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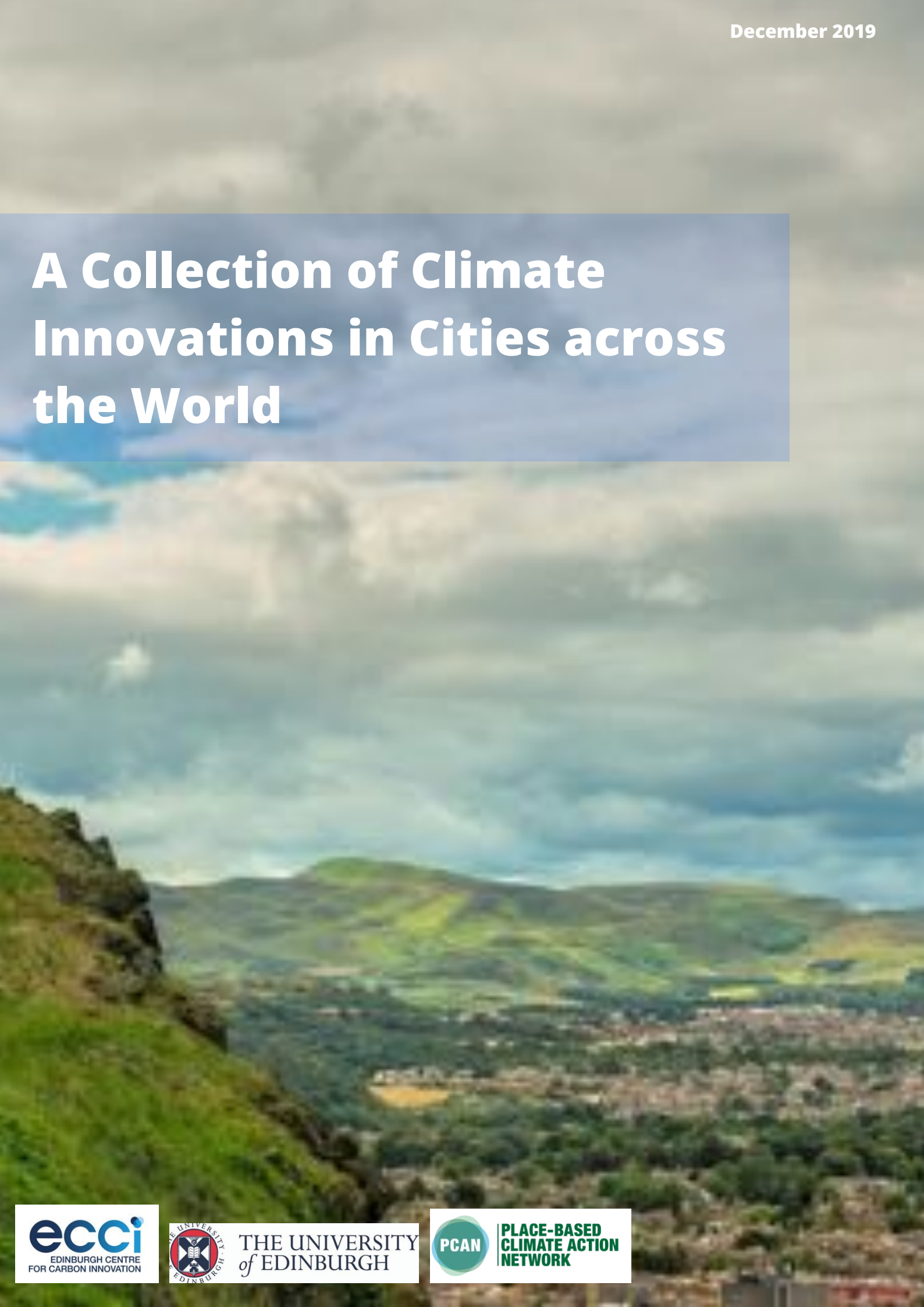
A Collection of Climate Innovations in Cities across the World



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PCAN PLACE-BASED CLIMATE ACTION NETWORK

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Introduction

By 2050 70% of the world's population will live in cities. This significant shift towards the planet's urban centres places the city at the heart of discussions around climate change. While there remains a lack of leadership on urban transitions from national governments, cities are increasingly becoming sites through which social and technological experimentation around mitigating and adapting to climate change are taking place. A recent report from the Coalition for Urban Transitions has stressed that by using technologies and policies that already exist today, cities could cut their carbon emissions by 90% by 2025. If this was to be done it would account for 60% of the global emissions cuts needed to prevent warming beyond 2 degrees Celsius. While these changes will require significant investment (the report estimates that to achieve these emission reductions would require US$1.83 trillion), the future returns of such investments would collectively generate an economic return worth US$23.9 trillion in today's terms. It is safe to say then that cities that lead the way today will be the best placed to ensure an equitable and sustainable transition into the future.

In Edinburgh the Local Authority has set a target that the city will reach net zero emissions by 2030. Achieving this ambitious goal will require significant investment and collaboration with actors from across the city. With this in mind, the following briefing will present some of the methods that groups in cities across the world have developed in order to reduce their carbon emissions.

Buildings

Making buildings more energy effect has the potential to reduce emissions by 60%. Breaking this down means that about 30% of all urban emissions could be cut by 2050 by making buildings more efficient with a further 30% cut by electrifying the big energy users that currently run primarily on fossil fuel power—like heating and cooling systems, lights, and stoves—with renewable sources like solar or wind. Additionally, just over 15% could be cut by using better or different materials to build the buildings, vehicles, roads, and railways meaning less new concrete and steel, glass, and chrome. while ensuring future construction is environmentally sustainable, it is also vital that efforts be concentrated on existing infrastructure. As Maureen Guttman, an architect and expert in green building design has said: "The greenest building is the one that already exists".

• Retrofitting

In the UK around a quarter of emissions come from our homes. Energy efficiency therefore is an issue that needs to be addressed in order to achieve net zero alongside adapting buildings and infrastructure to the risk of flooring and other extreme weather events. One of the biggest challenges within this is figuring out how to retrofit the vast majority of our housing stock to make it more energy efficient. In theory investing in energy efficiency measures makes logical sense as it would help reduce energy bills, cut carbon emissions, create warmer, healthier places to live and help households in fuel poverty. It would also create employment for local tradespeople and help communities become more resilient to climate change. In fact, Research by Cambridge Econometrics found than insulating 6m homes by 2025 would:

- Create 108,000 jobs
- Provide a threefold increase in GDP for every pound spent.
- Return £1.20 directly to the Treasury for every £1 the government invests.

With this in mind, while local authorities and housing associations own a significant proportion of housing stock within UK cities, resources to carryout retrofitting is often an issue and the majority of properties are managed owned privately. Retrofitting projects are therefore opportunities to create partnerships with other organisations and work with different sectors to achieve better energy efficiency standards. The following extracts have been taken from a report published by C40 Cities.

Supporting the Private Sector
Chicago and London

Chicago was the birthplace of the modern skyscraper in the 19th century and is now home to a host of innovative architecture and design projects. Now the city is working to make that skyline one of the most energy efficient in the world in line with the city's overall goal to reduce CO2 emissions by 25% by 2020 and 80% by 2050, compared to 1990 levels. Launched in 2012

"The Retrofit Chicago Energy Challenge ("the Challenge") encourages, supports and celebrates voluntary energy efficiency leadership among large commercial, institutional, and private buildings throughout the City of Chicago. In partnership with diverse public, nonprofit and private stakeholders, the Challenge motivates and guides voluntary action towards reducing energy consumption by 20% over five years. The Challenge provides direct support and peer networking to help participants achieve their energy goals. Additionally, it facilitates best practise sharing and showcasing of ambitious energy leadership and impact."

"The Challenge targets the owners, managers, operations teams and other stakeholders in existing, large commercial, institutional, multifamily residential and cultural facilities. There is presently no explicit size to qualify for joining the Challenge. Participants range in size from 30,000 to more than 4 million ft2. The average Gross Floor Area (GFA) is approximately 700,000 ft2. To date, 62 buildings are enrolled in the programme, spanning more than 43 million ft2 of space. Initial participants were clustered in Chicago's central business district. Yet subsequent expansion has broadened participating building types and the geographical scope of the programme. Currently, 72% of participating buildings serve primarily as commercial offices. The remaining participants are comprised of hotels, universities, multifamily residences and cultural institutions. Specifically, these include iconic skyscrapers,historical landmarks, affordable and market-rate housing, worship facilities,mission driven organisations such as the Salvation Army headquarters and beloved Chicago attractions such as Navy Pier and the John G. Shedd Aquarium."

"To join the Challenge, a senior representative of building ownership or management sends a letter to the Mayor's Office stating a commitment to the following goals:

• Reduce energy usage in one or more buildings by at least 20% within five years
• Begin energy efficiency work within six months
• Track progress using the U.S. Environmental Protection Agency (EPA) ENERGY STAR Portfolio Manager (henceforth Portfolio Manager) and share best practices with the public
• Serve as ambassadors to other buildings interested in increasing energy efficiency"

A similar approach has been taken in **London** where the Local Authority created the city's Business Energy Challenge (BEC). Like in Chicago this is a voluntary program that:

"taps into the competitive disposition of private sector enterprises to drive reductions in energy use and CO2 emissions in key London businesses. By rewarding outstanding achievements through Mayoral recognition and a diverse array of awards, London's Business Energy Challenge (BEC) aims to foster low-carbon business practices and building usage across a large range of industry types. Overall results from the programme are analysed to draw out key carbon intensity and energy consumption performance trends for each industry sector. Data will be used by the Greater London Authority to increase understanding of the energy intensity and carbon emissions of the local building stock. Feedback is also provided to businesses in the form of individual report cards on the carbon intensity performance of their buildings compared to peers".

Measuring Success and Recognising Good Practice

Mexico City

By measuring success through a certification program, or framework for action, building owners have something tangible to work towards. This has been the case in Mexico City where the city's Sustainable Buildings Certification Programme (SBCP)

"offers the owners or tenants of commercial, residential and industrial buildings an opportunity to reduce and demonstrate the environmental impact of their properties across a broad range of categories. By requiring multiple actions covering energy, water, waste, transport and social and environmental responsibility, SBCP promotes a holistic view of sustainability in the building industry. Participation from owners and tenants is incentivised through tax reductions, reduced energy and water bills, access to project financing, expedited permitting procedures, and finally, prospects of increased rental yields from green premiums."

Financial Assistance for Retrofitting

Seoul

A lack of financial resources is a key barrier to retrofitting for many building owners. In Seoul the Metropolitan Government has set up a Building Retrofit Program (BRP) and Loan Support Scheme. The aim of this is to incentivise retrofitting in government, commercial and residential buildings. The Scheme

"targets building owners and tenants, and also, energy service companies and retrofitting contractors. This initiative promotes energy efficiency refurbishments by facilitating access to highly attractive, low interest rate loans with generous repayment and grace periods. In parallel, it lowers financial barriers to key building technologies such as high performance insulated windows and doors."

- # Pioneering Neighbourhoods

Large, complex and historic cities can be a daunting arena to try and bring about carbon neutrality or net zero. In Two European cities however innovation around the project has been concentrated in one neighbourhood. The idea behind this is that solutions, discussions and challenges can be ironed out in order to help ensure a smoother transition at a city level.

Nordhaven

Copenhagen

Copenhagen aims to be the world's first carbon neutral city by 2025. With regards to energy the neighbourhood of Nordhaven is leading the way. The area has become a smart energy laboratory, testing potential solutions to energy efficiency at a local scale before implementing them across the whole city. Between April 2015 and December 2019 the project EnergyLab Nordhavn will develop and demonstrate future energy solutions. The project utilizes the neighbourhood of Nordhavn as a full-scale smart city energy lab and demonstrates how electricity and heating, energy-efficient buildings and electric transport can be integrated into an intelligent, flexible and optimized energy system.

The project participants are: DTU, City of Copenhagen, CPH City & Port Development, HOFOR, Radius, ABB, Danfoss, COWI, Nerve Smart Systems, Glen Dimplex, METRO THERM and the PowerLabDK facilities. The project is supported by EUDP (Energy Technology Development and Demonstration Programme).

Bo01
Malmö

In Malmö a similar project is in place. The city's eco-city quarter, "Bo01", is Sweden's first climate neutral district. The neighbourhood is built on a former industrial estate/port where the ground was polluted. This redevelopment combines urban planning, energy-efficient buildings, transport facilities, economic growth, access to green and blue areas, waste management, and making neighbourhoods more resilient to climate change. The Bo01 district is supplied by 100% renewable energy, rainwater is recycled to create waterfalls, ponds and various elements for buffering the water and green roofs help reduce the amount of rainwater to be drained.

Urban Ecovillages,
London

The award-winning BedZED eco village (pictured below) was completed in 2002. Initiated by Bioregional and developed by the Peabody Trust in partnership with Biorgional and ZEDfactory architects, this project is the UK's first large-scale, mixed-use sustainable community. The neighbourhood consists of comprises 100 homes, office space, a college and community facilities. BedZED is a zero-carbon eco village located in the heart of the UK's biggest city. The village is built around creating low-carbon lifestyles that do not compromise quality of life and put a focus on green space, liveability and community cohesion.

Energy

Cities produce around three quarters of global greenhouse gas emissions and of that energy use accounts for over half of city emissions. Alongside improving building efficiency, decarbonising the energy consumed within the city is one of the most fundamental challenges for urban areas. The following section will address the second element of this challenge- energy.

Embracing Solar Power

America

A 2015 report found that 65 American cities account for 7% of the country's solar capacity. While Sunbelt cities such as Los Angeles, San Diego and Phoenix are leading the way, solar initiatives stretch across the country. Solar has the potential not only to provide cleaner energy but also reduce pollution and create employment. In an effort to increase urban solar capacity in 2016 San Francisco became the first major US city to require all new buildings to install rooftop solar PV. This ordinance builds on a California requirement for new buildings to set aside 15% of the roof area to be "solar ready", meaning the space should be clear and unshaded.

Barcelona

Barcelona was the first city in Europe to introduce a Solar Ordinance in 1999. This ordinance mandated that 60% of hot water be provided through solar energy in new and renovated buildings. Since then the area of installed solar panels expanded from 1 650 m2 to 87 600 m2 within a decade (2000-2010). This effort by the City has prompted more than 70 Spanish cities to introduce similar ordinances, and in 2007, the Spanish national government adopted a new technical building code requiring mandatory solar thermal installations (ICLEI, 2014a; WWI, 2016). Since then, many other cities and countries around the world have followed this example

Tokyo

By the time of the Summer Olympics in 2020 Tokyo aims to increase the share of renewables to 20% of total power generation. Furthermore, the City also plans to install 1 gigawatts (GW) of rooftop systems by 2024, including 22 megawatts (MW) of PV on metropolis-owned buildings and facilities by 2020.

The Edinburgh solar co-operative

While the UK has much less consistent sunshine than many of the cities cited in this report there, solar panels work on daylight not necessarily sunlight and so this still the capacity for solar to provide an important part of the country's energy needs.

In Edinburgh for example there is the Edinburgh Community Solar Co-operative which has over 540 members. The aims of this group are to:

- Support and be involved in the development, installation, management, operation, generation, transmission and provision of renewable energy and low carbon sources;
- Reduce climate change emissions
- Alleviate fuel poverty
- Improve energy security
- Help foster sustainable development in and around Edinburgh

Seawater District Cooling

Stockholm

"District cooling is a method for providing chilled water for indoor cooling purposes to buildings through a closed loop pipe network. In its functionality and technology, it is similar to district heating. Chilled water is circulated via underground insulated pipes to buildings within a district and is then fed into each individual buildings' own cooling systems through a heat exchanger. Units in these buildings then use this water to lower the temperature of air passing through the building's air conditioning system." (Therma mech 2019)

One of Europe's largest District Cooling systems is in Stockholm, Sweden. This system can be generated using different fuel sources and techniques in order to generate district cooling with minimal energy consumption in comparison to cooling through building specific facilities. In Stockholm, the piping infrastructure measures 250 km for the district coolingnetwork. Stockholm's district cooling is not only an efficient way to cool buildings and industrial facilities but is also a vital part of the city's environmental ambition to be a sustainable city, and fossil fuel free by 2040.

Turning Waste into Energy

Copenhagen

In 2019 the Danish architecture firm BIG completed the "cleanest waste-to-energy power plant in the world" in Copenhagen. CopenHill is a power plant located on an industrial waterfront that is capable of converting 440,000 tons of waste into clean energy annually. Designed to double as a piece of public infrastructure, the plant is topped with an artificial ski slope, hiking trails, a rooftop bar, cross-fit area and the tallest artificial climbing wall in the world for use by members of the public.

Belo Horizonte

The city of Belo Horizonte in Brazil has launched an ambitious Greenhouse Gas Reduction Plan for 2030 The plan encompasses innovative actions, including mandates to the private sector for energy efficiency and solar water heating. Another highlight is MOVE, a new high quality BRT system already capable of transporting 700,000 passengers on a daily basis. Electricity in the city is largely generated through hydropower, solar and a large biogas plant that became operational in 2010. The plant now generates enough electricity to meet the needs of 35 000 people.

Monterrey

Extract from the International Renewable Energy Agency's 2016 publication 'Renewable Energy in Cities':

'In 2006, the city of Monterrey, Mexico, adopted the project "Monterrey Cinco" (Monterrey Five), to supply several urban services with biogas produced from the decomposition of the municipal landfills. Currently, the facilities generate 20.8 megawatt-hours (MWh) and serve the public lighting of the Metropolitan Area of Monterrey, governmental offices as well as the transport system Metrorrey (Tecnologico de Monterrey, 2013).'

Green Infrastructure

There is robust evidence to support the claim that green space has a positive impact on people's wellbeing with features such as parks, rivers and trees creating more liveable and pleasing urban environments. Research has shown that having access to green space can reduce health inequalities, improve well-being and aid in the treatment of mental illness. Importantly, green spaces also help to regulate the impacts of harmful emissions in the city. Trees absorb Carbon Dioxide and help to filter out harmful pollution while urban waterways such as lakes, rivers or even fountains moderate temperature and together with vegetation, play a vital role in cooling cities. In some areas it has been estimated that evapotranspiration (the process of converting water in leaves to water vapor which is then transpired through the trees) can reduce peak summer temperatures by 5°C. Additionally, green spaces provide areas where runoff interception can occur, thus reducing the likelihood of flooding, an issue particularly pertinent to Scotland where winter rainfall is expected to increase between 10-35% in some areas.

Green Roofs
Copenhagen

The use of green and blue infrastructure to mitigate against the risk of flooding is being put into practice in Copenhagen where stormwater volumes are set to increase by up to 40%. Given the economic risk posed by this increased risk of flooding, the City Council adopted a Cloudburst Management Plan in 2012. 300 Cloudbursts projects combine green surface and sewer-based solutions will help to retain and drain water. Additionally, these projects are expected to result in an overall benefit of $767 million. Green roofs are one way that the City is increasing its green infrastructure. Since 2010 green roofs have been mandated on the majority of new local plans. These roofs help to support biodiversity and absorb rainwater while also helping to curb city temperatures.

High-tech Street Planters
Glasgow

In June 2017 two CityTrees arrived in central Glasgow. At £20,000 each, these high-tech pieces of street furniture are 4 meters tall, nearly 3 meters wide, 2 meters deep and are covered in a mixture of moss cultures which filter harmful pollutants out of the air. The chosen mosses have a much greater leaf surface area than thus capture more pollutants. In fact, the creators of CityTree have found that these designs have the environmental benefit of up to 275 urban trees with each unit removing around 12.2kg of particulate matter and 240 metric tons of CO_2 annually. Glasgow is ranked as one of the cities with the worst air pollution in the UK, so addressing this issue has become a serious public health concern in recent years and the Council is a member of the Scottish Government's Cleaner Air for Scotland Strategy. These high-tech street planters are part of Glasgow City Council's effort to create healthier and liveable streets.

Restoring Industrial Infrastructure
Edinburgh

The Union Canal in Edinburgh runs 16km between Ratho and Fountain bridge. A navigable waterway for boating, this stretch of water is also an important wildlife habitat, a walking, jogging and cycling route, and a focus for new canal-side development and for local community use. After extensive consultation with communities and stakeholders the Union Canal Strategy was published by in 2011. The Strategy, which is a collaboration between the City of Edinburgh Council and Scottish Canals, aims to maximise the use of the 200-year-old waterway by locals and visitors to the city through a wide range of projects and events. The award-winning strategy identifies seven hubs for development in key sites along the canal and is structured around four key areas of opportunity:

- **Access to the Union Canal**

This area covers issues such as improving local use, access and visual connections to the canal as well as managing competing canal users such as commercial drafts, rowers, canoeists, cyclists, anglers and walkers. This section also covers opportunities focusing on issues of safety and maintenance.

- **Development and environment**

Under this section opportunities and projects are identified surrounding the improvement and development of facilities such as toilets, seating and lighting. It also covers opportunities for businesses, employment and housing on sites along the canal. An important part of this is to develop new waterspaces and moorings (both residential and commercial) with the aim of building a stronger community.

- **Community, recreation and tourism**

Chances to develop green space and recreational facilities are key to this section which identifies projects aimed at improving the relationship with surrounding communities and local use of the waterway. Here the canal is identified as 'a catalyst to community regeneration' and opportunities are identified to raise awareness and improve the appeal of the canal to locals and tourists.

- **Infrastructure, drainage and climate change**

This section explores the canal as a water resource and covers opportunities to improve water quality, drainage and flood risk management. It also considers how the canal can contribute to supporting climate change, carbon reduction and Environmental Sustainability. Important in this is ensuring the balance between increased use of the waterway and protecting the ecosystems and local communities.

Restoring Industrial Infrastructure
New York

The Highline in New York is a former elevated railway which has been transformed into a 1.45-mile-long "park in the sky". After it was threatened with demolition in the late 1990s a group of community activists founded 'Friends of the Highline', a non-profit conservancy, to advocate for its preservation and reuse as a public space. Over the next ten years this group worked, with the help of strong support from the then mayor and City Council a zoning area was created which facilitated the conversion and use of the Highline as a public park. Now this old railway line is a greenway home to 500+ species of plants and trees. The park is still maintained and operated by the Friends of the High Line in partnership with the NYC Department of Parks and Recreation. It has become a popular public space which hosts a diverse array of public programs, community and teen engagement, and world-class artwork and performances, free and open to all.

Re-purposing abandoned infrastructure may also have the added benefit of encouraging more active travel by providing safe routes for walking and cycling within the city. This is already the case in Edinburgh where a network of abandoned railways have been turned into cycle paths. Further investment in this infrastructure could help to widen this already well used network.

A National Park City London

Launching in July 2019 the London National Park City scheme aims to improve life in the capital by making it greener, healthier and wilder. While National Parks are typically in rural areas, in a world where the vast majority of people live in urban areas a National Park City recognises the value of urban life, habitats, landscapes, people and culture, and seeks to apply similar purposes to a whole city. A National Park City is defined as "a large urban area that is managed and semi-protected through both formal and informal means to enhance the natural capital of its living landscape. A defining feature is the widespread and significant commitment of residents, visitors and decision-makers to allow natural processes to provide a foundation for a better quality of life". With no top down authority structure, this collaborative project brings together people and organisations from across society to help improve the environmental and social quality of the city. In London this scheme includes these four major goals:

- A city which is greener in the long-term than it is today and where people and nature are better connected.
- A city which protects the core network of parks and green spaces and where buildings and public spaces aren't defined only by stone, brick, concrete, glass and steel.
- A city that is rich with wildlife where every child benefits from exploring, playing and learning outdoors.
- A city where all can enjoy high-quality green spaces, clean air, clean waterways and where more people choose to walk and cycle.

The informative website provides useful information on the concept of a National Park City It also details ways that local people can get involved such as how to become a 'citizen scientist', design projects and simple ways to make where they live wilder. It also provides information on activities such as feeding wild birds, nature walks, nature craft activities and wildlife spots.

Greening Permits
Paris

Since June 2015 the Paris Greening Permit has provided people with the opportunity to get involved in greening the city. Over 2500 people have applied for this permit which allows every Parisian to become a gardener. This project is run by the City of Paris and anyone can apply for a licence which allows them to grow on an otherwise derelict piece of local public space. Applicants generally receive their permit within one month and can request a free planting kit from the local authority consisting of topsoil and seeds. A green charter is signed by every applicant which prohibits the use of pesticides, encourages the planting of local species that encourage biodiversity and commits them to maintaining the piece of ground. The permit lasts for three years after which it can be renewed. Advisors are also on hand to help gardeners with any questions. The Greening Permit is not available for private spaces or existing parks but beyond this there are almost no limits to the scheme. Rooftops, under street trees, boxes on walls and fences are just some of the places commonly used as part of the project. This permit allows people of Paris, supported by the local authority, to combine their efforts to create special places, connect with their community and to green the whole city.

Transport

Addressing urban transport emissions is a key issue for cities if they are to effectively reduce their greenhouse gas emissions. In fact, 21% of the 90% reduction in emissions predicted by the Coalition for Urban Transitions comes from improvements to transport. Well maintained, affordable and comfortable public transport combined with safe and extensive cycle infrastructure could drastically reduce the number of cars on the roads, a transition that would benefit both environmental and human health. Coupled with this, policies that prioritise electric and low emission vehicles could help to ensure that those remaining have the least impact possible.

Low Emission Public Transport

Barcelona

In Barcelona a new fleet of electric and hybrid buses brought in by the municipal operator will reduce CO2 emissions by 27,900 tonnes in 4 years (2017-2020). The investments by the municipality is aimed at reducing the age and improving the efficiency of the service as well as minimising their environmental impact.

In addition to this Barcelona and its surrounding 39 municipalities have banned cars registered before January 1997 during weekdays, in a new agreement that aims to cut traffic emissions by 30 percent over 15 years. The new rule, which came into force on 1 January 2019, is expected to affect around 7 percent of cars in the area; that's 106,000 pre-1997 models. It is hoped that the continued investment in public transport will aid this transition and make it easier for people to leave their cars at home.

Incentivising Electric Cars

Copenhagen and Oslo

In Copenhagen's bid to become the world's first carbon neutral city by 2025 massive investments (an additional 18.3 million euros in the city's 2020 budget) have been made to introduce better climate policies. One of these policies is to provide free street parking for all electric cars in an effort to reduce emissions in the city. This will be coupled with a raise in the price of parking fees and resident licences for cars that pollute the most. From July 2020 this environmental zone in Copenhagen will be reinforced so that the most polluting vans and trucks are not allowed to drive in the city.

Similarly to Copenhagen, Oslo has also been working on policies to incentivise electric car use including; no-purchase taxes and reduced value added tax, no charges for using toll roads, access to free parking within cities, and free access to bus lanes. The city currently has the highest density of electric vehicles in the world and across the country nearly one in every four cars sold is electric, with hydropower delivering close to all electricity.

In the UK, demand for SUVs is increasing with recent analysis revealing that this growing demand was the second largest contributor to the increase in global CO2 emissions from 2010 to 2018. Harsher consequences for the most polluting vehicles, particularly in cities, could be a key way of reducing emissions going forward.

Bike Friendly Cities
Copenhagen

In Denmark as a whole 9 out of 10 people own a bike with cycling accounting for over quarter of all personal transport of journeys of less than 5km. In Copenhagen alone there are over 400km of cycle paths that stretch all across the city, all separated from car lanes and pavements, make cycling safe and efficient. The cost of cycle infrastructure is recuperated by the health benefits of cycling, in fact the 41% of Copenhagen's residents who arrive at work or school by bike contribute €235m (£185m) a year to the public coffers. Residents of the city who cycle request in total 1.1 million fewer sick days and cyclists in the city on average reduce CO2 emissions by 20,000 tons a year. The city is full of features that encourage cycling and make it an easy and safe option for all ages in the city.

Green wave traffic lights for bicycles allow cyclists to move continuously through the city, speeding up their journeys and making cycling a fast and efficient mode of transport particularly at peak times of the day. Additional features include bike bridges across the harbour, digital countdowns that allow cyclists to move before cars and footrests at junctions. If cities want to encourage cycling building well-designed infrastructure that improves the safety of cyclists is vital. Just like in Copenhagen this infrastructure should be built for the 'citizen cyclist' from all ages and wages.

Food

Food is an evocative and emotive issue. Drawing together aspects of culture, economy, society and environment what someone eats is deeply personal, yet the food we eat has profound effects on both our health and the environment around us. Consumption of carbon-intensive foods such as meat is rising across the world and we are increasingly eating produce from further and further away. Changing our diets is vital if climate change is to be tackled effectively, as a recent article published in the journal Nature stated; 'efforts to curb greenhouse-gas emissions and the impacts of global warming will fall significantly short without drastic changes in global land use, agriculture and human diets'. In fact, it is estimated that agriculture (including forestry and land use) contributes roughly 25% of global greenhouse gas emissions. A quarter of the world's emissions can therefore be attributed to the agricultural practices which go in to putting food on our plates.

Cutting out Meat
London and Cambridge

Some organisations have taken steps to ban carbon intensive foods such as meat from all catering facilities. in 2019 Goldsmiths, University of London announced a ban on beef from University food outlets as part of its pledge to be carbon neutral by 2050.

Since removing beef and lamb from its catering menus in 2016 the catering team at Cambridge University has cut its carbon emissions by over 10.5% despite an increase in the volume of food produced. The catering services also recorded a 33% reduction in carbon emissions per kilogram of food purchased and a 28% reduction in land use per kilogram of food purchased. Vegan and vegetarian options have been strategically placed in the canteen to encourage customers to choose them over the remaining meat options (pork and chicken) and in order to facilitate this the university's community of chefs were provided with free plant-based cookery classes.

Carbon Friendly Diet
Copenhagen and Durham

Across the world Councils are adopting food purchasing policies that include the environment, health and fair labour standards. In the UK Durham County Council's Sustainable and Health Food Policy includes a pledge to "support and promote higher quality, higher welfare meat, whilst seeking to encourage reductions in overall meat consumption".

In Copenhagen, the City has started to cook "greener meals" meaning that the 70,000 meals served daily by the municipality in facilities such as the City Hall, schools, nurseries, hospitals and offices, will be made out of a CO2-friendly diet menu. This includes a transition to selling 90% organic food, a move made financially possible by reducing the volume of meat purchased. Buying organic has been found to benefit biodiversity levels which have been declining drastically in recent years. Calls have been made to cut meat from school meals in the city completely, a move which would connect Copenhagen's schools to a growing number across the world that are switching to a vegetarian or vegan menu.

Urban Agriculture Policy
Ghent

In 2013 the City of Ghent launched a food policy for the city which sets out five strategic goals to create a more sustainable food system in the city:

- A shorter, more visible food chain
- More sustainable food production and consumption
- The creation of more social added value for food initiatives
- Reduce food waste
- Optimum reuse of food waste as raw materials

Local urban gardens play an important part in a number of these goals. Goal 1.4 for example aims to create spaces for individual and joint non-professional food production, in doing so this document provides information on how to link up with gardening projects. Supporting the development of growing projects and education on food in schools is a prominent part of the plan. The city works with local organisations to help support the construction of gardens in schools with the goal of developing green space, promoting health and connecting young people to the natural world. Educational workshops about issues such as food systems, gardening and biodiversity are led by experts from the local government.

Education
UK

Connecting people of all ages with where their food comes from is essential in ensuring food sustainability and security into the future. Encouraging gardening in nurseries and schools is one way of introducing young people to sustainable eating. Campaigns such as the RHS School Gardening Campaign encourage and support school who want to start a vegetable garden, providing advice and lesson plans to teachers. Other organisations like Countryside Classroom offer the chance to let children visit local farms and learn outside. Similar programs would be beneficial across Council and partner's facilities including prisons, hospital gardens, care homes and council offices. There are numerous organisations that facilitate these activities and support from Councils would help ensure that education about sustainable eating is accessible to everyone.

Urban Farming
Detroit and Vancouver

There are over 1,400 urban farms and community gardens in Detroit supplying fresh produce to communities, neighbourhoods and restaurants across the city. These gardens have emerged within the context of a city in crisis. Deindustrialisation took Detroit from one of America's richest cities to one of its poorest within 50 years. Now, out of abandoned hosing lots and in the shadow of factory ruins, the city's residents are creating urban farms which green neighbourhoods, re-build communities, reduce food miles and provide income and food to residents.

Local produce is a common feature in South Vancouver too, where the University of British Columbia's campus farm hosts three markets a week during the growing season. Run by a small group of staff and volunteers, the farm also supplies local restaurants with vegetables, flowers and eggs, it is a space for university student research, community events and volunteer opportunities. The UBC farm is an example of a project that both provides healthy produce and builds community resilience and cohesion.

Vertical Farms
Kortrijk

Urban growing helps to reduce food miles and connect people with the food on their plates. Until now urban growing has been done through more traditional ground-based urban farms however, there is a new method of growing vegetables at a large scale in cities; vertical farming. Vertical farming takes various forms such as aquaponics, hydroponics, aeroponics, essentially however these techniques allow a large volume of leafy vegetables to be grown in a small space. Trays of plants are often stacked above each other in buildings and grown under UV or LED lights. While energy is used to power technology on the farm, the higher crop yields, lack of pesticides and small volume of land needed are all environmentally beneficial. In many cases urban farms use power generated form solar panels to run equipment.

In Kortrijk, Belgium one company is pioneering this approach in an old carpet factory on the outskirts of the city. The farm is run by a firm called Urban Crops which started in 2014 and is able to grow produce all year round. The company has developed technology which can be used by anyone from university campuses to office blocks, spreading fresh and local food to communities across the city.

Citizen Engagement

Climate change is an issue that impacts individuals and communities across the world. As well as being key drivers of the climate crisis, cities and their residents are profoundly vulnerable to its affects. This fact means that engaging people in discussions around climate change in the city will not only legitimise action but create a more effective, representative and just response. With division and populism on the rise in countries across Europe, engaging people in place-making within their communities offers the opportunity to build cohesion and resilience within cities.

Online Engagement
Reykjavik

While not specifically climate related, the city of Reykjavik in Iceland has created an online platform for crowd sourcing of solutions to urban challenges. Launched after the financial crash of 2008 the platform, named Better Reykjavik', was created to:

"connect citizens to the city administration, to increase participation and awareness amongst citizens on municipal issues and to lessen the gap between on the one hand elected officials and administrative staff and the general public on the other hand".

Engagement with this collaborative platform has increased year on year in the city where citizens have made a tangible impact on the physical, social and economic fabrics of their neighbourhoods. In fact, out of a population of 120,000, over 70,000 people have participated to some degree in the process with 27,000 registered users submitting over 8,900 ideas and 19,000 points for and against.

Citizen's Assembly
Oxford and Leeds

In Oxford the City Council set up the UKs first Citizen's Assembly on Climate Change in order to consider this question:

The UK Government has legislation to reach 'net zero' carbon by 2050. Should Oxford be more proactive and seek to achieve 'net zero' sooner than 2050 and what trade-offs are we prepared to make?

The Assembly was held over two full weekends in October 2019 during which participants learned about climate change and explore different options to cut carbon emissions through a combination of presentations by experts and facilitated workshops. In preparation the City Council established an independent advisory group, `made up of a representative from each of the political parties, local environment and democracy experts and representatives from local industry in order to provide governance and oversite in the creation and direction of the Citizen's Assembly. The assembly itself is made up of 50 participants who have been recruited through a stratified random process thus 'creating a 'mini-public' broadly representative of the demographics of the city's population'.

Similarly in Leeds a Citizen's Jury was established in September 2019. This group brings together a broadly representative group of 25 people from across the city who meet eight times to discuss and hear evidence on climate change impact and action in their city. The recommendations made by the jury will guide future action in the city and catalyse.