and Digital Intelligence Enable a Regenerative Economy? An integrative literature review* (2016)
57 LWARB, *London's Circular Economy Route Map* (2015)
58 TNO, *Opportunities for a Circular Economy in the Netherlands* (2013)
59 Ellen MacArthur Foundation, *Scotland and the Circular Economy*
60 https://cbcny.org/research/9-things-new-yorkers-should-know-about-how-new-york-city-buys-stuff
61 http://ec.europa.eu/environment/gpp/pdf/Public_procurement_circular_economy_brochure.pdf
62 World Economic Forum, *Beyond Supply Chains: Empowering responsible value chains* (2015)
63 UNIDO, *Eco-industrial Parks: Achievements and key insights from the global RECP programme 2012–2018*
64 C40, *Municipality-led Circular Economy Case Studies* (2018)
65 https://www.sfapproved.org/san-franciscos-new-carpet-regulation-pushing-boundaries-green-products
66 World Bank, UNIDO and GIZ, *An International Framework for Eco-industrial Parks* (2017)
67 http://www3.weforum.org/docs/WEF_ENV_TowardsCircularEconomy_Report_2014.pdf
68 http://www3.weforum.org/docs/WEF_ENV_TowardsCircularEconomy_Report_2014.pdf
69 Ellen MacArthur Foundation, *Towards the Circular Economy* Vols. 1 and 2 (2013)
70 https://www.queenofraw.com/
71 https://www.ellenmacarthurfoundation.org/assets/downloads/A-New-Textiles-Economy_Full-Report_Updated_1-12-17.pdf
72 https://atlasofthefuture.org/project/queen-of-raw/
73 http://getwarpit.com/pricing.aspx
74 https://ec.europa.eu/environment/archives/waste/eu_guidance/introduction.html
75 OECD, *Extended Producer Responsibility: Updated guidance for efficient waste management* (2016)
76 https://ec.europa.eu/environment/waste/elv/
77 Ethical Corporation, *Transitioning to a Circular Economy* (2019)
78 *Circular Amsterdam: A vision and action agenda for the city and metropolitan area*, page 14
79 https://brooklynnavyyard.org/about/development-at-the-yard
80 https://www.ellenmacarthurfoundation.org/assets/downloads/CE-in-Cities_Policy-Levers_Mar19.pdf
81 https://new.circle-economy.com/jobs-skills/news/municipal-policy-in-the-circular-economy
82 Oliver Wyman, *Supporting the Circular Economy Transition: The role of the financial sector in the Netherlands* (August 2017). Available online via: https://www.oliverwyman.com/content/dam/oliver-wyman/v2/publications/2017/sep/CircularEconomy_web.pdf
83 ING, *Rethinking Finance in a Circular Economy* (2015). Available online via: https://www.ingwb.com/media/1383724/rethinking-finance-in-a-circular-economy-report.pdf
84 HSBC, *Waste Less, Grow More: Why the circular economy matters* (2019). Available online via: https://www.research.hsbc.com/C/1/1/339/cL9KMvW
85 FinanCE, *Money Makes the World Go Round* (2016). Available online via: https://www.ellenmacarthurfoundation.org/assets/downloads/ce100/FinanCE.pdf
86 Wijkman, A., and Skånberg, K., *The Circular Economy and Benefits for Society,* Club of Rome
87 https://www.business.hsbc.com/sustainability/hsbc-and-walmart-partner-to-drive-sustainability-of-businesses
88 ING, *Rethinking Finance in a Circular Economy* (2015). Available online via: https://www.ingwb.com/media/1383724/rethinking-finance-in-a-circular-economy-report.pdf
89 Sanderson, H., "BlackRock launches fund to cash in on recycling push," *Financial Times* (October 8, 2019)
90 https://www.closedlooppartners.com/case-studies/closed-loop-fund-emerald-coast-utilities-authority/
91 https://www.zerowastedesign.org/wp-content/uploads/2017/10/ZeroWasteDesignGuidelines2017_Web.pdf
92 https://www.lwarb.gov.uk/what-we-do/circular-london/circular-london-accelerator/
93 European Commission, "Identifying barriers to innovation" https://ec.europa.eu/info/research-and-innovation/law-and-regulations/innovation-friendly-legislation/identifying-barriers_en#:~:text=Innovation%20Deals%20help%20innovators%20who,aims%2C%20news%20and%20contact%20details.
94 Accenture, *Circular Advantage: Innovative business models and technologies to create value in a world without limits to growth* (2014)
95 Hollinger, D., and Milne, R., "Lego looks at putting together potential rental service," *Financial Times* (October 14, 2019)
96 Bellos, I., and Ferguson, M., "Moving from a product-based economy to a service-based economy for a more sustainable future," chapter from *Sustainable Supply Chains* (2015). Available online via: https://mason.gmu.edu/~ibellos/bfchapter.pdf
97 Hollinger, D., and Milne, R., "Lego looks at putting together potential rental service," *Financial Times* (October 14, 2019)
98 https://envisioncharlotte.com/circular-charlotte/
99 https://www.forbes.com/sites/natalieparletta/2019/07/15/how-a-whole-city-plans-to-close-the-loop-on-waste/#66fe91f46e7a
100 https://cities-today.com/charlotte-circular-economy/
101 https://www.theguardian.com/sustainable-business/2015/jun/29/circular-economy-inspires-young-people-to-change-the-world
102 https://www.ellenmacarthurfoundation.org/news/new-research-presents-a-global-snapshot-of-circular-economy-learning-in-higher-education

Photography credit:
Solar reference array (page 18) available at https://www.flickr.com/photos/nait/6915219490/ https://www.flickr.com/photos/nait/
Under a Creative Commons Attribution 4.0. Full terms at https://creativecommons.org/licenses/by-nc-nd/4.0/

New York
Circular City
Initiative

CONVENED BY

Freshfields

circularnyc.org