
DUNDEE CLIMATE ACTION PLAN

December 2019

Foreword

In June this year, Dundee City Councillors declared a climate emergency, recognising the serious and accelerating environmental, social and economic challenges we face due to climate change.

In response, the Climate Action Plan has been prepared to set out a first set of ambitious actions in a long-term pathway to support Dundee in a just transition to a net-zero and climate resilient future by 2045 at the latest.

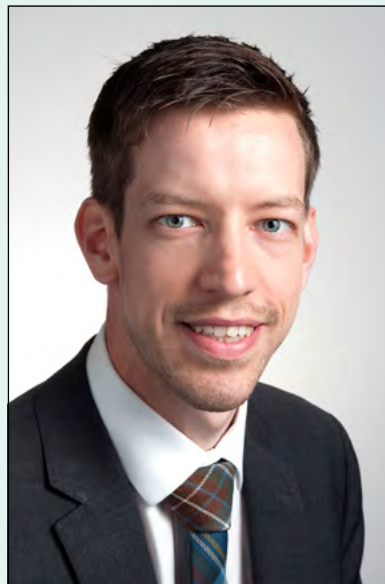
The plan builds on the considerable work achieved by our public, private and third sector organisations as we continue to shape our energy future by developing clean, low-cost solutions to energy supply and to reduce the city's carbon footprint.

Dundee already has much to be proud of. City partners are capitalising on opportunities for retrofit programmes for energy efficiency in homes and investment in low and zero carbon technologies across buildings to reduce energy costs. We have one of the most extensive electric vehicle charging infrastructures in the UK and are participating in the most ambitious hydrogen fuel deployment to date. Dundee City Council has an ongoing programme to reduce energy costs in buildings and infrastructure. This has included the installation of renewable energy on public buildings, an extensive programme to refurbish and upgrade the social housing stock and conversion to LED street lighting.

However, there is much work still to do if we are to make significant reductions in emissions and accelerate further transformational and preparatory change in the face of climate change. This transition can only be achieved with everyone's input. We need government, businesses, public sector, and individuals to play their part in delivering local solutions.

The Plan also needs to be flexible in order to adapt and respond to new technologies and knowledge of the most effective methods of reducing emissions. It is also essential that carbon management and energy efficiency become core values throughout the city and that everyone takes responsibility for reducing emissions.

As a Council, we are pleased to be in a position to lead this process on behalf of the Dundee Partnership. By working together to ensure that this plan is supported and implemented, we can become a driver for low carbon innovation and investment and show how our local economy can transition to net zero in a way that strengthens our local communities.



Councillor John Alexander
Chair of the Dundee
Partnership Forum & Leader
of Dundee City Council



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Welcome to Dundee 2045: A Sustainable City

Dundee is a truly SMART city with transformative innovations in energy, transport and waste.

Fuel poverty is a thing of the past with the energy grid now decarbonised through a mix hydrogen, solar and tidal power renewable technologies. The Dundee Energy Services Company (ESCO) provides a local delivery model for energy schemes in the city, managing energy supplies and ensuring fair prices for consumers in the city.

Behaviours have changed and, combined with technological innovations, residents are able to live within a smaller carbon footprint without compromising quality of life.

Early investment in energy efficiency measures to retrofit heating, lighting and insulation of properties has provided significant financial and carbon savings.

New buildings are designed to perform efficiently and older buildings are being retrofitted with adaptive technology such as ventilation, shading and greywater harvesting systems.

Commuters and visitors access Dundee's ShareMobility platform on their smartphones; presenting real-time information on ultra-low emission transport options, including car clubs, electric and hydrogen buses, taxis and bicycle hire.

Dundee's Low Emission Zone was a great success in encouraging infrastructure and behaviour changes required for the modal shift to low carbon transport.

Many commuters travel to work by electric bike from much further afield thanks to the integrated cycle network across Dundee, Perth and Angus.

The benefits of a low carbon Dundee are apparent – clean air, reduced fuel poverty and collaboration across sectors.

People are consuming less and sharing more; community Re-Use is integrated with the high street and recycling rates have exceeded the 70% target. The Circular Economy is now part of Dundee with businesses widely sharing resources and knowledge. Single use plastics are no longer produced and packaging is minimal. Deposit Return Schemes have helped to close the loop on drinks bottles, this along with the successful take Pride in Your City campaign, have resulted in, mostly, litter free streets and parks across Dundee.

Taking a path on the segregated cycle network to the award winning Broughty Ferry beach, lyme grass is abundant on the carefully maintained sand dunes, which provide a natural flood defence as well as protecting habitats for the many birds, bees and butterflies that are frequently spotted. Further along the coast, the set back wall protects communities from flooding events on the Tay River.

Wildlife corridors threading across the city are conserved through public and community partnerships; facilitating diverse flora and fauna, the resilience of the ecosystem as well as aiding surface water management, local air quality and general well-being.



Emission targets have been met, low carbon living is viable but challenges remain adapting to the ever changing climate.

The changing climate is becoming more apparent. Snow and ice were less frequent over the winter months, but rainy days were all too common! Recent severe storms, with record levels of rain and high wind speeds tested flood defences.

Robust Community Resilience Plans ensure communities are supported with essential supplies delivered and health services prioritised to ensure help was targeted to the most vulnerable.

The consideration of climate-friendly planting and green spaces has greatly reduced the heat island effect from the regular summer heat waves whilst a wide diversity of community gardens, allotments and

food growing networks integrate across the region to further increase sustainability and resilience.

Businesses, communities and public services co-designed the necessary adaptation of buildings, land, and infrastructure two decades ago; actions that have saved the city millions in potential repair costs and inflated bills.

Dundee Climate Action Plan provided a focus for the diverse challenges and activities required to urgently reduce and adapt to climate change. Although the work must continue, a solid foundation for future sustainability in Dundee has been created.

Introduction

In October 2018, the **International Panel on Climate Change** (IPCC) published its Special Report on Global Warming of 1.5°C, concluding that there is less than 12 years to act to avoid the worst impacts of climate change. The report describes the enormous harm that a 2°C rise is likely to cause compared to a 1.5°C rise and informed that limiting Global Warming to 1.5°C may still be possible, with ambitious action from national and local governments, the private sector and local communities.

The UK **Committee on Climate Change** published a landmark report in May 2019 which recommended that a 100% reduction in greenhouse gas emissions should be legislated by the UK Government “as soon as possible”. Such a target would constitute the UK’s “highest possible ambition” to combatting climate change and would “send a much stronger signal internationally”. The report stated that this net-zero target could be achieved at the same cost that is currently put against achieving the current Climate Change Act, which is between 1-2% of GDP in 2050.

On the same day, the Scottish Government announced plans to amend its **Climate Change Bill** and commit to a legally binding target of reaching net-zero greenhouse gas emissions by 2045 at the latest which would see Scotland become carbon neutral by 2040.

Along with these reports and political commitments, there has been a groundswell of public concern and global activism on climate change and an increasing focus on broader sustainable development aims. In responding to the IPCC report and public calls for action, Dundee has declared a **climate emergency**, recognising that our city has a key leadership role to play in making significant reductions in emissions and building resilience to the unavoidable impacts of a changing climate.



Covenant of Mayors
for Climate & Energy





Dundee is showing leadership in tackling climate change. In March 2018, the Lord Provost and Leader of Dundee City Council, signed the **Covenant of Mayors for Climate and Energy**, a global initiative that brings together local governments in a voluntary commitment to reduce emissions and develop an action plan that adopts a joint approach to tackling climate change mitigation and adaptation.

The Climate Action Plan is the culmination of collaborative work, led by Dundee City Council and co-designed with public, private and community organisations, recognising the fact that a concerted city-wide effort is required. It represents the first set of actions in a long-term pathway to first surpass the Covenant of Mayors target of **40% reduction in greenhouse gas emissions by 2030** and then to **achieve net-zero greenhouse gas emissions by 2045** or sooner. To achieve this target we will require

local interventions identified in this Plan, alongside significant additional measures in order that Dundee benefits from the effects of national policies.

The plan is organised into the following sections:

- **Context:** Why do we need the plan; what are its key drivers and objectives?
- **Development:** How the plan was co-designed with stakeholders; the preparatory work to understand Dundee's emissions and climate risks; assessing the environmental impact of the plan.
- **Themes:** Energy, Transport, Waste and Resilience; why action is needed, what work is currently planned and what we want to achieve.
- **Delivery:** Deliverable actions for each theme; delivery mechanisms, including governance, communication, monitoring and reporting.

Why do we need the Climate Action Plan?

Situated on the Tay Estuary, covering 60km² and with a population of almost 150,000, Dundee is undergoing a major transformation, spearheaded by the £1 billion Dundee Waterfront project, spanning 240 hectares of land stretching 8km along the River Tay. Key economic sectors within Dundee include life sciences and healthcare, creative industries and digital media, tourism, energy, electronics, publishing, retail and education.

Visitor numbers are projected to increase with the opening of the V&A Museum of Design, attracting tourism revenue of £1 billion within ten years, which is creating demand for hotels, hospitality, leisure and service businesses. In addition, two world-class universities and an award-winning college, museums and galleries, a captivating arts and science scene, over 3,000 businesses, a thriving port, beach, green and open spaces and internationally recognised biodiversity and habitats, all help Dundee to live up to its accolade of the “coolest little city”.

Dundee is also a young city with 51% of its population under 40. With a student to population ratio of 1:6, the highest in Scotland, Dundee’s talent pool is skilled, multicultural and highly educated and the general population is set to grow at 6% per annum for the next twenty years.

These factors provide both opportunities and challenges for Dundee. More visitors and an increasing population mean greater resource use and consequently increased energy demands, more waste, more greenhouse gas emissions resulting in reduced air quality and greater pressures on the resilience of the city. Conversely, in meeting these challenges great steps forward in sustainability and innovation can be achieved through increased use of renewables, more sustainable transport alternatives, smart options for waste reduction, integrated district heating systems and improved blue and green infrastructure. These all help to mitigate against and build resilience to the future impacts of climate change on our communities, buildings, land and wildlife.

One of the most difficult challenges facing Dundee and the wider city region is to achieve economic growth whilst reducing emissions. To do this we will need to achieve an absolute decoupling of emissions from economic growth, whereby emissions reduce whilst still supporting sustainable economic growth. This is a long term goal and will require the successful implementation of significant interventions.



Key Drivers

National and International Commitments

Scotland has some of the most ambitious climate change targets in the world. In May 2019, the Scottish Government announced that the Climate Change Bill will be amended so that the Scottish Parliament can vote on a new, bold target of achieving net-zero greenhouse gas emissions by 2045. In doing so, Scotland will become one of the first countries in the world to legislate to support the aims of the Paris Agreement which sets the standard for the international response to climate change.

"There is a global climate emergency. The evidence is irrefutable. The science is clear."

Roseanna Cunningham,
Climate Change Secretary, May 2019

Progress is underpinned by the **Climate Change Plan**, published in 2018, which is the Scottish Government's third report on proposals and policies (RPP3) for meeting its climate change targets. It sets out 64 policies and 31 proposals to reduce emissions from

electricity generation, housing, transport, services, industry, land use, waste, and agriculture.

Alongside the Climate Change Plan, Scotland's first **Energy Strategy** was published in 2017, setting out the long-term vision for the future energy system in Scotland. With a strong focus on local energy systems and the adoption of a system wide approach, the strategy sets a target to supply 50% of Scotland's energy needs from renewable sources. In addition, it commits to increase the productivity of energy use across the Scottish economy by 30% by 2030.

In September 2019, the Scottish Government published the statutory **Climate Change Adaptation Programme**. Covering a five year period, it is designed to address climate risks for the country, with actions centred around communities, climate justice, infrastructure and the environment.

Scotland's public bodies are expected to lead by example in tackling climate and delivering national plans through influencing and enabling positive behaviours; driving change; and acting as exemplars of climate action and low carbon innovation. All public bodies in Scotland are now mandated under **Public Bodies Climate Change Duties** to report annually on action they are taking to reduce carbon emissions.

Annual reports from public bodies in Dundee can be viewed on the Sustainable Scotland Network website¹.

Other specific legislation and policy that relates to the Climate Action Plan is discussed under each of the four themes as well as in the 'Strategic Environmental Assessment – Environmental Report' which accompanies the Plan.

Paris Agreement

The Paris Agreement, adopted by world leaders of 195 countries, is the first-ever universal, legally-binding global climate deal. The agreement sets out a global action plan to put the world on track to avoid dangerous climate change by limiting global warming to well below 2°C and to pursue efforts to limit the temperature increase even further to 1.5°C. However, scientists now agree that we actually need to keep temperature rises to below 1.5°C.



¹ Scottish Public Bodies Climate Change Reporting: <https://sustainablescotlandnetwork.org/reports>



Around 41% of private rented households in Dundee are fuel poor compared to 27% in the social rented sector.

most critically: the cost of energy; household income; the energy efficiency status of the property and how energy is used in the home. Under the current definition, a household is said to be in fuel poverty if it spends more than 10% of its income on all household fuel use.

According to the most recent Scottish House Condition Survey published in 2019², fuel poverty affects approximately 31% (22,000) of all households in Dundee (against 27% for Scotland as a whole) with numbers highest in homes built before 1945 (43%) and amongst those in the private rented sector (41%).

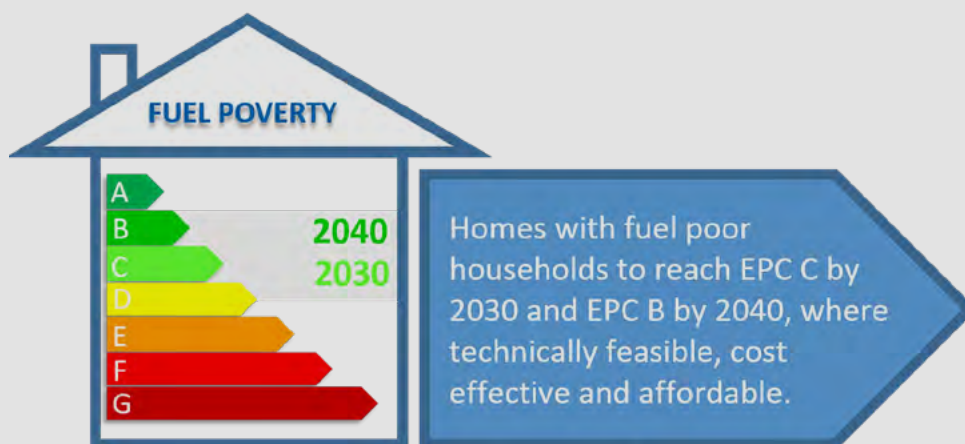
Whilst the long term trend continues downwards, the fact remains that more than **1 in 3 people in Dundee are still in fuel poverty**. These statistics reinforce the need for physical improvements to properties and the provision of energy advice through national and local advice agencies to assist the fuel poor.

Tackling Fuel Poverty

Climate change and fuel poverty are inextricably linked in that actions taken to mitigate against fuel poverty such as installing insulation (which reduces fuel bills and keeps the home warmer) also help mitigate against climate change by reducing heating use and emissions.

The **Fuel Poverty (Scotland) Bill** 2018 will set a new definition for fuel poverty recognising that it is caused by the interaction of a number of factors,

Figure 1: National Fuel Poor Household Standards



Source: Draft Fuel Poverty Strategy for Scotland, June 2018

² Scottish House Condition Survey - Local Authority Analyses: <https://www2.gov.scot/Topics/Statistics/SHCS/keyanalyses>

Maximising Economic Opportunities

Scotland's transition to a more prosperous, low carbon economy is already well underway with new markets, businesses and industries being established. The low carbon and renewable energy sector and supply chain supported over 49,000 jobs Scotland in 2016, generating over £11 billion in turnover³.

Opportunities are emerging faster than ever for new and innovative solutions to **energy integration** as we continue to decarbonise our national energy use. In Dundee, this requires a greater level of 'connectability' in what we all do if we are to scale this work to a level that makes significant reductions

in emissions and accelerates change. By doing so, the city can become a centre of green business, utilising the city's knowledge base, existing assets and low carbon infrastructure as a catalyst for inward investment, business growth, and the development of local supply chains.

The renewable energy sector is a particularly important part of our city's future and the broader local economy encompassing offshore wind, decommissioning (driven by the proximity of the Scottish Offshore Wind projects) and growing areas such as hydrogen, electric vehicles and a general market demand to lower energy costs and become more sustainable. The Climate Action Plan can be an asset in promoting the city to new investors and promoting its green credentials as a leader in renewable energy.

Case study: UN Global Goals for Sustainability

In 2015, the world's governments came together to adopt 17 UN Sustainable Development Goals (SDG) and 169 associated targets forming a comprehensive description of the environmental and social challenges to overcome if greater sustainability is to be achieved.

Each goal has targets and indicators that UN member states are expected to use in setting their agendas over the next 15 years. These goals recognise that tackling climate change is essential for achieving sustainable development

and as such, many of them address the core drivers of climate change. Scotland was one of the first nations to sign up to the goals and has a good history of policy as well as action in relation to sustainability issues.

At the local level, Dundee City Council has demonstrated its commitment to the goals through the Council Plan, City Plan and ongoing sustainability projects as well as being part of the Scotland Sustainable Development Goals network.



³ Climate Change Plan: third report on proposals and policies 2018-2032 (RPP3): <https://www.gov.scot/publications/scottish-governments-climate-change-plan-third-report-proposals-policies-2018>

Decarbonising Energy

Carbon dioxide (CO₂) is the main greenhouse gas, responsible for over 80% of our emissions, which is why there is global effort to reduce emissions of this gas. Decarbonising energy supply means reducing its carbon intensity, which is necessary to achieve our city's emissions reduction targets.

Dundee is a net-importer of energy and therefore our ability to achieve net-zero greenhouse gas emissions will rely heavily on a number of national policy and technology influences, including proposals for carbon capture and storage (CCS), future utilisation of the gas grid and the continued decarbonisation of electricity supply where energy from fossil fuels is replaced with renewables.

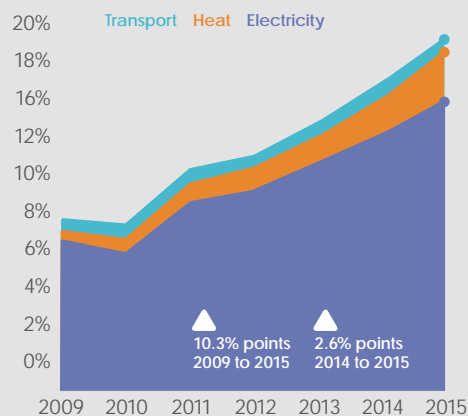
The share of renewable energy we generate and consume in Scotland has increased considerably over the past decade (figure 2) and, whilst the country is well on its way to generating 100% of its electricity demand from renewables by 2020, more needs to be done to tackle the challenges of decarbonising heat and transport.

This will require a major transformation of local energy systems, extending into people's homes, including the fabric and domestic heating systems of buildings. Supporting and delivering local solutions to meet local needs, linking local generation and use, can help create vibrant local energy economies. Yet the technological choices we make for heating buildings will impact electricity networks, as will the introduction of electric vehicles, and are likely to place extra pressure on the electricity network's ability to generate, store and deliver the capacity necessary to meet peaks in demand.

These significant developments will benefit from a 'whole systems' approach that considers heat, electricity and transport in planning future decarbonised energy systems.

The share of renewable energy we generate and consume in Scotland has increased considerably over the past decade.

Figure 2: Renewable Energy in Scotland



Source: Scottish Energy Strategy: The future of energy in Scotland, Dec 2017





City Resilience

Severe weather and climate impacts are already affecting communities and service delivery provided by organisations across Dundee, with operational, reputational, financial and legal consequences. The latest **UK Climate Projections (UKCP18) projections**⁴ show that this trend is set to increase in the future and the impacts we see today may occur more frequently with higher average temperatures, increased flooding and more extreme, unpredictable weather patterns. The consequences will be more serious, compounding many of the other long-term challenges we face – rising energy prices, resource scarcity, ageing population, and social and economic inequalities.

We therefore need to plan and adapt to the increasingly apparent and inevitable impacts of climate change. By choosing a resilience pathway that takes a long-term view, organisations and communities can identify their climate risks and prioritise actions that will allow them to prepare, respond and recover from severe weather and climate change impacts.

Communities that are strong and well connected are not only more likely to respond better to the challenges of climate change, but are able to build on their assets and capabilities to help transform and adapt their surroundings for the benefit of the whole community, including those most vulnerable. For example, creating a green space in a neighbourhood may provide food growing opportunities and improve flood attenuation as well as creating a place for social interaction and community support.

The long-term vision is for Dundee to become a Sustainable City that plays a leading role in Scotland's goal to achieve net-zero greenhouse gas emissions by 2045 or sooner.

Objectives

Whilst a number of significant challenges come with climate change, taking action to **mitigate** and **adapt** can bring multiple benefits for Dundee's environment, society and economy. Both pillars open up new opportunities to promote sustainable local development, enhance quality of life, stimulate investment and innovation, create jobs and reinforce stakeholder participation and co-operation.

The long-term vision is for Dundee to become a Sustainable City and in the coming decades to pass through a period of transition from a carbon-based economy to one that plays a leading role in Scotland's goal to achieve net-zero greenhouse gas emissions by 2045 or sooner. To do this, each of the four themes of the Climate Action Plan has a key objective:

- Energy:** Reduce the consumption of energy, promote energy efficiency and increase the proportion of power and heat from low and zero carbon technologies.
- Transport:** Encourage active travel through walking, cycling and public transport and deploy sustainable alternatives to decarbonise transport.
- Waste:** Manage waste sustainably by reducing, reusing, recycling and recovering waste to improve resource efficiency whilst working towards a circular economy.
- Resilience:** Ensure our communities, green networks and infrastructure are adaptable to a changing climate and reduce the risks and vulnerability to unavoidable impacts.

Developing the Climate Action Plan

The Climate Action Plan demonstrates how the city will meet its commitment to reduce emissions and adopt a joint approach to tackling climate change mitigation and adaptation.

To translate this commitment into action we have:

- **Measured greenhouse gas emission levels for Dundee**
- **Assessed the climate risks and vulnerabilities for Dundee**

Using the findings from the above, we have:

- **Set an ambitious target for greenhouse gas reduction and a pathway for climate resilience**
- **Defined a set of initial actions that stakeholders plan to undertake to help reach the targets**

Co-designing with stakeholders

The Climate Action Plan has been developed alongside a series of workshops and preparatory reports that involved various teams within the Council and a great many partners across the city, within the public, private and third sectors, who are also passionate about ensuring a low carbon future for Dundee.

At the initial stages of Plan development, a Strengths, Weaknesses, Opportunities & Threats (SWOT) analysis of sustainability in Dundee was carried out. Some of the main strengths highlighted were

the city's compact size, its proactive approach and political will, without which progress would be much more difficult. There are many opportunities regarding its orientation and location (being south facing and on the river) and likely future investment due to the large-scale development of the waterfront. However many challenges were also presented, not least of which was lack of funding for sustainability projects and the high poverty levels in Dundee, with legislation, economic and political uncertainty and timescales for development seen as particular challenges.

In August 2018, fifty individuals representing twenty different public, private and community organisations came together to contribute their ideas and knowledge to help shape Dundee's transition to a low carbon city in a workshop titled **"Dundee 2030: Envisioning a Low Carbon Future"**, arguably the most important step in the process, ensuring that the whole city is committed to the low carbon goal.

Facilitated by Open Change, experts in design led change, discussions initially focused on six themes. The workshop took place in three stages; initially,



**Dundee
2030**
Envisioning
a Low Carbon
Future



participants envisioned what a low carbon Dundee might look like in 2030. They were then asked to define long term actions (2025 onwards) that would help us to reach that vision and short term actions to start the to prepare the ground for these future actions and start the course of emissions reductions and resilience building immediately.

Through enthusiastic collaboration and discussion, over 100 actions were identified. These were then collated and further refined in partnership with the stakeholders to formulate an initial list of practical and feasible actions to help Dundee meet its goals (see Annex 1).

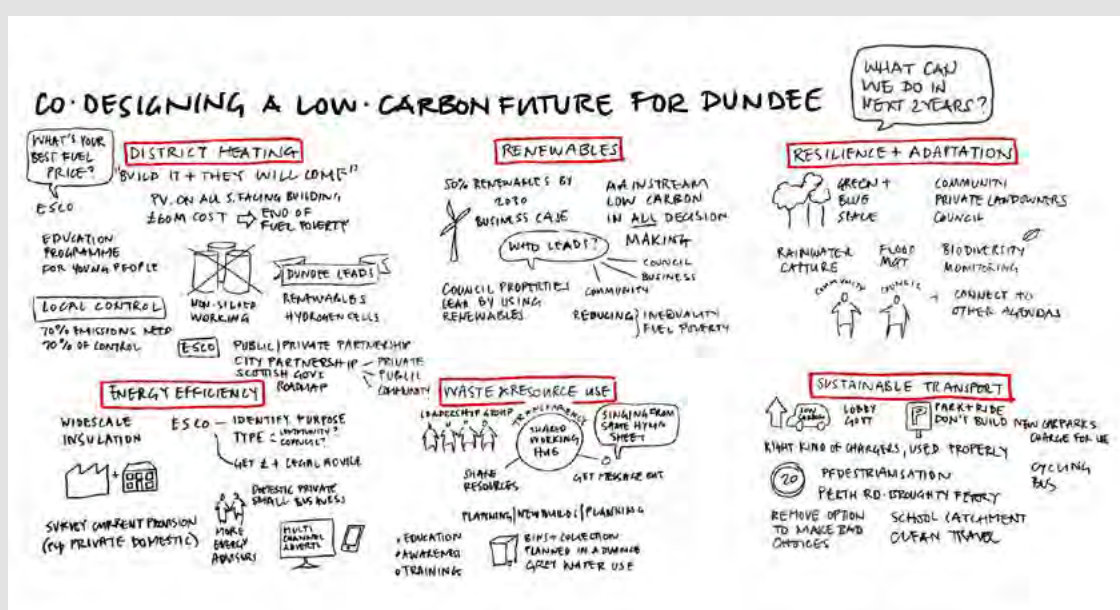
Climate Risk and Vulnerability Assessment

The Covenant of Mayors includes a commitment to strengthen resilience and capacity to adapt to adverse climate change impacts. As such, the preparation of a **Risk and Vulnerability Assessment** is a prerequisite to Plan elaboration. It determines the nature and extent of climate-related risks

Strategic Environmental Assessment

The Climate Action Plan has been influenced by a Strategic Environmental Assessment (SEA), carried out in accordance with the **Environmental Assessment (Scotland) Act 2005**. The purpose of SEA is to minimise potential negative effects of plans, programmes and strategies on the environment and to enhance positive effects. The SEA Environmental Report and associated documents for the Plan are available on the Scottish Government's SEA database⁵.

Figure 3: Summary of Dundee 2030 workshop captured by Open Change



⁵ Scottish Government SEA database: www2.gov.scot/seag/publicsearch.aspx

Dundee's Emissions

In order to set an emissions reduction target and actions for the Plan it was essential to collate the following information:

- An understanding of greenhouse gas emissions for Dundee at a set starting point (the '**Baseline Emissions Inventory' (BEI)**)
- An understanding of greenhouse gas emissions reduction for Dundee since the starting point (the '**Monitoring Emissions Inventory (MEI)**')
- Consideration of future emissions projections.

BEI and MEI for Dundee

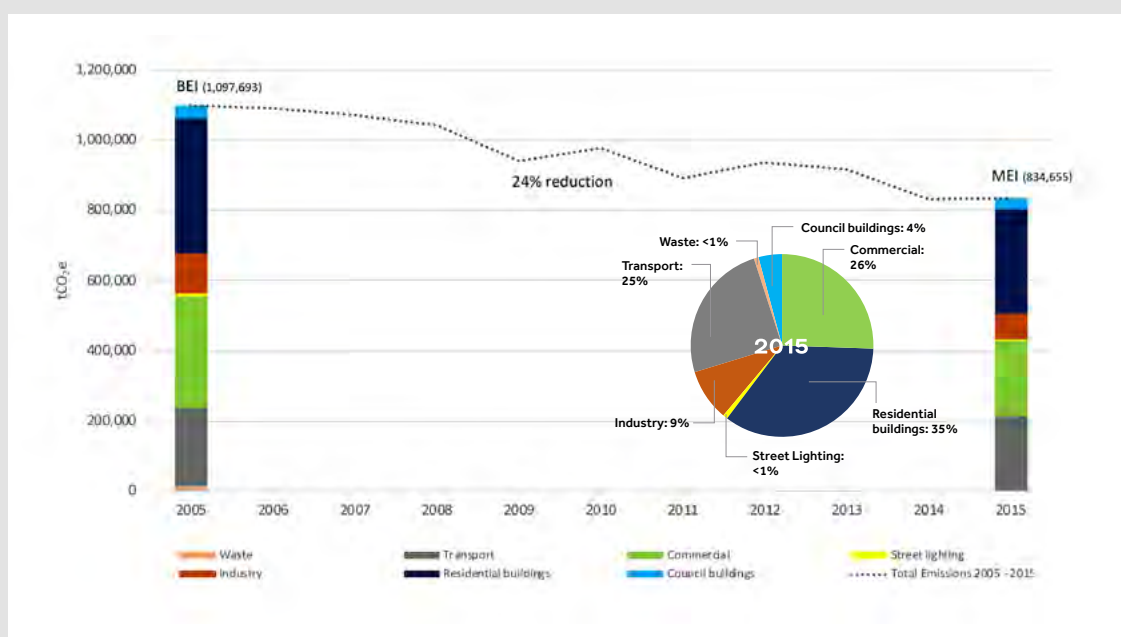
A baseline year of 2005 was selected to measure the starting point (BEI) for emissions reduction as this was the earliest year for which reliable data exists in the UK. The most recent year for which data was available when preparing the Emissions Inventories was 2015, therefore this year was selected to measure progress in reducing emissions to date (MEI).

The BEI and MEI study was carried out by Aether and used national energy data broken down by sector (domestic, industrial and commercial, transport and waste). In order to translate the energy and waste data into emission estimates, the data is multiplied by emission factors.

Figure 4 shows the emissions in the baseline year (2005) and monitoring year (2015), broken down by sector. As can be seen, residential buildings make up the largest source of emissions in Dundee, comprising 35% in total in both years. This is followed by the commercial (26%) and transport (25%) sectors. With around 75,000 residential properties, 5,500 commercial and industrial properties, as well as 600 public buildings, including 42 schools, it is not surprising that buildings make up the bulk of emissions in Dundee. Emissions from Council property account for less than 4% of total emissions which is why a city-wide approach is essential if we are to reach targets. Nonetheless, the Council is committed to reducing its own emissions year on year and has a long-term aspiration to set carbon budgets for its service areas.

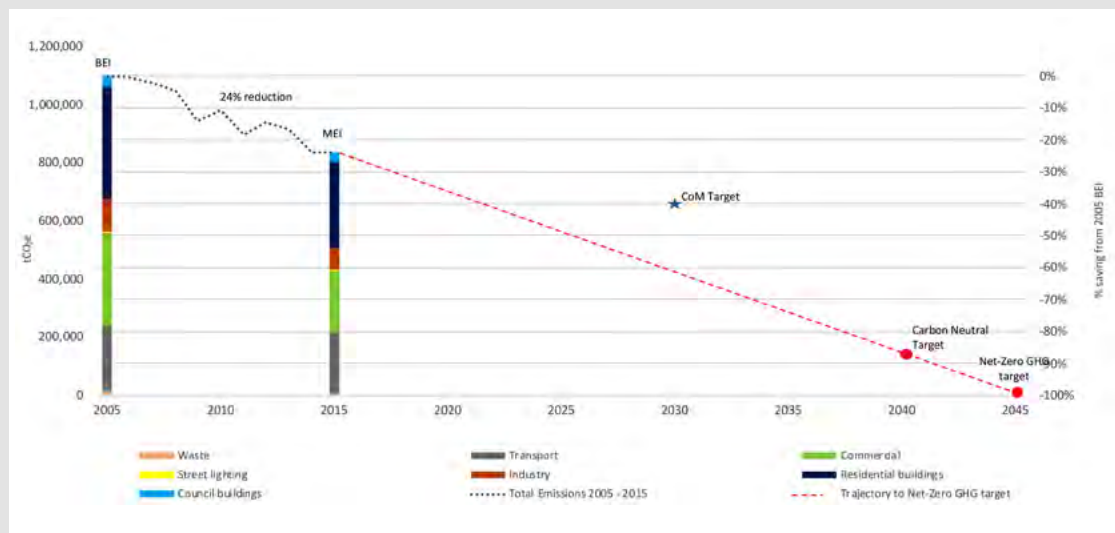
Whilst being the largest emitters, a lot of work has taken place to reduce emissions from the residential and commercial sectors, achieving the greatest reduction between 2005 and 2015, accounting for 40% and 35% of the emissions reductions respectively. **Overall, emissions reduced by 24% from 2005 and 2015.**

Figure 4: Dundee carbon emissions 2005 and 2015 (By End Use)



Source: Dundee GHG Inventories and future projections

Figure 5: Emissions Reduction Targets



Source: Dundee GHG Inventories and future projections

Emissions Reduction Target

The Climate Action Plan commits to surpass the Covenant of Mayors target of 40% reduction in greenhouse gas emissions by 2030 and ultimately achieve a science-based target of **net-zero greenhouse gas emissions by 2045**, in line with the proposed targets of the Scottish Climate Change Bill (figure 5).

Meeting the Target

Meeting the target will be challenging and there are a number of external factors that will impact on this, including UK and Scottish Government policies and initiatives highlighted in the Plan. A key factor will be the decarbonisation of the electricity supply grid where energy from fossil fuels is replaced with renewables. This has a direct impact on determining the **Grid Emission Factor**⁶ which is used to measure emissions reduction progress.

As far as possible, actions in the Climate Action Plan will be quantified in terms of their emissions reduction impact. For some initiatives, further development of

business cases will be required with a more detailed project plan to provide a better measurement of impact. For others, the scale is likely to be the crucial factor and consequently only best estimates may be provided.

The following performance indicators will be used to measure emissions reduction progress against the target:

- Total carbon dioxide equivalent (CO₂e)⁷ emissions (total and by end-use) in Dundee
- Per capita (person) CO₂e emissions in Dundee

ACTION G.1

Adopt an emissions modelling tool to quantify the impact of Climate Action Plan actions, to inform future targets and present data in an interactive way.

ACTION G.2

Develop and trial a carbon budget for Dundee City Council and encourage other organisations in the city to prepare carbon reduction plans.

⁶ A measurement of CO₂ emissions intensity per unit of electricity generation in the grid system (tCO₂e/MWh)

⁷ CO₂e is a commonly used way of presenting total greenhouse gas emissions as an equivalent amount of CO₂



Energy

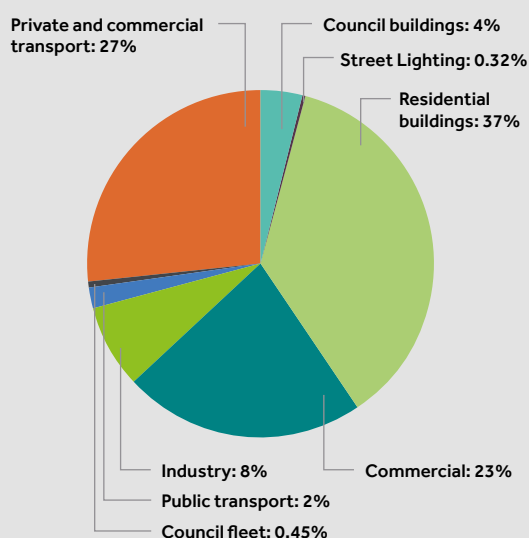
Objective: Reduce the consumption of energy, promote energy efficiency and increase the proportion of power and heat from low and zero carbon technologies.

Why Take Action?

Energy consumption and emissions at the local level are dependent on many factors: economic structure (industry/service oriented and nature of the activities), level of economic activity, population, density, characteristics of the building stock, usage and level of development of the various transport modes, citizens' attitudes, climate etc. Some factors can be influenced in the short term (like citizens' attitudes), while others can only be influenced in the medium or

long term (energy performance of the building stock). It is useful to understand the influence of these parameters, how they vary in time, and identify upon which partners can act (in the short, medium and long term). Dundee's total energy usage in 2005 was estimated as 3,726,176 MWh and had reduced to 2,849,645 MWh by 2015. Just under three quarters of the energy consumed is used in buildings and over a quarter for transport.

Figure 6: Dundee energy consumption 2015 (By End Use)

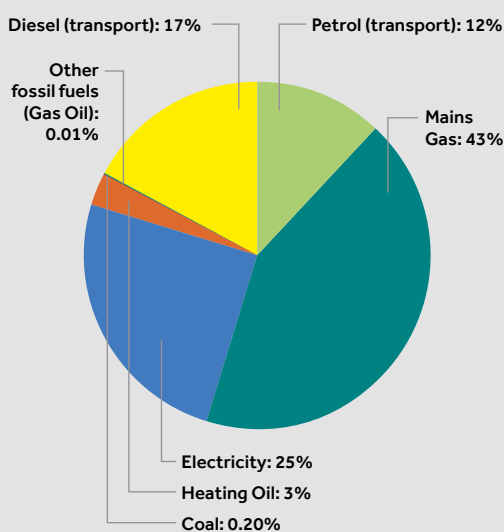


| CATEGORY (END USE) | ENERGY CONSUMPTION IN 2015 (MWH) | CONTRIBUTION |
|---|----------------------------------|--------------|
| BUILDINGS, EQUIPMENT/FACILITIES AND INDUSTRIES: | | |
| Council buildings | 107,256 | 4% |
| Commercial | 642,504 | 23% |
| Residential buildings | 1,041,500 | 37% |
| Street lighting | 9,237 | 0.32%* |
| Industry | 227,670 | 8% |
| Subtotal | 2,027,585 | 71% |
| TRANSPORT: | | |
| Council fleet | 13,079 | 0.45%* |
| Public transport | 42,788 | 2% |
| Private and commercial transport | 766,193 | 27% |
| Subtotal | 822,060 | 29% |
| TOTAL | 2,849,645 | 100% |

* Percentages of less than 1% are shown to two decimal places whilst the total figure is rounded to the nearest whole number.

The type of fuel used is also important as each type emits different amounts of carbon. Figure 7 shows that in terms of fuel usage, just under half of the energy used in Dundee in 2015 was from mains gas supplies and a quarter from electricity, indicating that heating and lighting of the city's domestic, commercial and industrial properties is a major contributor to emissions and significant reductions from these sectors will be required to meet the target.

Figure 7: Dundee energy consumption 2015 (By Fuel)



| FUEL USED | ENERGY CONSUMPTION IN 2015 (MWH) | CONTRIBUTION |
|------------------------------|----------------------------------|--------------|
| Mains Gas | 1,707,297 | 43% |
| Electricity | 882,534 | 25% |
| Heating Oil | 260,436 | 3% |
| Coal | 5,200 | 0.20%* |
| Other fossil fuels (Gas Oil) | 1,451 | 0.01%* |
| Diesel (transport) | 412,389 | 17% |
| Petrol (transport) | 456,870 | 12% |
| TOTAL | 3,726,176 | 100% |

* Percentages of less than 1% are shown to two decimal places whilst the total figure is rounded to the nearest whole number.

Energy in Dundee

The Energy Hierarchy

The Climate Action Plan was developed with the principles of the energy hierarchy, where the approach seeks to reduce the amount of energy used in the first place, before employing technologies to reduce energy, as shown below.

Energy Reduction

Energy conservation – prevent unnecessary use of energy

Energy Efficiency

Energy needed is used as efficiently as possible

Renewables

Generating energy using sustainable, renewable technology

Low Emission

Low impact methods of utilising fossil fuels e.g. carbon capture and storage

Conventional

Generating energy using conventional, high impact fossil fuels

The Scottish Government has designated energy efficiency as a National Infrastructure Priority, the cornerstone of which is the **Energy Efficient Scotland** programme committing substantial annual funding to transform the energy efficiency of Scotland's buildings so that, wherever technically feasible, and practical, buildings are near zero carbon by 2035.

Energy efficiency is one of the most cost-effective ways of reducing costs and, in the process, emissions. Measures can include retrofitting properties with better insulation, installing more efficient boilers, controls and energy management systems. Typically, this will mean a shift towards renewable and low carbon energy sources; however, with this comes a risk of increased price rises due to the capital costs associated with deploying the associated infrastructure.

It is therefore important to consider both capital expenditure and operational expenditure through **Whole Life Costing**, so that the best approach

can be taken when investing in new buildings and refurbishments. Often, capital expenditure and operational expenditure are separated so that the long-term cost-effectiveness of actions is not fully understood. Whole Life Costing refers to the total costs and benefits of ownership of a building, or other asset, and allows resource efficiency to be appropriately considered during the assessment of the true cost of design, construction and operation. This reduces designs that are influenced on the basis of short term capital financial outlays and that do not consider the longer term operation of the building, for example adding solar panels to a new housing development leading to a long term reduction in energy costs. Value for money can only be achieved if the costs associated with the life of the product are considered. It therefore makes economic sense for Dundee City Council to adopt this methodology for the sake of long term cost savings as well as reducing emissions.

ACTION E.1

Adopt a Whole Life Costing approach to ensure new developments achieve greater operational sustainability.

(This will include analysis of maintenance burdens, end of life use, outputs and performance to ensure resilient, efficient buildings are designed with minimal waste.)

Domestic Energy Efficiency

Increasing energy efficiency and reducing emissions of the **social rented sector** has been driven by the Scottish Housing Quality Standard and its successor, the Energy Efficiency Standard for Social Housing. The Council and Housing Associations are adhering to these standards to address fuel poverty via their continued energy improvement programme for domestic properties.

- By 2015, all Council housing stock reached required energy ratings, via replacement of all electric storage heating with gas central heating and ensuring all suitable properties had appropriate insulation.
- 3,500 hard-to-treat properties (Council and private) have had external wall insulation fitted, reducing carbon emissions.
- A further 1,300 properties will be completed by the end of 2019.
- Installation of photovoltaic panels installed on multi-story developments.



Energy Efficiency standards for social housing are expected to increase under national targets with the Scottish Government aiming to maximise the proportion of social housing stock achieving an Energy Performance Certificate (EPC) Band B by 2032. This higher standard is likely to result in an increase in the deployment of renewables. A longer term target is for properties to become carbon-neutral by 2040.

ACTION E.2

Complete fabric improvements to outstanding domestic Council (and ex-Council properties in mixed-tenure blocks) stock to achieve the Energy Efficiency Standard for Social Housing (EESH) by 2020 and widen range of technologies (including renewables) under consideration to allow compliance with the more exacting EESH2 standard by 2032.

Up until now, there has been no regulation of energy efficiency in the **private rented sector**. However, this is expected to change as legislation will require that only privately rented properties with an EPC Band of at least E (i.e. minimum rating of 39) can be let. The standard will then be stepped up so that only those dwellings with a Band of at least D (i.e. minimum rating of 55) can be let from 2022 onwards. A further proposal is that all privately rented properties achieve at least a Band C (minimum rating of 69) by 2030.



For the **owner-occupied sector**, there have been no previous proposals to regulate for energy efficiency. However, within the current Energy Efficiency Scotland consultation the proposal is for continuation of existing support programmes of grants and loans for energy efficiency measures until 2020, followed by a ten year period where these properties are encouraged to achieve an EPC Band C with the proposed mandatory phase requiring Band C in the subsequent 10 years.

Behaviour Change

The most cost-effective way to reduce emissions is to reduce the amount of energy used in the first place. This can be achieved by relatively small measures such as turning down controllers, reducing the temperature of clothes washing, insulating lofts, choosing energy efficient appliances, switching off appliances when not in use, changing to LED bulbs and many more actions. Despite their cost-saving benefits and simplicity, these actions often fail to be carried out. There are many initiatives in Scotland that provide advice and support to householders such as **Home Energy Scotland** and businesses such as **Resource Efficient Scotland**, as well as specific local advice services such as **Dundee Energy Efficiency Advice Project (DEEAP)**.

ACTION E.3

Continue to deliver a city-wide energy awareness campaign to improve energy efficiency behaviour in all households.

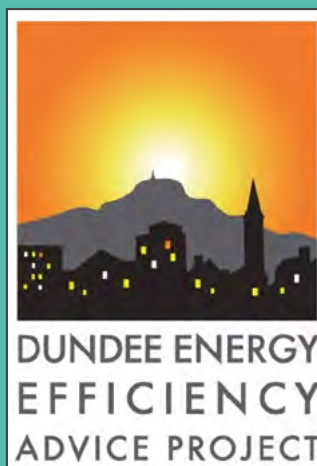
ACTION E.4

Explore how the work of the Dundee Energy Efficiency Advice Project (DEEAP) can be maintained and delivered.

Case study: Local energy advice

DEEAP was established by the Council in response to the need to eradicate fuel poverty in Dundee. Its aim is to provide a service throughout the city advising householders on fuel tariffs, how to reduce bills, energy efficiency measures and referral or advocacy work to resolve individuals debts with energy suppliers. DEEAP carries out 4,000 energy advice home visits per year and their staff attend events across the city to raise awareness of the service.

Home Energy Scotland North East has expert advisors based in Dundee, offering free and impartial advice on energy saving, keeping warm at home, renewable



energy, greener travel, cutting water waste and more. Home Energy Scotland is funded by the Scottish Government and managed by the Energy Saving Trust and has a mission to help people in Scotland create warmer homes, reduce their bills and help tackle climate change. Advisors support over 18,000 householders in the North East last year with energy saving advice, leading to carbon savings of over 60,000 tonnes of CO₂. Feedback from North East Customers shows customer satisfaction levels of over 98% for advice and support

from the team. Advisors attended over 60 events in Dundee during 2018/19 with a full events programme planned for 2019/20.

Non-Domestic Energy Efficiency

In order to accelerate progress in transforming the energy efficiency of public sector buildings, a national framework of **Non-Domestic Energy Efficiency (NDEE)** contractors has been put in place. The twelve appointed suppliers can deliver energy efficiency retrofit works and services at scale for all Scottish public sector organisations, registered social landlords and third sector organisations, rapidly delivering modern, efficient technology that supports Scotland's ambition on energy demand reduction, helping to cut costs and tackle climate change.

Dundee City Council is utilising this Energy Performance Contracting model, investing £1.7 million in the installation of energy efficiency measures in eight properties initially. This is guaranteed to achieve savings of at least £222,000 per annum and a further 1,000 tonnes of CO₂. Non-Domestic buildings involved in these initial energy efficiency improvements include Olympia Leisure Centre, Dundee Contemporary Arts and Dundee Ice Arena. The long term plan is to include more than 100 Council properties.

ACTION E.5

Complete phase 1 of the Non Domestic Energy Efficiency (NDEE) retrofit of Dundee City Council public buildings (Basket 1) before implementing subsequent phases (Baskets) annually until all prescribed measures are complete on all Council public buildings.

The Councils' first **carbon management plan** was adopted in 2009 to reduce CO₂ emissions from its operations. Since 2007/8, the total carbon footprint has reduced by 40%; 37% of this a result of improved energy efficiency in buildings, such as SMART metering, Building Energy Management Systems and behavioural changes. The Council will produce an updated Carbon Management Plan to reflect the ambitions of the Climate Action Plan as well as incorporate findings from the Public Bodies Climate Change Duties Reporting.

ACTION E.6

Update the Councils Carbon Management Plan, identifying new targets in line with the Public Bodies Climate Change Duties (PBCCD) and Climate Action Plan targets.

Dundee's public sector organisations will also be expected to inform and support the establishment of **Net Zero Carbon Standards for new public buildings**, announced by the Scottish Government in September 2019.

LED Street lighting

Dundee has more than 24,000 streetlights which use around 8.9GWh of power a year at a cost of £1.2 million. These lights also emit 3,980 tonnes of CO₂.

Since 2012/13 the Council has installed 5,000 LED street lights that have so far resulted in a 35% reduction in CO₂ emissions. By 2020, a further **£4.8 million will have been invested to complete the programme of converting all possible streetlights to LED**. This will significantly reduce running costs and is estimated to achieve a further 35% reduction in CO₂ emissions.

ACTION E.7

Replace all streetlights with energy efficient lighting systems by 2020 and explore opportunities for future smart intelligent lighting.



Business and Industry

Industry and commercial sectors are large emitters in Dundee and there is great potential to engage with businesses to reduce energy usage and emissions across the city.

Resource Efficient Scotland, in partnership with Dundee & Angus Chamber of Commerce, Scottish Enterprise and Business Gateway, funded by the Scottish Government and European Regional Development Fund, have worked closely with local businesses and the Council's Economic Development Service in Dundee since 2013 to provide advice and support in reducing emissions and saving costs. This has involved **advising 63 Small to Medium Enterprises** in Dundee, delivering **92 projects** identifying savings of £620k of energy (8,594 MWh) and £13,380 of waste (152 tonnes of waste).

ACTION E.8

Provide advice and support on resource efficiency and climate risk management for businesses in Dundee.

Renewable and Low Carbon Solutions

Using renewable energy rather than fossil fuels can significantly decrease emissions. The pace of investment and share of renewable energy as a proportion of the energy we generate and consume in Scotland has increased considerably over the past decade as the cost of technologies fall and efficiencies continue to rise.

Renewable energy sources now supply the equivalent of almost 18% of Scottish final energy consumption, up from around 8% in 2009. In 2015, 77% of electricity generation came from zero or low carbon sources, and 27% from wind energy alone.

In Dundee, according to the 2015 MEI, **less than 1% of our locally generated electricity comes from renewable sources**. There is therefore great potential to increase the percentage of local electricity generation from renewable sources in Dundee to make a significant reduction in emissions.

Emerging energy technologies such as hydrogen are also likely to become increasingly important for meeting future energy demand from continued population growth and more use of electricity in other sectors (e.g. transport, industry). Changes to how we store energy across the system, and particularly in terms of electricity and heat, could have a profoundly important bearing on our low carbon future.

By 2032, 35% of Scotland's homes are to be heated by low-carbon technologies.

Dundee is a compact city and the opportunities to deploy some renewable technologies such as large scale wind and solar farms are limited. Yet other renewable technologies, such as photovoltaics, are now well established and the challenge remains to scale up their use to a level that can make significant impact on reducing emissions.

Within Dundee's **Local Development Plan**, proposals for all new buildings will be required to demonstrate that a proportion of the carbon emissions reduction standard set by Scottish Building Standards will be met through the installation and operation of low and





zero carbon generating technologies. Supplementary guidance will be kept under review to ensure the proportion of the carbon emissions reduction standard to be met by these technologies will increase over time.

In the Government's Programme for Scotland 2019-20, commitments are set out to ensure that, from 2024, all new homes must use renewable or low carbon heat. This is to be achieved through a fundamental overhaul in building regulations that aim to increase energy efficiency and the efficiency of construction from 2021.

Solar

Renewable technologies, in particular photovoltaics, have been included in the design of new build schools at Sidlaw View, Tayview, Coldside and the North East Campus, alongside three systems at DISC, Claverhouse and The Crescent. Further plans include a rolling programme of photovoltaic installation, covering all Council buildings.

Dundee is home to the UK's first **purpose-built electric vehicle charging hub** in Princess Street, featuring eighteen bays of **solar canopies**, rapid charging units and an integrated energy storage system utilising second-life Electric Vehicle (EV) batteries. Further solar canopies have been constructed at Queen Street, Broughty Ferry.

New EV charging hubs will also be developed at Dundee's three main multi-storey car parks – Greenmarket, Olympia and Bell Street. Each new hub will see the installation of ten charging posts with two connectors, doubling the number of public charging points in the city.

The installation of solar panels and a battery storage system will integrate more renewable energy and enable variable charging of vehicles when grid demand is lower, helping to reduce environmental impacts associated with electricity generation.

ACTION E.9

Identify solar PV opportunities across Dundee for public and private buildings and ensure all civic buildings have renewables where technically feasible.

Hydrogen

Dundee is supporting the Scottish Government's ambitions for the creation of a hydrogen economy in Scotland to attract investment into transport, manufacturing, engineering, energy and commercialisation of the technology. Replacing diesel with hydrogen as a fuel source in vehicles will result in better air quality, improved health, reduced noise levels and zero carbon emissions as well as providing the capacity for longer transport distances compared to other low carbon energy technologies.

A potential site has been identified in Dundee as a **National Hydrogen Knowledge Centre** for fuel generation, energy storage, vehicle research and development and manufacture together with a skills academy to support the wider hydrogen growth. It also has the potential to attract various associated businesses, including fuel cell development and transportation companies such as local bus and fleet networks, thus expanding out the wider low carbon sustainable transport market.

Dundee is one of 22 cities in the pan-European JIVE2 Project (Joint Initiative for Hydrogen Vehicles across Europe) which will see **12 new Hydrogen Fuel buses deployed in Dundee**. The underlying objective is to support the transition of fuel cell buses as a mainstream choice for public transport authorities and operators by demonstrating parity in cost and operation against using fossil fuels. The project is one of the early adopters in the Government's National Hydrogen Transport Objective.

ACTION E.10

Implement the Joint Initiative for Hydrogen Vehicles Across Europe (JIVE 2) hydrogen bus project, deploying 12 hydrogen fuel buses into operation in Dundee and creating a local fuel and maintenance station.



Geothermal

As part of the regeneration of Dundee's waterfront, the V&A Museum of Design aims to achieve the **BREEAM Excellent category** as a recognised measure of sustainability. The building itself runs solely on geothermal energy. Design includes thirty, 200-metre deep bore holes for heating and cooling of the building along with air source heat pumps on the roof. This form of renewable energy provides the building with 800,000 kWh/annum of heating and 500,000 kWh/annum of cooling.

Hydro

Generating power from the flow of water requires either a fast flowing water course with a high volume of water or a river with a significant change in levels. Dundee's location on the banks of the River Tay provide an opportune location for harnessing the energy of the tides to generate electricity. The city also has a long-history of utilising water and its Jute Mills were extracting water from the burns that run through the city in the 18th and 19th centuries. Hydro schemes could therefore offer another potential on and off-grid contribution to Dundee's energy mix.

ACTION E.11

Research opportunities to utilise local water bodies for renewables including local reservoirs, rivers and estuaries.

Offshore Wind

Dundee's geographical location (in close proximity to major Offshore Wind Farm locations), its unrestricted access to deep water port facilities, port side land assets and access to skilled labour provides a major platform to realise opportunities that will emerge in the coming years. Indeed, the Scottish Government's **National Renewables Infrastructure Plan** recognised Dundee as one of the most strategically important port locations for offshore renewables. The geographical location of Scottish consented wind farms such as Neart na Gaoithe (NNG), Seagreen and Inchcape to the Port of Dundee provides an ideal location for Construction/Assembly of turbines and the longer term Operations and Maintenance (O&M) work.

Dundee Port has ambition to secure assembly and construction work for the offshore wind sector and have invested over £10m to create a new quayside with an industry-leading "heavy lift" capability, coupled with a significant onshore operational area. Further investment will be forthcoming to enable offshore wind marshalling to be supported at the port should a suitable project be awarded.

Alongside investment in infrastructure, Dundee offers world leading research and development expertise and competencies across the supply chain to meet industry needs. Dundee's cluster approach brings together regional strengths in the engineering/manufacturing sectors via networks, such as **Energy Dundee** and the **Forth & Tay Offshore Cluster** to support the sector.

ACTION E.12

Develop a regional cluster approach to attract investment, support business growth and create jobs in the offshore wind sector; retaining more graduates and making the city a magnet for new talent.

Low Carbon Heat

Heat accounts for more than half of the energy consumed in Scotland, with the majority of homes, businesses and public buildings using conventional gas boilers. This dependence on fossil fuels, coupled with old and poorly-insulated building stock, means that heating also accounts for half of Scotland's total CO₂ emissions. Heat must therefore be at the centre of our move to a low carbon economy.

District heating is the supply of heat by hot water to a number of buildings through a heat network of underground pipes. It is an effective method for

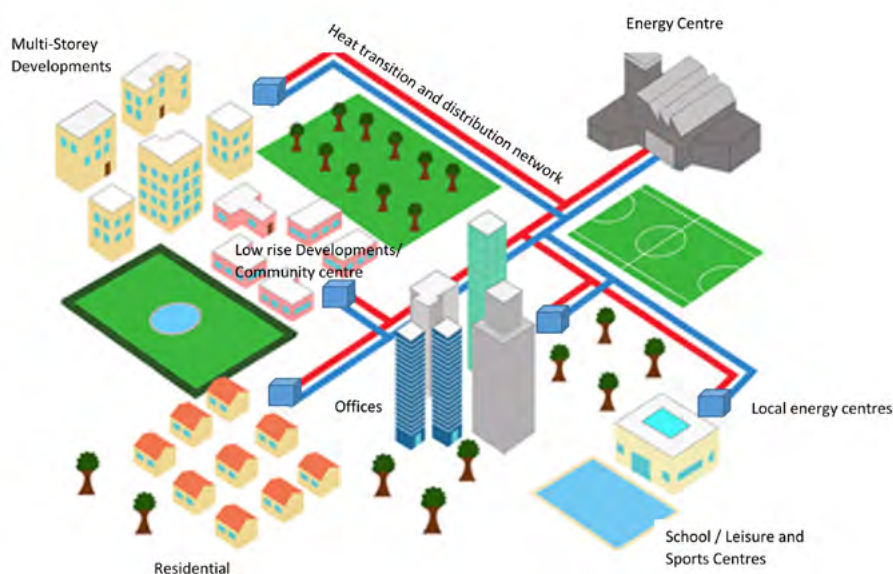
reducing the carbon intensity of heat, reducing fuel costs and helping to tackle fuel poverty. The benefits of district heating derive from economies of scale. Even a local (building-scale) district heating system is usually operating at a greater scale than the alternative heating systems it replaces.

The Scottish Government recognise that district heating could make an important contribution to meeting Scotland's future heat demand in areas where heat density is sufficiently high to develop networks that can provide heat at an affordable cost. Where allied to a low carbon heat source, it also offers the potential to meet heat decarbonisation objectives⁸.

Historically, the city has embraced energy conservation and generation, including district heating dating back to the first public sector social housing developments in the 1920's and 1930's. The Council at that time built the Logie Housing estate often referred to as "The Steamies" on account of the high temperature steam engines serving low rise units.

How District Heating Works

Buildings are connected to the heat network through a substation where the heat used is metered. Buildings may have an associated energy centre which at times provides heat to the building, but at other times feeds heat into the wider district heating network. As the district heating network expands, higher levels of efficiency and resilience are achieved through the incorporation of multiple heat sources supplying multiple and varying demands.



⁸ The Scottish Government, (2017) 'Consultation on Heat & Energy Efficiency Strategies, and Regulation of District Heating': www.gov.scot/Resource/0051/00513244.pdf

Case Study: Low Carbon District Energy Hub at Regional Performance Centre for Sport



The Council secured £2.9 million funding from the Scottish Government's Low Carbon Infrastructure Transition Programme (LCITP) together with capital investment to develop an innovative Low Carbon District Energy Hub at Caird Park Regional Performance Centre for Sport (RPCS). This multi-technology energy centre design combines heat pumps, gas Combined Heat & Power (CHP), solar thermal, photovoltaics, and large thermal stores combined with gas boilers for peak demand and backup.

By delivering a low carbon solution, the Energy Hub will be capable of generating 100% of its electrical demand and provide 85% of the site's heat demand from renewables with a reduction in carbon emissions of at least 536 tCO₂e per annum. The hub will provide key infrastructure that will act as the catalyst to accelerate the city's ambitions for the development of a city-wide energy network.

It has been designed in such a way to have future capacity to feed approximately 220 houses in Mill of Mains or Linlathen housing developments adjacent to the site over the next ten years and to other possible interested parties.

Public sector bodies in Dundee have a key leadership role to play in developing district heating through the actions they take on their own estates to minimise heat demand; transforming the district heating market by providing 'anchor' loads (buildings with major heat requirements); and identifying partnership opportunities for utilising unused excess heat.

The **University of Dundee** has its own district heating system which has served their campus since the early 1970's. This scheme, considered as integral to a city-wide network, has four large engines with opportunities to expand to other feasible properties in the area.

More recently the City Council has delivered a number of domestic district heating installations within ten multi storey developments at Dallfield, Lansdowne, Lochee and Whorterbank, making homes warmer and more fuel efficient.

Dundee City Councils' District Heating Strategy 2018-2028, sets out a long term vision to support the city's growth and low carbon transition using decentralised energy and provides an evidence base to advance district heating network schemes in Dundee, informing both policy and delivery. It identifies potential district heating networks and sets out an indicative programme of short, medium and long-term network development and interconnections together with a deliverable action plan.

ACTION E.13

Explore options to further improve efficiencies in the Council's existing Multi-Storey domestic district heating schemes.

ACTION E.14

Deliver the Low Carbon District Energy Hub at the Regional Performance Centre for Sports as a catalyst project; proving industry/technology programmes and projects.

The City Council were successful in an additional LCITP bid in 2018 to develop an investment-ready business case for the **Dighty Corridor project**. This long-term project would link the waste to energy facility at Baldovie to the Low Carbon District Energy Hub at the Regional Performance Centre for Sport, creating an energy corridor along the line of the



Dighty Burn. Connections would then be taken from this main network pipe to serve homes in Douglas, Mid Craigie, Linlathen, Fintry and Whitfield.

ACTION E.15

Prepare an investment-ready business case that identifies district heating opportunities from the city's Energy from Waste Combined Heat and Power facility.

ACTION E.16

Engage with stakeholders and wider industry to promote district heating in Dundee and work with technology providers to explore the potential for integrating alternative fuels as a source of low carbon heat.

An **Energy Services Company (ESCO)** is a commercial structure created specifically to produce, supply and manage the local delivery of decentralised energy to a 'whole site' development allowing the generation of low carbon energy into the heart of communities. These can operate as a public-private partnership and provide a model with which to co-ordinate the planning, funding, operations, and delivery of low carbon energy production such as district heating networks. The City Council's recent heat network developments represent an investment of around £27m, which could potentially be transferred to an ESCo to operate, and form part of its asset base.

ACTION E.17

Investigate options to create a Dundee City Energy Services Company (ESCO) to help coordinate planning, funding, operations, and delivery of projects.

The Council has been working with the Scottish Cities Alliance and Resource Efficient Scotland to pilot a **Local Heat and Energy Efficiency Strategy (LHEES)** approach in the Lochee Community Planning Partnership area. Proposed by the Scottish Government, an LHEES is intended to establish geographical zones which set out the most appropriate energy efficiency, district heating and heat decarbonisation options for local areas.

The study focuses on the step-by-step practicalities of developing a localised investment plan, the data requirements necessary to inform the plan, the technology solutions likely to be applicable in the area as well as an understanding of how an LHEES model could be replicated across the city.

ACTION E.18

Participate in the Scottish Government's pilot Local Heat and Energy Efficiency Strategy (LHEES) programme and respond to proposals to create a statutory framework for LHEES.



Transport

Objective: Encourage active travel through walking, cycling and public transport and deploy sustainable alternatives to decarbonise transport.

Why Take Action?

Unlike the dense smog and smoking chimneys of the past, today's air pollution is largely considered invisible; caused mainly by emissions from vehicles that can descend into the lungs and aggravate existing health problems such as asthma and heart and respiratory disease.

The Scottish Government acknowledges that local authorities are meeting their statutory responsibilities in actively working towards achieving air quality standards. However, across many areas of Scotland including Dundee, **the rate of progress must increase if air quality standards are to be met.**

The **Cleaner Air for Scotland Strategy – The Road to a Healthier Future** is being implemented to help meet these standards and sets out proposals to reduce air pollution further and fulfil Scotland's legal responsibilities. It has six main objectives on Transport, Health, Placemaking, Legislation & Policy, Communication and Climate Change, with sustainability as a common thread throughout. In addition, Scottish local authorities must consider air quality when developing a Climate Action Plan.

Dundee has an **Air Quality Action Management Area** covering the whole of the local authority

area, as there are locations where the Scottish and UK Air Quality Standards and EU limits for nitrogen dioxide (NO₂) and fine particulates (PM₁₀) are being exceeded.

Placemaking is how we plan, design and manage our towns and cities. This can significantly impact air quality and is fundamental to both the Scottish Government's spatial planning policies and Dundee's Local Development Plan. For example, integrating greenspaces into existing developments can act as a buffer against noise and emissions from vehicles, whilst improving green spaces and active travel opportunities. New developments can be designed so that they generate less traffic, are well linked to public transport, walking and cycling routes and make it easier for people to make sustainable transport choices. This not only helps reduce air pollution but also creates attractive, healthy places to work and live in.

The new **National Planning Framework 3** and **Scottish Planning Policy** set out the Scottish Government's spatial strategy and planning policies to ensure more connected, sustainable places that reduce the need to travel; integrate different transport modes; and provide safe, convenient opportunities for active travel.

Transport in Dundee

Engage Dundee, a consultation process carried out in June 2017 to draw out the priorities of citizens to input to the City and Council Plan, received over 6,000 responses. It highlighted the importance of improving public transport and cycling and walking routes. Increasing sustainable transport options ensures streets are safer and less congested, air quality (and consequently, human health) improves and emissions are reduced.

Active Travel

Cycling is the fastest growing mode of travel in Scotland and recent evidence from the Dundee Travel Active programme shows that communities from across Dundee respond positively to active travel initiatives by walking and cycling more. **However, only 25% of households in Dundee have access to an adult bike and, in 2017, only 1% of journeys in Dundee were made by bike** – that's a third less than the Scottish average on both scores and this despite the fact that 44% of Dundee households do not have access to a car for private use.

Dundee, being a small city, is perfectly suited to cycling around given the right infrastructure, although the hilly topography can pose challenges on some

routes. Active travel is encouraged through provision of walking and cycling routes and various initiatives promoted to schools and communities. Additionally, the Council supports the Dundee Cycling Forum and publishes the Dundee Cycle Map. In line with the **Dundee Cycling Strategy 2019**, cycle paths are being systematically upgraded and extended where feasible; alongside changes in policy and promotion, this will enable more people to cycle more often.

A new major public bike hire scheme for the city will be launched shortly. Supported by the Council and operated by Ride-On Scotland, **350 e-bikes** will be provided at 40 docking stations in the city over the next 12 months.

ACTION T.1

Implement the Dundee Cycling Strategy and Councils Active Travel programme in partnership with community groups, improving and increasing cycling paths and infrastructure across the city to reduce the modal share of car based transport.

A new **Active Travel Hub** will be built in the heart of Dundee's Central Waterfront in 2020. It will be the only building set within a new landscaped and play/beach area sitting adjacent to the V&A Museum and alongside the River Tay and National Cycle Network. The Hub is expected to become a focal point for cycling, walking and sustainability in the city with the operator delivering multiple active travel services to residents of Dundee and visitors to the city.

ACTION T.2

Develop a Low Carbon Active Travel Hub in Dundee Waterfront to include bike hire, cycle parking, bike maintenance, electric vehicle (EV) charge points, an EV car club and community outreach.

Mobility Innovation Living Laboratory project (MILL), a public-private-people partnership led by Urban Foresight, strives to introduce shared mobility solutions that integrate with the transport network based on initiatives tested in the real world, namely Dundee city centre, under the banner ShareMORE (Shared Mobility and Resource Efficiency). This includes projects that improve the efficiency of parking infrastructure, implement easy to access cycle hire schemes, enhance public transport information and accessibility and encourage shared use of assets to reduce the number of vehicles on the road.





The MILL will lead a £3m Innovate UK project to develop a Clean Streets EV Infrastructure Toolkit Demonstrator project. Funding of £550,000 has been allocated to Dundee for the installation of the pop up electric vehicle chargers within the city.

ACTION T.3

Implement Shared Mobility and Resource Efficiency projects developed by the Mobility in Living Laboratory (MILL) to ensure Dundee remains in a position to take advantage of future innovative mobility solutions including autonomous vehicles.

A number of projects are being delivered to further support active travel:

- **Pedal to the Pool**, promoted by Leisure & Culture Dundee, is a family approach to active travel, offering free swimming for children who have cycled to their local swimming pool. Participants take a selfie next to their bike to show they have cycled and they can claim their free swim.
- The **'Get on the Go'** campaign was a joint radio and social media campaign between Dundee City, Perth

and Kinross, and Angus Councils. The campaign was aimed at people driving in their cars, specifically single occupancy cars. The campaign promoted walking, cycling and park and stride, as well as car sharing schemes, with the aim of reducing the number of unnecessary cars on the road.

- **'Safer Routes to School'** leaflets have been designed and distributed to every primary school within Dundee. These school specific maps highlight the recommended safe routes for walking to school, as well as highlighting designated park and stride zones where parents can park up and pupils can walk the rest of the way (typically a ten minute walk is acceptable). These maps are intended to make it easy for families to choose active travel methods, providing information on safe crossings and less congested routes in their area.

ACTION T.4

Ensure safer streets that enable active travel in Dundee including assessing suitable locations for pedestrianisation, 20mph zones and off road/segregated active travel networks.

Buses

Given the low levels of car ownership, Dundee is probably the most bus dependent city in Scotland. The city is fortunate to have an extensive public transport network with high frequency routes and increasingly cleaner, quieter and attractive buses. The city has some of the best passenger waiting facilities in Scotland with a high quality real time information system providing accurate bus information to passengers. The cost of regular bus travel is very competitive and the ABC (All Bus Companies) ticket allows bus users to purchase a product that is valid on all services in the city.

Xplore Dundee, Stagecoach East Scotland and Moffat & Williamson continue to invest in their vehicles and are beginning to explore new technologies that will offer opportunities to decarbonise their fleets in future year.

In December 2018, Xplore Dundee, the city's largest public transport provider, invested £4m in 14 smart-hybrid 'Emerald' buses. Their arrival complemented previous investments in earlier Hybrid-technology with 9 electric-hybrids arriving in 2013, and 5 micro-hybrids in 2015. Low-emission vehicles are now the

standard in their fleet. Xplore Dundee has participated in the Scottish Government's BEAR programme, a scheme which brings older buses up to modern standards. So far, 7 double-decks (currently deployed on services 28/29, which run via the Lochee Road due to its higher levels of NOx pollution) were upgraded in the project's first phase - with funding secured for a further 10 single decks in the second phase.

ACTION T.5

Explore options for increasing deployment of low emission buses in Dundee, including hybrid and hydrogen buses.

The provision of **Park & Ride** facilities on key commuting corridors into Dundee remains a strategic priority for TACTRAN and its Regional Transport Strategy. As our population and workforce grows, Park & Ride infrastructure can help deliver a modal shift in travel towards greater use of public transport, car sharing and cycling, thereby reducing traffic congestion and air pollution and supporting economic growth, connectivity and workforce mobility.

ACTION T.6

Develop and implement proposals for new Park & Ride sites to the south, west, east and north of Dundee and explore the provision of active travel options for these.





Dundee is one of the leading cities, not just in the UK but in Europe, when it comes to supporting and promoting electric vehicles.

Trains

As well as the main railway station in the city centre, Dundee also hosts Broughty Ferry station and Scotrail's 'Rail Revolution' has seen a huge increase in the number of stopping trains there. The local train network now provides a very attractive, quick and affordable way to commute and travel in the city.

Electric Vehicles

To date, Dundee has one of the highest concentrations of Electric Vehicles (EVs) of any city in the UK, with the Council's fleet of over 100 EVs being the largest of any local authority.

The charging infrastructure in the city has continued to grow since it was first introduced in 2011 with a mixture of publically available and private chargers being installed. The 90 charging units across the city have generated over 191,500 charging sessions, totalling an estimated 5.4 million electric miles.

The **Drive Dundee Electric campaign** was launched in June 2017 to encourage and support the uptake of EVs in the area. It is now the face of all the latest news about charging infrastructure, regulation and events, and acts as a point of information and contact to ensure all responses are accurate and quick, providing the best experience to EV owners.

One of the most significant transport sectors to adopt electric vehicles in Dundee has been the taxi industry, with 18% (130 vehicles) of all taxis presently 100% electric. This transition to e-mobility has been achieved by progressive policy changes and continued Council/taxi trade engagement including a reduced price for taxi testing and all new private hire vehicles must be electric.

Co-wheels is a social enterprise car club scheme, allowing members to share the use of multiple cars parked in and around Dundee. Members can pair their



NEC card to their account, book cars online and collect and return them to their dedicated parking bays, unlocking the cars with their own smartcard. The club has a current pool of 15 low and ultra-low emission vehicles, available to members 24/7. Around half of co-wheels cars are electric vehicles, meaning that the club is an important promoter of sustainable, clean transport and as the membership grows, hopefully the emissions within Dundee will continue to reduce. In 2019 Enterprise Car Club also arrived in the city.

ACTION T.7

Expand Electric Vehicle (EV) charging hubs and infrastructure across the city.

ACTION T.8

Increase EV uptake in Dundee via support and awareness provided by the Drive Dundee Electric campaign and local policy measures, including continued migration to low carbon vehicles within the council fleet.

Low Emission Zone

As air quality becomes an increasingly political issue, measures are being put in place to discourage more polluting vehicles from entering areas where air quality is poor. Dundee is one of four Scottish cities that will introduce a **Low Emission Zone (LEZ)** by 2020 in line with Scottish Government targets. An LEZ is a defined geographical area where access for high polluting vehicles is restricted by implementing a Penalty Charge. An LEZ is designed to improve air quality alongside other objectives such as promoting low emission vehicles, which are permitted to enter the zone without penalty.



The Council has setup a delivery group to manage the LEZ development process and this will steer the design and implementation of the LEZ. The delivery group consists of organisations such as SEPA, NHS, Dundee City Council, Transport Scotland, and TACTRAN the Regional Transport Partnership. The Dundee LEZ will use SEPA air quality modelling to provide an evidence base to determine the LEZ with further public consultation. The Scottish government are bringing forward legislation to support LEZs in the new Transport Act and a final LEZ proposal will be submitted to Scottish Ministers for approval in advance of its introduction.

ACTION T.9

Establish a Low Emission Zone in Dundee by 2020 to contribute to the broader city objectives and the vision to create a healthy, vibrant and attractive city by protecting public health through improving air quality.

ACTION T.10

Continued promotion of ECOSTARS schemes to encourage Heavy Duty, Taxis and Private Hire vehicle companies to participate in air quality improvements in Dundee.

Case Study: ECO Stars Dundee

Two ECO Stars schemes have been set up in Dundee to provide information and support to the city's fleet operators to help them improve vehicle efficiency, reduce fuel consumption and reduce emissions whilst rewarding them with a star rating and cost savings.

The first to launch was the Heavy Vehicles scheme in December 2013 (supported by TACTRAN), while the Taxi – Private Hire Vehicles scheme was launched in March 2015.





The **Michelin Scotland Innovation Parc** is a joint venture between Michelin, Scottish Government, Dundee City Council and Scottish Enterprise to deliver Scotland's centre for driving innovation and investment in sustainable mobility and low carbon energy, giving a significant boost to Dundee's and Scotland's journey to net zero emissions.

It will provide business and industry with support packages containing a mix of grants, loans and

incentives as well as competitive rates, space and expertise for innovation and prototypes. To make sure that this support is at the cutting edge of technological and industrial expertise, it will be backed up by partnerships with academia and industry experts.

The Parc will also include an Advanced Skills Academy to help to develop the workforce of the future, delivering bespoke packages covering data, digital, creativity and innovation, as well as core technical skills.





Waste

Objective: Manage waste sustainably by reducing, reusing, recycling and recovering waste to improve resource efficiency whilst working towards a circular economy.

Why Take Action?

The way we obtain, use and dispose of goods has a significant impact on our carbon footprint. The economy has continued to move from a manufacturing base towards the services sector and one of the consequences of this is that more of the goods we buy and use are now produced overseas. We are all consumers – of food and drink, personal travel, household products and travel tourism. As such, we are accountable to some degree for the pressures which our consumption puts on the environment. Changes in material consumption patterns and a shift towards more sustainable waste management not only saves money; they also have significant implications for reducing emissions.

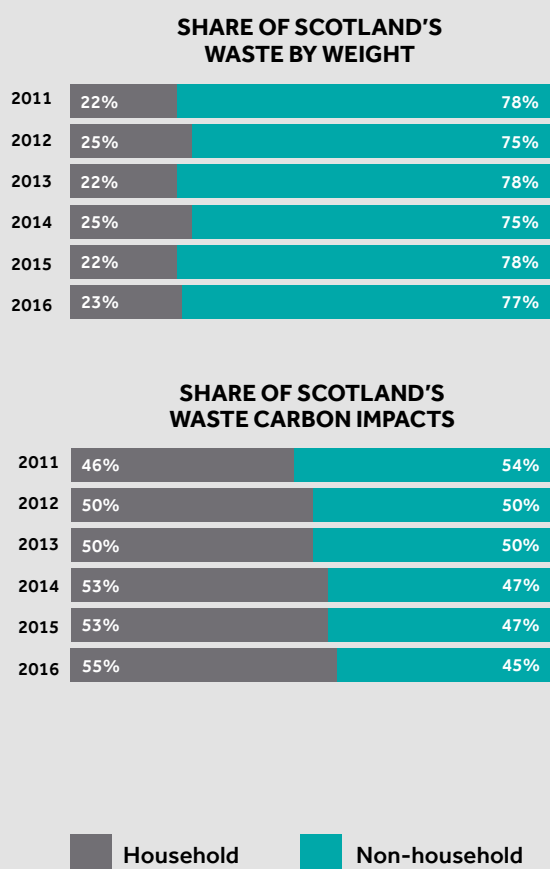
The five main policy drivers to reduce waste generation and increase recycling rates in Scotland are:

1. Ban on biodegradable municipal waste to landfill from 2025
2. Reduce waste arisings in Scotland by 15% against 2011 levels by 2025
3. Reduce food waste arisings in Scotland by 33% against 2013 levels by 2025
4. Achieve 70% recycle rate for all waste by 2025
5. Landfill no more than 5% of waste by 2025

Zero Waste Scotland has developed a Carbon Metric tool to help assess the carbon impacts for waste materials. The Carbon Metric quantifies the complete **lifecycle impacts** of more than 30 different common waste materials, providing policy makers and business leaders with an alternative to weight-based waste measurement, and allowing them to identify and focus specifically on those waste materials with the highest carbon impacts and greatest potential carbon savings.

Figure 8 shows that household waste accounts for less than 25% of all Scottish waste by weight, but a growing majority of the carbon impacts due to the high carbon value of household waste and more rapid impact reduction in the non-household waste stream. Food waste in particular has a high carbon impact, accounting for 2% of all waste but 22% of all carbon impacts.

Figure 8: Comparison of Weight and Carbon Impact of Scotland's waste



Source: www.zerowastescotland.org.uk/research-evidence/carbon-metric-summary-report

Circular Economy

A circular economy is an alternative to a traditional linear economy (make, use, dispose) aiming to 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 of each service life. This closed loop model can offer businesses new commercial opportunities, reduce resource costs and to reduce carbon emissions.

The Carbon Metric is helping to measure our progress towards a circular economy, proving that sustainable waste and resource policy can deliver major emissions savings across all economic sectors.

Local businesses are being supported to maximise circular economy opportunities through **Circular Tayside**, a joint Chamber of Commerce and Zero Waste Scotland initiative to deliver savings across the Food and Drink, Manufacturing, Energy/Oil and Gas and Manufacturing sectors.

Although much work is already taking place, many opportunities were identified in the action planning process that could accelerate our progress towards a more circular economy in Dundee. Opportunities will be identified and taken forward by Circular Tayside, with a city-wide circular economy education and awareness strategy to be developed.

ACTION W.1

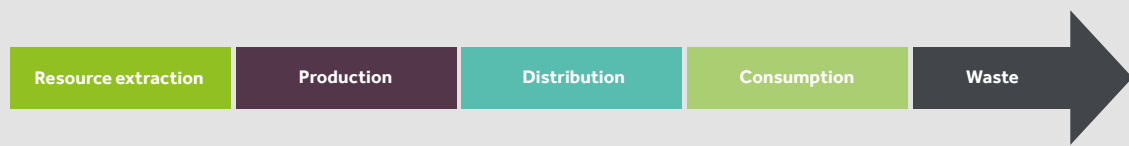
Develop and implement circular economy projects identified by the Circular Tayside initiative and deliver a circular economy education strategy across the city.

Waste in Dundee

Scotland's Zero Waste Plan 2010 sets a municipal recycling target of 70% by 2025. Dundee City Council currently recycles 35% of household waste and is working on improving, enhancing and supporting these services further.

Comprehensive recycling collections have been rolled out across the city since 2012 and these services are now fully compliant with the **Charter for Household Recycling in Scotland** (a government initiative to bring consistency to recycling services across the country).

Linear Economy



Circular Economy



Dundee is the first city in Scotland to achieve this and internal waste management practices are now also being aligned with the Charter. The Council's Waste team continually assesses collection routes, improving these where possible to avoid unnecessary trips, therefore reducing emissions and fuel costs as well as increasing resource efficiency.

Current waste education and awareness programmes include support on how to '**Reduce, Re-Use and Recycle**' to schools and community groups. Meaningful opportunities and activities are regularly offered to a variety of people, linking to the 'Take Pride in your City' campaign. The Council has been working with Zero Waste Scotland to develop a **Community Litter Prevention Action Plan**, made up of individual plans from each of the Council's services, businesses, schools, community groups and organisations.

With the ban on biodegradable waste going to landfill coming into force in Scotland in 2025, Dundee will support and participate in the national campaign to **reduce food waste** across businesses, schools and homes.

Technology is also playing its part in waste reduction. The **Smart Street Waste** project is trialling a mix of smart technology including solar-powered compactor bins, sensors in street and park area bins, electric industrial vacuum machines and the utilisation of hand held devices, which could lead to a reduction in journeys for emptying and efficient route planning, thereby reducing emissions.

ACTION W.2

Continue to communicate frequently with residents around waste/recycling services to improve participation/recyclate quantity and quality.

ACTION W.3

Zero Waste Scotland to pilot food waste reduction project in Dundee schools, hospitals and small businesses by December 2020.

ACTION W.4

Encourage citizens to take personal and shared responsibility for the environment through the Take Pride in Your City campaign.

ACTION W.5

Trial Smart waste technology to improve waste monitoring and collection efficiencies in the city.

ACTION W.6

Explore initiatives to significantly reduce the quantity of single-use plastics used in Dundee organisations including Council premises and wider commercial establishments.

ACTION W.7

Continued delivery of sustained waste education campaign programme which aligns to the curriculum for excellence and embeds behavioural change at all stages of the educational journey.

Introducing a **deposit return scheme** is part of Scotland's ambitious plans to develop a circular economy. These schemes are used in lots of places around the world as a way of encouraging more people to recycle certain drinks containers, such as plastic, glass bottles and metal cans. They work by charging anyone who buys a drink a deposit for the bottle or can it comes in. They can get this money back when they return the bottle or can to a collection point to be recycled. Such schemes have been found to increase recycling of drinks containers to much higher levels than we have in Scotland at the moment.

The public consultation on a deposit return scheme for Scotland received more than 3,000 responses from individuals and organisations, indicating the high level of public interest. The final scheme design has now been published and the Scottish Government laid the





proposed Deposit and Return Scheme for Scotland Regulations 2020 before parliament in September 2019. It is anticipated that these regulations will be passed in early 2020 and that the Deposit Return Scheme will be operational by April 2021.

ACTION W.8

Support the Scottish Governments Deposit Return Scheme and other viable take back schemes.

Reuse and Repair

Thousands of tonnes of waste are thrown out by households each year and finding alternative uses by reusing and repairing can divert this waste and save carbon. There are a range of organisations in the city actively involved in re use and repair of a range of items including, textiles, furniture, bikes, electronic and white goods.

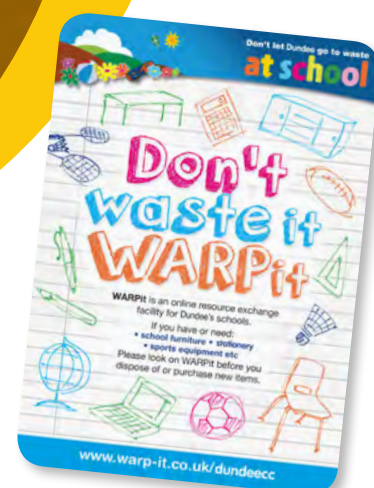
The **Baldovie Community Reuse Hub** was initially a pilot project between the Council, Tayside Re-Users, Transform and Dundee Social Enterprise Network. Items are saved from the skip and repaired, reducing waste. Since September 2015, approximately 135 tonnes of goods have been recovered. Following successful completion of the pilot, Tayside Reusers will be taking the project forward.

WARPit (Waste Action Re-Use

Portal) is an online tool that makes it easy for organisations in Dundee to locate and obtain surplus resources (such as furniture, office consumables, electrical items, fixtures and fittings, books and technical equipment) thereby reducing procurement spend and waste disposal costs, as well as minimising waste and reducing associated carbon emissions.

Since launching in 2014, Dundee City Council's use of WARPit has saved over £320,000 in item replacement, waste disposal and procurement costs; 154 tonnes of CO₂ and 53 tonnes in waste disposal. Items totaling almost £69,000 have been donated to local charities.

A Tayside Charities WARPit account has also been established with over 20 members, through which charities and social enterprises across Dundee and the wider Tayside region can sign up, donate their surplus resources, and claim additional resources, for free. Not only is WARPit a great way to make the best of our region's resources through partnership working, but it will help to record and track our collective monetary and carbon savings.



ACTION W.9

Stimulate increased reuse as well as upcycling and repairing opportunities and the necessary skills and training to undertake these.



Resilience

Objective: Ensure our communities, green networks and infrastructure are adaptable to a changing climate and reduce the risks and vulnerability to unavoidable impacts.

Why Take Action?

The experience of recent years has shown us that climate change and extreme weather events have already impacted many aspects of our natural environment and our society, including buildings and property, health, agriculture, forestry, transport, water resources and energy demand.

Climate Resilience concerns how we adjust these aspects to the impacts of climate change. This

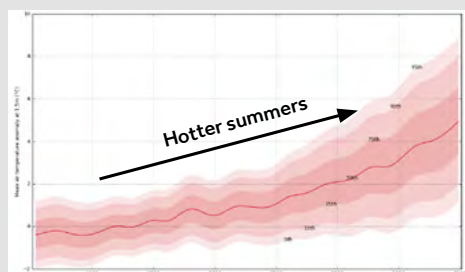
will require changes in processes, practices, and structures to moderate potential damages or to benefit from opportunities associated with climate change. Dundee will need to develop adaptation solutions and implement actions to respond to the impacts of climate change that are already happening, as well as prepare for future impacts.

Future Climate in Dundee

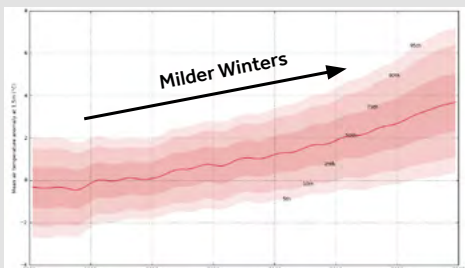
As shown in the graphs below, Dundee's climate is set to get warmer and drier in the summer and milder and wetter in the winter. It is also expected that Dundee will experience higher incidences of extreme weather events such as flooding and storms and a rise in sea level around the coast. What is considered a heatwave or extremely hot summer today will occur more frequently in future.

Figure 9: UKCP18 climate projections for Dundee

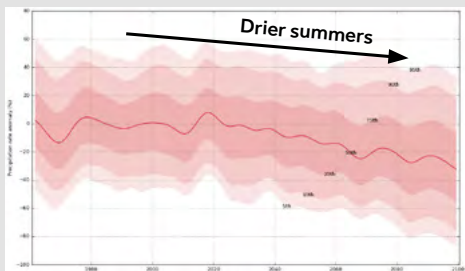
Mean summer air temperature 1961-2100



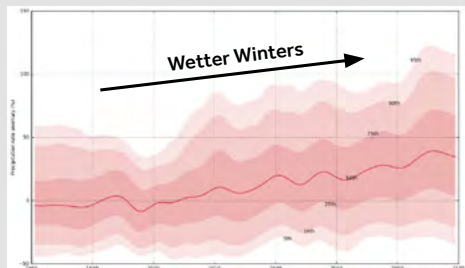
Mean winter air temperature 1961-2100



Average summer precipitation 1961-2100



Average winter precipitation 1961-2100



Climate Risk and Vulnerability Assessment

As required by the Covenant of Mayors, a Risk and Vulnerability Assessment of ten policy sectors was carried out in small workshops with key resources in each policy sector to determine the nature and extent of climate related risks in Dundee. Climate impacts were identified for each of the climate hazards/scenarios for the policy sectors with an estimate of how likely they are to occur, the level of impact and the timeframe for occurrence, short, medium or long term. The policy sectors and some examples of impacts are shown below.

| POLICY SECTOR | EXPECTED IMPACT(S) |
|------------------------------|---|
| Buildings | Increased demand for cooling and insulation, higher costs for repair and maintenance. |
| Transport | Damage to transport infrastructure, extreme weather impact on mobility, higher maintenance costs. |
| Energy | Damage to electrical infrastructure and power generation facilities. |
| Water | Increased water scarcity and drought, impacts upon flora and fauna, lower ground water recharge. |
| Waste | Damage to waste infrastructure and treatment facilities, site and access disruption. |
| Land Use Planning | Urban heat island effect, erosion and floods, including coastal. |
| Environment & Biodiversity | Ecosystem degradation, species migration, insect infestation, habitat loss due to flooding, access to food. |
| Health | Increased disease and mortality rate, hygiene issues, increased incidence of injury. |
| Civil Protection & Emergency | Increased number of disasters/deployments, increased insurance costs. |
| Tourism | Decline in tourism and demand, closure of museums, increased maintenance costs, reduction in bathing water quality. |

During this exercise, climate resilience actions were co-designed with stakeholders, including NHS Tayside, Scottish Water, SEPA and Scottish Natural Heritage. Many of the actions identified were already in progress by various organisations; some new actions were identified during the Climate Action Plan visioning event; and the remaining actions were devised in partnership with the stakeholders.

The full Risk and Vulnerability Assessment is available as a separate, supporting document to the Climate Action Plan.

The benefit of collaborating across sectors to co-design adaptation and resilience actions are that the actions are deliberated in a holistic, integrated manner, with due consideration given to "place". Going forward, this will mean designing urban areas with the people who use it, to creating a place with a strong identity, engaging successfully with its surrounding buildings, nature and activities. For example, when increasing green infrastructure, rather than designing this in isolation, this might be integrated with a new cycle route and contain planting that can withstand climate changes, increase biodiversity and reduce heat island impacts.

Resilience in Dundee

Infrastructure and Services

Designing infrastructure, building and services to be climate ready will involve **climate proofing** new developments as well as retrofitting adaptive measures, such as increasing cooling systems and protecting the built heritage of the city.

Since 2009, Councils in Scotland have had a duty to work towards a co-ordinated flood risk management plan. Studies have demonstrated that large areas of Broughty Ferry are at significant risk and during a 1 in 200 year event, extreme water levels in the River Tay would cause flooding. The estimated costs to residents, businesses and infrastructure would be in the region of £97 million with 450 properties at risk.

The £13.5m **Broughty Ferry Flood Protection scheme** is currently at detailed design stage and will see the construction of a new setback wall and gates along with a four metre wide combined cycle walkway running from Douglas Terrace to Broughty Castle. This scheme will also include soft flood protection measures utilising the existing sand dunes along Broughty Ferry Esplanade from the car park to the Glass Pavilion.

An investment of £6.9m has recently been made to construct set back walls and flood gates from the central waterfront to Dundee Airport which used local stone to minimise the carbon footprint and incorporated a combined cycle walkway.



Early collaboration with other sectors in the development of projects can ensure that opportunities to enhance biodiversity, water management and active travel are considered at the pre-design stage.

Dundee City Council is working closely with Scottish Water on an integrated catchment study to develop Surface Water Management Plans. This will include measures such as increasing permeability of surface, increasing blue and green infrastructure and improving urban drainage networks.

Scottish Water will increase their network to ensure sufficient drinking water is available, expanding to the River Tay in times of low flow. Rainwater harvesting and conservation techniques will help to provide additional back up, as well as help to reduce supply and treatment related carbon emissions and energy use. Increased use of renewables will ensure we are resilient to interruptions in energy supply and Business Continuity plans will be updated to incorporate climatic risks.

ACTION R.1

Design a Dundee Surface Water Management Plan/Tayside Integrated Catchment Study that considers measures to reduce flood risk and protect buildings, infrastructure and people from flooding and includes blue-green infrastructure across the city and/or retrofitting SUDS to store and manage surface water runoff. Ecological solutions will be used where possible e.g. dune replenishment as part of Dundee Coastal Flood Protection Scheme.

ACTION R.2

Undertake coastal and watercourse inspections and organise repairs and maintenance under current legislation and the Tay Estuary and Montrose Basin Local Flood Risk Management Plan.

ACTION R.3

Improve Dundee's Public Sewer and Mains Water systems to improve drinking water quality and reduce sewage discharge to the water environment; continued communication of water quality information via electronic display, SEPA website and Dundee City Council signage and social media.

ACTION R.4

Scottish Water will review and develop its 25 Year Water Resource Plan to ensure projected drought conditions are included; incorporating reinforcement of reservoirs, expanding the supply network and developing mitigation measures as required.

ACTION R.5

Monitor costs associated with climate change including heating and cooling costs as well as maintenance and repair costs of buildings and infrastructure.

ACTION R.6

Promote efficient water use by businesses and the wider community and create a business case for rainwater capture and reuse capital investment.

ACTION R.7

Implement 'Cleaner Air for Scotland - The Road to a Healthier Future' strategy and monitor guidance for developers to ensure air quality is taken into account for new developments.

Case Study: Broughty Ferry sand dune management

Soft engineering techniques are being utilised to restore and develop the dunes and act as a natural flood defence, avoiding the need for more costly wall structures or stone cores.

The height and width of the land side dunes will be increased at points to provide better flood protection. This involves removing the top layer of grasses and vegetation, importing sand and relaying the grasses which help stabilise the dune and provide a barrier to absorb wave energy.

On the sea side of the dunes, chespaie fencing will be used to trap moving sand and allow the dunes to grow out. It will also be used to create beach access points and prevent public access in order to help protect and stabilise the dunes and prevent erosion. These works will be complemented by a programme of planting new grasses and inspection regimes.



NHS Tayside are already experiencing increased demands on the service due to extreme weather events and a changing climate. Public health campaigns and regular testing and review of Winter Plans to prioritise services will be critical. The **Dundee Green Health Partnership** is one of four national pilot projects funded by Scottish Natural Heritage. In partnership with existing projects – Nature Based Interventions, NHS Tayside and developing referral pathways, it works on improving mental health and well-being using green spaces in Dundee.

ACTION R.8

Public health information campaigns to address increase in sun/heat/air and water quality related illnesses and development of Green Health Partnership, linking health care and greenspace initiatives.

ACTION R.9

Develop an interactive green map for Dundee to help visitors and residents identify sustainable options and information for travel, food, recreation and resource use.

SMART technology, such as that being developed for the waste and transport sectors in SMART cities, can help to ensure communication methods are prompt and wide-reaching, for example during transport interruptions, providing quicker demand response options for commuters and visitors to Dundee. New online tools such as **Climate Just** can also help us to identify vulnerable communities and future flood risk.

If waste services are disrupted due to weather events there could be increases in litter and fly tipping and longer refuse runs. The **Take Pride in Your City** campaign will continue to encourage responsible litter behaviour whilst waste service operational contingencies will continue to be reviewed and updated. Waste reduction/circular economy education and activities will help to mitigate this.



ACTION R.10

SMART Mobility to include co-ordinated communication of transport information and quicker demand response options to keep visitors and residents informed of disruptions and alternatives.

ACTION R.12

Develop adaptation engagement tools to support community capacity building, including visual and interactive tools, workshops and collaboration with community organisations.

ACTION R.11

Plan co-ordinated, prompt communication to inform residents of waste service disruptions, alternative options available and estimate of when normal services will resume; ensuring that operational contingencies are in place for extreme weather events.

ACTION R.13

Develop a Persons at Risk Register in partnership with the NHS to help identify members of the community vulnerable to interruptions in supply of power, heating, water and other essential services and regular testing and review of Local Resilience Partnership plans and NHS Winter Plans to prioritise services.

Community Resilience

Ensuring Dundee is a truly resilient city, where communities feel empowered and connected, will be challenging. When broadening out from purely climatic impacts, resilience becomes even more challenging and complex, and will rely not only on our local communities working together but also on the emerging field of resilience science and the experience of other communities in order to find solutions that truly empower communities and do not just rely on physical adaptation measures.

Local Resilience Partnerships carry out considerable planning to ensure that communities, especially the vulnerable, are supported during events that may cause an interruption to services and utilities, e.g. storms and flooding. The Council also has robust Flood Emergency Plans in place and climate related risks are taken into account in the Council's Risk Register.

Communication will certainly be key to ensuring that Dundee is resilient to climate change. Whether it be engaging with communities to co-design resilient neighbourhoods or helping schools and businesses and communities prepare for future risks to health or climate hazards and possible interruptions to essential services, clever and effective methods of communication will be essential.

Community-based adaptation empowers people to use their own knowledge and decision-making processes to take action.

ACTION R.14

Update the Green Tourism accreditation to incorporate climate adaptation and increase the number of Green Tourism Award Holders in Dundee.



Case Study: Eco Schools

Eco-Schools is a global programme designed to encourage a whole-school approach to **Learning for Sustainability**, encouraging young people to engage in their environment by allowing them the opportunity to actively protect it. To earn a Green Flag Award, schools choose from 10 topics, ensuring that it is pupil-led, linked to the curriculum and the UN Sustainable Development goals.



Many schools in Dundee undertake wide-ranging activities related to sustainability and climate change, providing a significant opportunity to affect behaviour change as well as directly reducing resource use across buildings. Increasing Eco-Schools attainment has the potential to reap considerable benefits.

Dundee City Council is endeavouring to increase Eco-Schools Green Flag status by adopting a co-ordinated approach; ensuring schools are aware of local support available to them and how Eco-Schools can be easily integrated into their curriculum across many learning objectives. By supporting a small number of schools through the new process in a pilot project, we hope to encourage others to take part by demonstrating the new process and the benefits of taking part.

ACTION R.15

Increase participation in the Eco-Schools programme in Dundee via improved local support and pilot projects with appointed schools.

One of our major underpinning aims is to care for the 'green lungs' of Dundee, to the benefit of citizens, visitors and biodiversity alike. More than 20 parks and greenspaces are annually assessed against the **National Green Flag** criteria, a number of which consider the impacts of climate change. 6 green spaces successfully attain a nation-wide Green Flag award.

It is important to ensure that as Dundee develops and adapts to change, people living, working, or visiting the city continue to have access to quality, connected, multifunctional and well managed green infrastructure.

Green Networks and Biodiversity

The health of our natural environment is vulnerable to the effects of climate change with the delicate balance of ecosystems likely to be affected, transforming our habitats and biodiversity and adding to existing pressures. Some distinctive species may struggle and could be lost, invasive non-native species may thrive, while a degraded environment may not be able to sustain productive land or water supply if risks are not properly managed.

Over 40% of Dundee is publicly accessible greenspace, with our waterfront location stretching 16.5km along the Tay Estuary. The water quality of the Tay makes it one of the best major estuaries in Europe and supports biodiversity and habitats which have been recognised internationally and offered protection through a number of natural heritage designations.



This includes individual elements such as trees, woodlands, allotments, community growing spaces, sustainable drainage systems, waterways, footpaths, cycleways, parks and wildlife corridors.

The TAYplan and Local Development Plan for Dundee promote policies to connect these individual elements into a multifunctional green network in order to improve environmental quality, link and create wildlife habitats, protect existing features and provide a range of opportunities for leisure and recreation.

The **Dundee Green Network**, was identified in a collaborative project between the Council and Scottish Natural Heritage. The Dundee Green Circular and the Dighty Wildlife Corridor are important green assets in the City and essential parts of the Dundee Green Network.

New development offers an opportunity for the Council to work with its partners to strengthen and extend the

network of green infrastructure. Developers will also be expected to play a key role in the improvement of the network by incorporating green and blue infrastructure into development which is consistent with the advice set out in the Dundee Green Network Planning Guidance.

ACTION R.16

Co-design blue/green infrastructure improvements in partnership with relevant departments and the wider community. Aligning with Dundee City Councils green networks supplementary planning guidance; improvements will into account flooding, heat island effect, active travel, biodiversity and including appropriate planting in urban areas, as well as community cohesion opportunities.



ACTION R.17

Produce an Open Space strategy based on collaboration and outcomes from workshops to include green infrastructure that helps Dundee's nature to adapt to changes in climate and supports the delivery of Dundee's green networks.

Preventing biodiversity loss as well as increasing biodiversity in the city will be the main objectives of the new Biodiversity Plan; and for this to happen, biodiversity needs to be incorporated into decision making across all sectors. Enhancing habitats, improving monitoring and changing green space maintenance regimes to favour biodiversity are one part of the picture.

Creating climate proof habitats will be taken into account in new developments and infrastructure improvements. For example, improving flood defences at Broughty Ferry will involve replenishing the dunes, thus enhancing coastal habitats.

Dundee's trees and woodlands have a multi-faceted role in helping to both mitigate carbon emissions and adapt to climate change by improving the quality of our air, cooling our warming city, reducing the risk of flooding as well being an excellent store of carbon. A warmer wetter climate will pose significant risks to tree health through extreme weather events or increased spread of pest and diseases which highlight the importance of positive management of our trees and woodlands over the long-term.

ACTION R.18

Prepare a Biodiversity Plan that includes actions for safeguarding and enhancing existing habitats and species, ensures biodiversity is prioritised in green space maintenance and that new biodiversity developments are climate proof where possible.

ACTION R.19

Contribute to the enhancement and maintenance of the Tay River and coastal habitats. Identify opportunities for soft coastal management /managed realignment habitat creation and maintain the Beach Award for Broughty Ferry.



Community food growing is one of the best ways to increase neighbourhood resilience,

ACTION R.20

Monitor and review the Urban Tree Policy to identify suitable areas for tree planting with climate appropriate species and with consideration of how planting interacts with surroundings e.g. air quality, active transport, biodiversity etc.

Community food growing is one of the best ways to increase neighbourhood resilience, empowering people to work together to produce their own resources, share with others and build relationships and support networks.

In 2014, funding was made available to develop growing spaces, with local projects now established in Menzieshill, Douglas, Lochee, Ardler, Charleston and Maryfield and work ongoing with the local community to establish a growing space in Fintry.

ACTION R.21

Develop a Local Food Growing Strategy and support and encourage communities to establish growing projects in their local areas.

Delivering the Climate Action Plan

Action Plan

The Plan will be delivered through the four themes of Energy, Transport, Waste and Resilience with each theme including an initial set of actions (Annex 1) to reduce emissions or adapt to a changing climate, taking into account existing projects, stakeholder priorities and national initiatives.

Three types of actions have been defined:

- Those that have **direct** impact on emissions and resilience, such as an energy efficiency programme.
- Those that help to **deliver** or implement the direct actions, such as undertaking research, securing funding, measuring and monitoring.
- Those that **enable** the delivery of actions such as developing governance and project management frameworks.

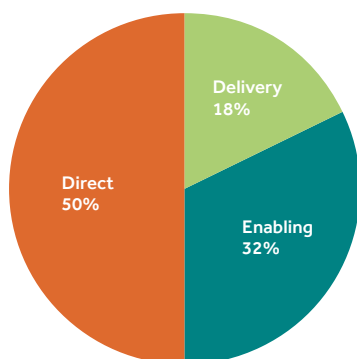
64 actions have been identified for the Climate Action Plan and are split as shown below:

Funding and Resourcing

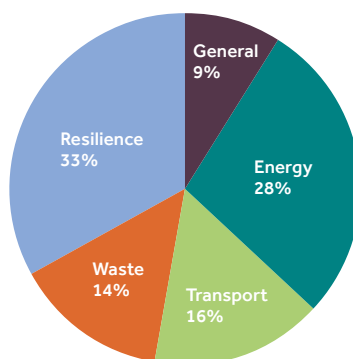
The successful delivery of the Plan's actions will depend on appropriate levels of funding and resources being in place. It is stressed that these actions represent **a mix of committed and desired interventions** across stakeholders, with many actions already having funding committed, whilst others will require feasibility studies or business cases in the first instance to determine their viability and funding to be secured to make them happen. This is particularly the case for some of the larger projects.

What is clear is that significant additional investment will be needed for a number of projects if the targets are to be met. All stakeholders are therefore committed to exploring potential sources of funding through existing avenues as well any innovative approaches to ensuring projects can be delivered.

Split of actions by type



Split of actions by theme



Funding / Resources



The Climate Action Plan is a city wide plan, not just a Council document. It is essential that all stakeholders play their part in proposing and taking forward actions. The action plan will therefore constantly evolve and change to reflect ongoing engagement and the adoption of further actions from other stakeholders to support the Plan.

Governance

Successful implementation of the Climate Action Plan will require governance at both strategic and action level.

A high-level Dundee Climate Change Partnership will therefore be established to provide oversight and review of the Climate Action Plan and to consider additional interventions required to achieve net-zero greenhouse gas emissions by 2045 or sooner.

A biennial Dundee Climate Change Conference will also be held to consider progress. It will provide a forum, to involve interest groups, communities, local and national partners and elected members in a review of climate change matters and Dundee's response as well as an opportunity to influence the direction, policy and investment of city partners.

ACTION G.3

Establish effective Climate Action Plan governance in partnership with public, private and community organisations and implement a system for monitoring and reporting progress.

Monitoring & Reporting

The Climate Action Plan sets out our long term pathway across the four themes and the action plan highlights the initial steps we will be taking along the way. However, we cannot be sure what the future of our energy system will look like, given emerging technologies and increasingly localised energy systems. To take account of the anticipated changes, we will review progress regularly and evolve the plan



over time reflecting changes to legislation, best practice and attitudes.

Monitoring of individual projects will be undertaken by project leaders and reported on a six monthly basis via Dundee City Council's performance management system (PENTANA). Annual monitoring reports will be prepared for the Council's Policy and Resources Committee outlining progress on action plan projects.

We will also explore new carbon footprint visualisation tools that can be used to model future emissions scenarios and interventions in Dundee and help measure progress in meeting our targets.

For the Covenant of Mayors requirements, a more in-depth report will be prepared every two years accompanied by a MEI using latest data available. This will monitor every action for progress and evaluate the quantifiable reductions in carbon emissions where possible.

Communications

Stakeholder engagement and statutory consultations have been undertaken to develop the Climate Action Plan. Further engagement will be necessary to raise awareness to all stakeholders as it is implemented. We will develop a communications plan to allow a coordinated approach for ongoing engagement and consultation to ensure people can follow progress and find out about climate change activities in Dundee.

Our main platforms for communication will be the Knowledge Hub, Dundee City Council website (www.dundee.gov.uk/sustainable-dundee), and the Sustainable Dundee (@sust_dundee) and Dundee City Council (@dundeecouncil) Twitter accounts.



Sustainable Dundee is a brand and campaign developed by Dundee City Council to raise awareness of, and link up, sustainability and climate change issues and progress, both internally and to the wider community. The branding visibly demonstrates relationships between the four themes of the Plan.

The logo will feature throughout internal and external webpages containing related information as well as printed publications from the various sections involved, acknowledging the position of such projects within a broader 'vision' or goal. The brand retains its own individual Twitter account (@sust_dundee), allowing us to reach a wider audience.

ACTION G.4

Develop the Sustainable Dundee communications strategy to raise awareness, communicate and engage people in the Climate Action Plan to promote prolonged behaviour change.

ACTION G.5

Friends of the Earth Tayside will raise public awareness of the causes and implications of climate change, and seek to influence people's behaviour, through campaign activity, media coverage, and collaboration with other organisations.

ACTION G.6

Friends of the Earth Tayside will lobby (with others where appropriate) for policies and actions by the public, private and voluntary sectors which will contribute towards reductions in greenhouse gas emissions and help build resilience to the impacts of climate change.



Contact

sustainability@dundee.gov.uk

www.dundee.gov.uk/sustainable-dundee

Twitter: @sust_dundee

Knowledge Hub: www.khub.net/group/dundee-city-sustainable-energy-and-climate-action-plan

Annex 1: Action Plan

Targets with tbc are to be confirmed when potential carbon savings or other relevant factors have been assessed.

General

| | Action | Lead Agency | Partners | Type of Action | Funding in Place |
|-----|--|------------------------------|--|----------------|------------------|
| G.1 | Adopt an emissions modelling tool to quantify the impact of Climate Action Plan actions, to inform future targets and present data in an interactive way. | Dundee City Council | Sustainable Scotland Network | Delivery | No |
| G.2 | Develop and trial a carbon budget for Dundee City Council and encourage other organisations in the city to prepare carbon reduction plans. | Dundee City Council | Dundee Partnership | Delivery | No |
| G.3 | Establish effective governance for the Climate Action Plan in partnership with public, private and community organisations and implement a system for monitoring and reporting progress. | Dundee City Council | Dundee Partnership | Enabling | Yes |
| G.4 | Develop the Sustainable Dundee communications strategy to raise awareness, communicate and engage people in the Climate Action Plan to promote prolonged behaviour change. | Dundee City Council | Dundee Partnership | Delivery | Yes |
| G.5 | Friends of the Earth Tayside will raise public awareness of the causes and implications of climate change, and seek to influence people's behaviour, through campaign activity, media coverage, and collaboration with other organisations. | Friends of the Earth Tayside | Dundee Green Groups, Dundee City Council | Delivery | Yes |
| G.6 | Friends of the Earth Tayside will lobby (with others where appropriate) for policies and actions by the public, private and voluntary sectors which will contribute towards reductions in greenhouse gas emissions and help build resilience to the impacts of climate change. | Friends of the Earth Tayside | Dundee Green Groups | Delivery | Yes |

Energy

| | Action | Lead Agency | Partners | Proposed Performance Indicators (where applicable) | Targets (where applicable) | Type of Action | Link to SDG's * | Funding in Place |
|-----|---|---------------------|---------------------------------|--|---------------------------------------|-------------------|-----------------|------------------|
| E.1 | Adopt a Whole Life Costing approach to ensure new developments achieve greater operational sustainability. (This will include analysis of maintenance burdens, end of life use, outputs and performance to ensure resilient, efficient buildings are designed with minimal waste.) | Dundee City Council | – | • Number of new developments designed by whole life costing principles. | – | Enabling/Delivery | 9, 11, 12, 13 | No |
| E.2 | Complete fabric improvements to outstanding domestic Council (and ex-Council properties in mixed-tenure blocks) stock to achieve the Energy Efficiency Standard for Social Housing (EESH) by 2020 and widen range of technologies (including renewables) under consideration to allow compliance with the more exacting EESH2 standard by 2032. | Dundee City Council | Public and private partnerships | • Energy savings (kWh/a) attributed to External Wall Insulation (EWI) and other fabric improvements to domestic housing stock. • % council houses achieving Energy Efficiency Standard for social housing. • % Reduction in fuel poverty in all tenure households. | • 100% social housing to achieve EESH | Direct/Delivery | 1, 7, 11, 13 | Yes |

* Sustainable Development Goals

| | Action | Lead Agency | Partners | Proposed Performance Indicators (where applicable) | Targets (where applicable) | Type of Action | Link to SDG's * | Funding in Place |
|------|--|-----------------------------|--|--|--|------------------|-------------------------|--------------------------|
| E.3 | Continue to deliver a city-wide energy awareness campaign to improve energy efficiency behaviour in all households. | Home Energy Scotland | Housing Associations, Dundee City Council | <ul style="list-style-type: none"> Number of households engaged. Number of measures implemented. Energy savings (kWh/a) attributed to improved energy efficient behaviour in households. | • tbc | Direct | 1, 7, 11, 12, 13 | Yes |
| E.4 | Explore how the work of the Dundee Energy Efficiency Advice Project (DEEAP) can be maintained and delivered. | Dundee City Council | Home Energy Scotland | <ul style="list-style-type: none"> Number of home visits by DEEAP advisors. | – | Enabling | 1, 13, 17 | No |
| E.5 | Complete phase 1 of the Non Domestic Energy Efficiency (NDEE) retrofit of Dundee City Council public buildings (Basket 1) before implementing subsequent phases (Baskets) annually until all prescribed measures are complete on all Council public buildings. | Dundee City Council | – | <ul style="list-style-type: none"> Energy savings (kWh/a) attributed to NDEE measures. Number of non-domestic properties upgraded. Energy consumption in Council buildings (tCO₂e) | <ul style="list-style-type: none"> 5% reduction in energy use in public buildings per annum by 2020. NDEE applied to all Council public buildings with significant energy use by 2030. | Direct | 7, 11, 12, 13 | Yes for Baskets 1 and 2. |
| E.6 | Update the Councils Carbon Management Plan, identifying new targets in line with the Public Bodies Climate Change Duties (PBCCD) and Climate Action Plan targets. | Dundee City Council | Scottish Government | <ul style="list-style-type: none"> % reduction in Council emissions. | • tbc | Delivery | 1, 7, 9, 11, 12, 13 | Yes |
| E.7 | Replace all streetlights with energy efficient lighting systems by 2020 and explore opportunities for future smart intelligent lighting. | Dundee City Council | – | <ul style="list-style-type: none"> Energy savings (kWh/a) attributed to conversion to LED streetlights. % streetlights converted. | • Replace all streetlights with energy efficient lighting systems by 2020. | Direct | 11, 12, 13 | Yes |
| E.8 | Provide advice and support on resource efficiency and climate risk management for businesses in Dundee. | Resource Efficient Scotland | Dundee and Angus Chamber of Commerce, Scottish Enterprise, Dundee City Council | <ul style="list-style-type: none"> Number of businesses engaged. Number of measures implemented. Energy savings (kWh/a) attributed to improved energy efficient behaviour in businesses. | • tbc, (identify potential energy savings). | Direct | 11, 12, 13 | Yes |
| E.9 | Identify solar PV opportunities across Dundee for public and private buildings and ensure all civic buildings have renewables where technically feasible. | Dundee City Council | Businesses, private energy companies | <ul style="list-style-type: none"> Energy generation (kWh/a) attributed to solar PV in civic buildings. KWp installed capacity in civic buildings. Energy generation (kWh/a) attributed to solar PV in private buildings. | – | Enabling/ Direct | 7, 9, 11, 13 | No |
| E.10 | Implement the Joint Initiative for Hydrogen Vehicles Across Europe (JIVE 2) hydrogen bus project, deploying 12 hydrogen fuel buses into operation in Dundee and creating a local fuel and maintenance station. | Dundee City Council | Scottish Government, Public and private partnerships | <ul style="list-style-type: none"> Number of hydrogen fuel cell buses deployed in Dundee. | – | Direct/ Enabling | 7, 8, 9, 11, 12, 13, 17 | Yes |

| | Action | Lead Agency | Partners | Proposed Performance Indicators (where applicable) | Targets (where applicable) | Type of Action | Link to SDG's * | Funding in Place |
|------|---|--|--|---|----------------------------|---------------------|-------------------------|------------------|
| E.11 | Research opportunities to utilise local water bodies for renewables including local reservoirs, rivers and estuaries. | Dundee City Council/ private energy sector | – | – | – | Direct/ Enabling | 7, 9, 11, 13, | No |
| E.12 | Develop a regional cluster approach to attract investment, support business growth and create jobs in the offshore wind sector; retaining more graduates and making the city a magnet for new talent. | Dundee City Council/ private enterprise | – | – | • tbc | Enabling | 7, 8, 9, 11, 13, 17 | Yes |
| E.13 | Explore options to further improve efficiencies in the Council's existing Multi-Storey domestic district heating schemes. | Dundee City Council | – | • Energy savings (kWh/a) attributed to improvements in MSD DHS. | – | Direct | 1, 7, 10, 13 | No |
| E.14 | Deliver the Low Carbon District Energy Hub at the Regional Performance Centre for Sports as a catalyst project; proving industry/ technology programmes and projects. | Dundee City Council | Scottish Government | • Proportion of energy generation (kWh/a) at RPCS attributed to low carbon technology. | – | Direct | 7, 8, 9, 10, 11, 13 | Yes |
| E.15 | Prepare an investment-ready business case that identifies district heating opportunities from the city's Energy from Waste Combined Heat and Power facility. | Dundee City Council | Scottish Government, MEB Environment Ltd | • Energy savings (kWh/a) realised by connected properties. | – | Enabling | 7, 8, 9, 11, 13, 17 | Yes |
| E.16 | Engage with stakeholders and wider industry to promote district heating in Dundee and work with technology providers to explore the potential for integrating hydrogen fuel as a source of low carbon heat. | Dundee City Council/ private energy sector | – | • Number of district heating schemes in Dundee. • Energy generation (kWh/a) attributed to hydrogen fuel. | – | Direct/ Enabling | 7, 8, 9, 10, 11, 13, 17 | Yes |
| E.17 | Investigate options to create a Dundee City Energy Services Company (ESCO) to help coordinate planning, funding, operations, and delivery of projects. | Dundee City Council/ private energy/ transport companies | – | – | – | Enabling | 7, 8, 9, 10, 11, 13, 17 | No |
| E.18 | Participate in the Scottish Governments pilot Local Heat and Energy Efficiency Strategy (LHEES) programme and respond to proposals to create a statutory framework for LHEES. | Dundee City Council | Scottish Government, private energy sector | • Energy savings (kWh/a) attributed to implementation of LHEES interventions. | – | Direct | 7, 10, 11, 13, 17 | Yes for pilot |

Transport

| | Action | Lead Agency | Partners | Proposed Performance Indicators (where applicable) | Targets (where applicable) | Type of Action | Link to SDG's | Funding in Place |
|-----|--|--|--|--|--|-----------------|-----------------|------------------|
| T.1 | Implement the Dundee Cycling Strategy and Councils Active Travel programme in partnership with community groups, improving and increasing cycling paths and infrastructure across the city to reduce the modal share of car based transport. | Dundee City Council | Local community groups | <ul style="list-style-type: none"> Active travel as a proportion of trips to work (as measured by the Scottish Household Survey). | <ul style="list-style-type: none"> Increase no. of journeys made by bike annually in Dundee by 100% by 2021. Increase the no. of children who cycle to school by 100% by 2021. | Direct | 3, 10, 11, 13 | Yes |
| T.2 | Develop a Low Carbon Active Travel Hub in Dundee Waterfront to include bike hire, cycle parking, bike maintenance, electric vehicle (EV) charge points, an EV car club and community outreach. | Dundee City Council/private enterprise | – | – | – | Enabling | 3, 10, 11, 13 | Yes |
| T.3 | Implement Shared Mobility and Resource Efficiency projects developed by the Mobility in Living Laboratory (MILL) to ensure Dundee remains in a position to take advantage of future innovative mobility solutions including autonomous vehicles. | Urban Foresight | Dundee City Council | <ul style="list-style-type: none"> Number of innovative (shared mobility) services introduced in the city (Outcomes based indicators being developed). | – | Direct/Enabling | 3, 10, 11, 13 | Yes |
| T.4 | Ensure safer streets that enable active travel in Dundee including assessing suitable locations for pedestrianisation, 20mph zones and off road/ segregated active travel networks. | Dundee City Council | – | – | – | Enabling | 3, 10, 13 | Yes |
| T.5 | Explore options for increasing deployment of low emission buses in Dundee, including hybrid and hydrogen buses. | Dundee City Council, bus companies, | Transport Scotland, Scottish Cities Alliance | – | <ul style="list-style-type: none"> Number of low carbon buses in operation in Dundee. CO₂ (tCO₂e) reduction as a result of low carbon buses. | Direct | 3, 11, 13, 17 | No |
| T.6 | Develop and implement proposals for new Park & Ride sites to the south, west, east and north of Dundee and explore the provision of active travel options for these. | TACTRAN/ Dundee City Council | Transport Scotland | – | – | Direct | 3, 8, 9, 11, 13 | No |
| T.7 | Expand Electric Vehicle (EV) charging hubs and infrastructure across the city. | Dundee City Council | Transport Scotland | <ul style="list-style-type: none"> (KWh/a) consumption at EV public charging points. Number of solar charging points. | <ul style="list-style-type: none"> 7 charging hubs by the end of 2020. | Enabling | 3, 11, 13 | Yes |
| T.8 | Increase EV uptake in Dundee via support and awareness provided by the Drive Dundee Electric campaign and local policy measures, including continued migration to low carbon vehicles within the council fleet. | Dundee City Council | Public and private sector | <ul style="list-style-type: none"> KWh/a consumption at EV public charging points. Number of solar charging points. % EV's in Dundee. | <ul style="list-style-type: none"> 25% increase in electric fleet vehicles by the end of 2020. 20% of all vehicles in Dundee to be electric by 2027. | Direct | 3, 11, 13 | Yes |

| | Action | Lead Agency | Partners | Proposed Performance Indicators (where applicable) | Targets (where applicable) | Type of Action | Link to SDG's | Funding in Place |
|------|---|--|--|--|--|----------------|---------------|------------------|
| T.9 | Establish a Low Emission Zone in Dundee by 2020 to contribute to the broader city objectives and the vision to create a healthy, vibrant and attractive city by protecting public health through improving air quality. | Dundee City Council | Transport Scotland, SEPA, SYSTRA, TACTRAN, NHS Tayside | <ul style="list-style-type: none"> • NO₂, PM₁₀ and PM_{2.5} levels. • Compliance with regulatory thresholds. | <ul style="list-style-type: none"> • NO₂ – annual mean 40ug/m³, hourly; mean 200ug/m³ (not to be exceeded > 18 times per yr). • PM₁₀ – annual mean 18ug/m³, 24hour mean 50ug/m³ (not to be exceeded > 7 times per yr). • PM_{2.5} – annual mean 10ug/m³. | Direct | 3, 11, 13 | Yes |
| T.10 | Continued promotion of ECOSTARS schemes to encourage Heavy Duty, Taxis and Private Hire vehicle companies to participate in air quality improvements in Dundee. | Dundee City Council/ private vehicle companies | – | <ul style="list-style-type: none"> • Increase in ECOSTARS membership. | – | Delivery | 3, 11, 13, 17 | Yes |

Waste

| | Action | Lead Agency | Partners | Proposed Performance Indicators (where applicable) | Targets (where applicable) | Type of Action | Link to SDG's | Funding in Place |
|-----|--|---------------------|---|--|----------------------------|----------------|-------------------|------------------|
| W.1 | Develop and implement circular economy projects identified by the Circular Tayside initiative and deliver a circular economy education strategy across the City. | Zero Waste Scotland | Dundee and Angus Chamber of Commerce, 3rd sector and private sector organisations | – | – | Direct | 8, 9, 11, 12, 13 | Yes |
| W.2 | Continue to communicate frequently with residents around waste/recycling services to improve participation/recycle quantity and quality. | Dundee City Council | – | <ul style="list-style-type: none"> • % Household waste recycled/composted. | – | Direct | 11, 12, 13 | Yes |
| W.3 | Zero Waste Scotland to pilot food waste reduction project in Dundee schools, hospitals and small businesses by December 2020. | Zero Waste Scotland | – | <ul style="list-style-type: none"> • % (by weight) of biodegradable waste diverted from WtE for recycling. tCO₂e reduction due to waste disposal avoided). | – | Direct | 11, 12, 13 | Yes |
| W.4 | Encourage citizens to take responsibility for the environment through the "Take Pride in Your City" campaign. | Dundee City Council | – | <ul style="list-style-type: none"> • Costs of clean-up and litter picking. | – | Enabling | 3, 11, 12, 13, 15 | Yes |
| W.5 | Trial Smart waste technology to improve waste monitoring and collection efficiencies in the city. | Dundee City Council | – | – | – | Direct | 9, 11, 12, 13 | Yes |
| W.6 | Explore initiatives to significantly reduce the quantity of single-use plastics used in Dundee organisations including Council premises and wider commercial establishments. | Dundee City Council | – | – | – | Enabling | 12, 13 | No |

| | Action | Lead Agency | Partners | Proposed Performance Indicators (where applicable) | Targets (where applicable) | Type of Action | Link to SDG's | Funding in Place |
|-----|--|----------------------------|---------------------|--|----------------------------|------------------|----------------------|------------------|
| W.7 | Continued delivery of sustained waste education campaign programme which aligns to the curriculum for excellence and embeds behavioural change at all stages of the educational journey. | Dundee City Council | – | – | – | Enabling | 11, 12, 13 | Yes |
| W.8 | Support the Scottish Governments Deposit Return Scheme and other viable take back schemes. | Scottish Government | Dundee City Council | – | – | Direct/ Enabling | 11, 12, 13 | Yes |
| W.9 | Stimulate increased reuse as well as upcycling and repairing opportunities and the necessary skills and training to undertake these. | Partner organisation (TBC) | – | <ul style="list-style-type: none"> • % (by weight) of materials diverted from disposal for re-use. (TBC) • (CO₂ (tCO₂e) reduction due to waste disposal avoided) | – | Direct | 8, 9, 11, 12, 13, 17 | No |

Resilience

| | Action | Lead Agency | Partners | Proposed Performance Indicators (where applicable) | Targets (where applicable) | Type of Action | Link to SDG's | Funding in Place |
|-----|---|---------------------|---|--|----------------------------|------------------|----------------------|------------------|
| R.1 | Design a Dundee Surface Water Management Plan/ Tayside Integrated Catchment Study that considers measures to reduce flood risk and protect buildings, infrastructure and people from flooding and includes blue-green infrastructure across the city and/or retrofitting SUDS to store and manage surface water runoff. Ecological solutions will be used where possible e.g. dune replenishment as part of Dundee Coastal Flood Protection Scheme. | Dundee City Council | SEPA, Scottish Water, Scottish Natural Heritage | <ul style="list-style-type: none"> • Number of flood events. • Number of buildings impacted by flood events. • Number of people affected by flood events. • Infrastructure impacted by flood events. | – | Delivery | 6, 9, 11, 13, 14, 15 | Yes |
| R.2 | Undertake coastal and watercourse inspections and organise repairs and maintenance under current legislation and the Tay Estuary and Montrose Basin Local Flood Risk Management Plan. | Dundee City Council | SEPA | – | – | Direct | 6, 9, 11, 13, 14, 15 | Yes |
| R.3 | Improve Dundee's Public Sewer and Mains Water systems to improve drinking water quality and reduce sewage discharge to the water environment; continued communication of water quality information via the electronic display at Monifieth, SEPA website and Dundee City Council signage and social media. | SEPA | Scottish Water, Dundee City Council | <ul style="list-style-type: none"> • Reduction in number of storm sewer discharges to the water environment. | – | Direct/ Enabling | 6, 9, 11, 13, 14, 15 | Yes |

| | Action | Lead Agency | Partners | Proposed Performance Indicators (where applicable) | Targets (where applicable) | Type of Action | Link to SDG's | Funding in Place |
|-----|---|---------------------|--|--|---|----------------|----------------------|------------------|
| R.4 | Scottish Water will review and develop its 25 Year Water Resource Plan to ensure projected drought conditions are included; incorporating reinforcement of reservoirs, expanding the supply network and developing mitigation measures as required. | Scottish Water | – | <ul style="list-style-type: none"> • % increase in supply network. | – | Direct | 6, 9, 11, 13, 14, 15 | Yes |
| R.5 | Monitor costs associated with climate change including heating and cooling costs as well as maintenance and repair costs or buildings and infrastructure. | Dundee City Council | – | <ul style="list-style-type: none"> • Costs associated with heating and cooling. | – | Delivery | 11, 13 | Yes |
| R.6 | Promote efficient water use by businesses and the wider community and create a business case for rainwater capture and reuse capital investment. | Scottish Water | Resource Efficient Scotland, Dundee City Council | <ul style="list-style-type: none"> • % reduction in water consumption. • Grey water recycling / rainwater harvesting per % of total consumption. • Water consumption in litres and associated supply and treatment energy savings (kWh/a) generated by water efficiency campaign. | <ul style="list-style-type: none"> • TBC awaiting SW/carbon assessment | Direct | 12 | Yes |
| R.7 | Implement 'Cleaner Air for Scotland - The Road to a Healthier Future' strategy and monitor guidance for developers to ensure air quality is taken into account for new developments. | Dundee City Council | – | <ul style="list-style-type: none"> • Reduction in NO₂, PM_{2.5} and PM₁₀. • Percentage of the total planning applications responded to with air quality conditions/ assessments. | <ul style="list-style-type: none"> • Annual mean PM_{2.5} concentration • 10 µg/m³ by the end of 2020. | Direct | 3, 11, 13 | Yes |
| R.8 | Public health information campaigns to address increase in sun/heat/air and water quality related illnesses and development of Green Health Partnership, linking health care and greenspace initiatives. | NHS Tayside | Green Health Partnership | <ul style="list-style-type: none"> • Number of water quality related illnesses. • Number of heat related illnesses. • Number of air quality related illnesses. • Number of sun related injuries/ illnesses. • Increase in reported atopic diseases. | <ul style="list-style-type: none"> • No more than 10% increase in any one year. | Direct | 3, 11, 13, 17 | Yes |
| R.9 | Develop an interactive green map for Dundee to help visitors and residents identify sustainable options and information for travel, food, recreation and resource use. | Dundee City Council | – | – | – | Delivery | 3, 11, 12, 13 | Yes |

| | Action | Lead Agency | Partners | Proposed Performance Indicators (where applicable) | Targets (where applicable) | Type of Action | Link to SDG's | Funding in Place |
|------|--|------------------------------------|--|---|----------------------------|----------------|--|------------------|
| R.10 | SMART Mobility to include co-ordinated communication of transport information and quicker demand response options to keep visitors and residents informed of disruptions and alternatives. | Urban Foresight | Private transport companies, Dundee City Council | <ul style="list-style-type: none"> Number of climate related transport disruptions that require a response. Average time taken to disseminate transport updates to multiple channels. | – | Enabling | 11, 13, 17 | Yes |
| R.11 | Plan co-ordinated, prompt communication to inform residents of waste service disruptions, alternative options available and estimate of when normal services will resume; ensuring that operational contingencies are in place for extreme weather events. | Dundee City Council | – | – | – | Enabling | 12, 13 | Yes |
| R.12 | Develop adaptation engagement tools to support community capacity building, including visual and interactive tools, workshops and collaboration with community organisations. | Dundee City Council | Dundee Partnership | <ul style="list-style-type: none"> Number of engagement events/activities. Number of people engaged. Positive feedback from events. | – | Delivery | 10, 11, 13, 17 | No |
| R.13 | Develop a Persons at Risk Register in partnership with the NHS to help identify members of the community vulnerable to interruptions in supply of power, heating, water and other essential services and regular testing and review of Local Resilience Partnership plans and NHS Winter Plans to prioritise services. | Local Resilience Partnership | – | – | – | Enabling | 3, 11, 13, 17 | Yes |
| R.14 | Update the Green Tourism accreditation to incorporate climate adaptation and increase the number of Green Tourism Award Holders in Dundee. | Green Tourism Accreditation Scheme | – | <ul style="list-style-type: none"> Number of businesses provided with climate adaptation support/ information. Number of Green Tourism Award holders in Dundee. | – | Enabling | 11, 12, 13 | No |
| R.15 | Increase participation in the Eco-Schools programme in Dundee via improved local support and pilot projects with appointed schools. Dundee City Council. | – | Keep Scotland Beautiful | <ul style="list-style-type: none"> Number of schools participating in Eco-Schools in Dundee. | • TBC | Enabling | 4, 5, 6, 7, 10, 11, 12, 13, 14, 15, 16 | Yes |

| | Action | Lead Agency | Partners | Proposed Performance Indicators (where applicable) | Targets (where applicable) | Type of Action | Link to SDG's | Funding in Place |
|------|---|---------------------|---|--|----------------------------|----------------|-------------------------------------|------------------|
| R.16 | Co-design blue/green infrastructure improvements with relevant Council departments, partners and the wider community. Aligning with Dundee City Councils green networks supplementary planning guidance; improvements will into account flooding, heat island effect, active travel, biodiversity and including appropriate planting in urban areas, as well as community cohesion opportunities. | Dundee City Council | Dundee Partnership | • % increase in blue/green infrastructure. | • TBC | Delivery | 3, 9, 11, 13, 15, 17 | Yes |
| R.17 | Produce an Open Space strategy based on collaboration and outcomes from workshops to include green infrastructure that helps Dundee's nature to adapt to changes in climate and supports the delivery of Dundee's green networks. | Dundee City Council | Dundee Partnership | – | – | Delivery | 3, 9, 11, 13, 15, 17 | Yes |
| R.18 | Prepare a Biodiversity Plan that includes actions for safeguarding and enhancing existing habitats and species, ensures biodiversity is prioritised in green space maintenance and that new biodiversity developments are climate proof where possible. | Dundee City Council | Scottish natural heritage, local community groups | • Actions implemented from the biodiversity plan. | – | Enabling | 11, 13, 14, 15 | Yes |
| R.19 | Contribute to the enhancement and maintenance of the Tay River and coastal habitats. Identify opportunities for soft coastal management /managed realignment habitat creation and maintain the Beach Award for Broughty Ferry. | Dundee City Council | Scottish natural heritage, local community groups | • Area of river/ coastal habitat enhanced/ managed for biodiversity and flood management. • Actions implemented from the Biodiversity Plan. | – | Direct | 11, 13, 14, 15 | Yes |
| R.20 | Monitor and review the Urban Tree Policy to identify suitable areas for tree planting with climate appropriate species and with consideration of how planting interacts with surroundings e.g. air quality, active transport, biodiversity etc. | Dundee City Council | – | – | – | Enabling | 3, 11, 13, 15 | Yes |
| R.21 | Develop a Local Food Growing Strategy and Support and encourage communities to establish growing projects in their own areas. | Dundee City Council | Community groups | • Number of community food growing projects in Dundee. | – | Direct | 1, 2, 3, 10, 11, 12, 13, 15, 16, 17 | Yes |

Acknowledgements

We would like to thank the organisations, partnerships and forums that have contributed to the research, workshops and action planning necessary to develop the Climate Action Plan.

Adaptation Scotland

Aether

DC Thomson & Co Ltd

Dundee & Angus Chamber of Commerce

Dundee and Angus College

Dundee City Council

Dundee Green Health Partnership

Dundee Heritage Trust

Dundee Naturalists' Society

Dundee Resource and Re-use Centre

Dundee Voluntary Action

Extinction Rebellion Dundee

Forth Ports

Friends of the Earth Tayside

Gate Church Carbon Saving Project

Hillcrest Housing Association

Home Energy Scotland

Kirkton Community Partnership

Leisure & Culture Dundee

Michelin

National Express

NHS Tayside

Open Change

Scottish Cities Alliance

Scottish Enterprise

Scottish Environment Protection Agency

Scottish Hydrogen & Fuel Cell Association

Scottish Natural Heritage

Scottish Water

Scottish Wildlife Trust

SNIFFER

Stagecoach East Scotland

Sustainable Scotland Network

TACTRAN

Tayside Re-Users

University of Abertay

University of Dundee

Urban Foresight

Zero Waste Scotland



Glossary

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| Adaptation | The adjustment in economic, social or natural systems in response to actual or expected climatic change, to limit harmful consequences and exploit beneficial opportunities. |
| BEI | Baseline Emissions Inventory. Identifies and quantifies the main sources of greenhouse gas emissions in a starting year. |
| Biodiversity | The variety plant and animal life on the planet and the surroundings they live in. |
| Carbon capture and storage | A process of capturing waste carbon dioxide usually from large point sources, such as a cement factory or biomass power plant, transporting it to a storage site, and depositing it where it will not enter the atmosphere, normally an underground geological formation. The aim is to prevent the release of large quantities of carbon dioxide into the atmosphere from heavy industry. |
| Carbon emissions | Release of CO ₂ into the atmosphere. |
| Carbon footprint | A measure of the carbon emissions produced as a result of an organisation's or service's activities. |
| Carbon intensity | The emissions per unit of electricity generated (often given in grams of CO ₂ per kWh). |
| Carbon neutral | Achieved when CO ₂ emissions are balanced by CO ₂ removals over a specified period. |
| Committee on Climate Change | An independent, statutory body established under the Climate Change Act 2008 to advise the UK Government and Devolved Administrations on emissions targets and report to Parliament on progress made in reducing greenhouse gas emissions and preparing for climate change. |
| CHP | Combined Heat and Power. |
| Circular economy | An alternative to a traditional linear economy (make, use, dispose) in which resources are kept in use for as long as possible, the maximum value is extracted from them whilst in use, then products and materials are recovered at the end of each service life. |
| Climate change | Any change in climate over time, whether due to natural variability or as a result of human activity. |
| Covenant of Mayors for Climate and Energy | An international alliance of cities and local governments with a shared commitment to accelerate ambitious, measurable climate and energy initiatives that lead to a low-emission and climate resilient future, helping to meet and exceed the Paris Agreement objectives. |
| CO ₂ | Carbon Dioxide. The most common greenhouse gas contributing to human made climate change. |
| CO ₂ e | Carbon Dioxide equivalent. A commonly used way of presenting total greenhouse gas emissions as an equivalent amount of CO ₂ . Most typically, the CO ₂ e emission is obtained by multiplying the emission of a greenhouse gas by its global warming potential (GWP) for a 100-year time horizon. |
| Decarbonisation | The reduction or removal of carbon dioxide from energy sources. |
| Ecosystem | A biological community of interacting organisms and their physical environment. |
| EfW | Energy from Waste. |
| Emission factor | A measurement of CO ₂ emissions intensity per unit of electricity generation in the grid system. |
| EPC | Energy Performance Certificate. Shows the current energy rating and potential energy rating of a property. |
| ESCo | Energy Services Company. |
| EV | Electric Vehicle. |
| Fossil fuel | Non-renewable energy sources formed from fossilised plants and animals over millions of years such as coals, oil and gas. |
| GDP | Gross Domestic Product. A measure of the value of goods and services produced in the UK. It estimates the size of and growth in the economy. |
| GHG | Greenhouse Gas that enhances the greenhouse effect and thus climate change. |
| Heat island effect | Also referred to as the urban heat island effect, whereby the average temperature of an area is higher than nearby rural areas. It is mostly caused by the fact that the materials in urban areas, like concrete, absorb and retain much more heat energy from the sun and then takes much longer to dissipate. |
| Infrastructure | Physical structures and facilities need to operate a functional society such as roads, utilities, water, sewage etc. |
| IPCC | International Panel on Climate Change. A United Nations body which evaluates climate change science. |
| KWh | Kilowatt Hour. A unit of energy equivalent to one kilowatt of power expended for one hour of time (1,000KWh = 1MWh). Commonly used in energy use billing. |
| LCITP | Low Carbon Infrastructure Transition Programme. |

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| LED | Light-emitting diode. An LED is an electronic device that emits light when an electrical current is passed through it. LEDs are energy efficient and have a long life span. |
| LEZ | Low Emission Zone. An area where access by some polluting vehicles is restricted or deterred with the aim of improving air quality. |
| LHEES | Local Heat and Energy Efficiency Strategy. |
| Low carbon | Causing or resulting in only a relatively small net release of carbon dioxide into the atmosphere. |
| Low carbon economy | An economy that produces goods and services of increasing value while reducing the associated carbon dioxide in their production, use and disposal. |
| MEI | Monitoring Emissions Inventory. Identifies and quantifies the main sources of greenhouse gas emissions at a point in time after a baseline year. |
| Mitigation | The attempt to lessen future climate change and its social, economic and environmental consequences by reducing the greenhouse gas emissions. |
| MWh | Megawatt Hour. A unit of energy use equivalent to one megawatt of power expended for one hour of time. Used for metering larger amounts of electrical energy and power generation. |
| NDEE | Non-Domestic Energy Efficiency. |
| Net zero CO ₂ emissions | Achieved when CO ₂ emissions are balanced by CO ₂ removals over a specified period. Also referred to as being carbon neutral. |
| Net zero GHG emissions | Achieved when anthropogenic (i.e. as a result of human activity) emissions of greenhouse gases to the atmosphere are balanced by anthropogenic removals over a specified period. |
| NO _x | Nitrogen Oxide. Gases which are formed whenever combustion occurs in the presence of nitrogen – e.g. in vehicle exhausts. |
| Photovoltaic | The method used to convert sunlight into electricity. |
| Resilience | The capacity of a system to absorb the stresses imposed by climate change. When change occurs, resilience provides the components for renewal and reorganisation. |
| RPCS | Regional Performance Centre for Sport. |
| RPP | Report on Policies and Proposals. |
| RVA | Risk and Vulnerability Assessment. Exercise to determine the nature and extent of climate-related risks by analysing potential hazards and assessing the vulnerability that could pose a potential threat or harm to people, property, livelihoods and the environment. |
| SDG | Sustainable Development Goals. |
| SEA | Strategic Environmental Assessment. An assessment of the significant environmental impacts of a qualifying plan, programme or strategy. |
| Sustainable development | Development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Its three core elements of economic growth, social inclusion and environmental protection are interconnected and all must be harmonised for the well-being of individuals and societies. |
| TAYplan | TAYplan sets the overall planning vision for the next 20 years for the whole Dundee and Perth area, including North Fife and parts of Angus. |
| UKCP18 | UK Climate Projections 2018 (UKCP18). |
| UN | United Nations. An intergovernmental organisation dedicated to improving global economic and social conditions on a global scale. |
| Vulnerability | The degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. |



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