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Edinburgh Net Zero: Developing Action Plans for City Emissions

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Causeway Growing Our Cities
24th November 2020

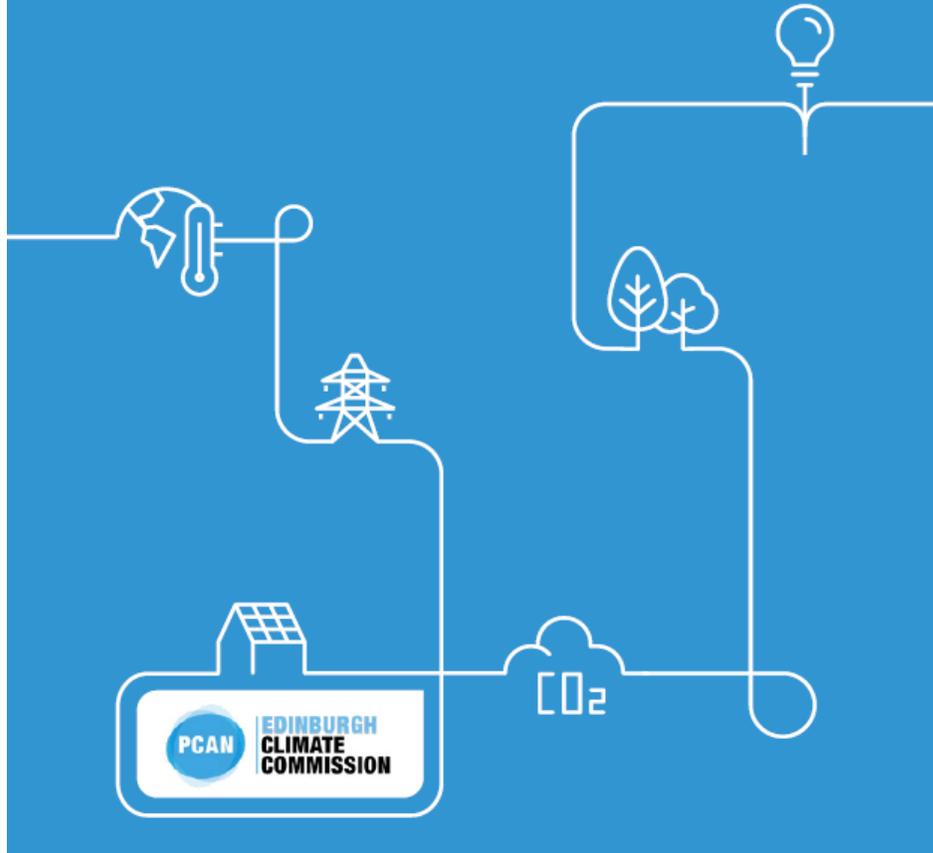


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A NET-ZERO CARBON ROADMAP FOR EDINBURGH

Robert Fraser Williamson, Andrew Sudmant, Andy Gouldson & Jamie Brogan



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E·S·R·C
ECONOMIC
& SOCIAL
RESEARCH
COUNCIL

Analysis of:

- **Edinburgh's emissions profile**, so we can understand the scale and source of Edinburgh's emissions footprint
- The **effectiveness of a range of measures for emissions reduction**, from both an economic and climate perspective



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BACKGROUND



1.5°C

The level of global temperature rise at which we risk triggering dangerous climate change

2030

The point at which - at current rates - the world will have locked into more than 1.5°C of warming

GLOBAL TO LOCAL



22m tonnes

Edinburgh share of the global carbon budget (to keep to 1.5°C of warming)



Edinburgh is emitting

2.5m tonnes

of carbon a year. At this rate, we will have used up our budget by

2031

BASELINES AND TARGETS

42%

The decline in Edinburgh's carbon emissions since 2000

This needs to be increased to

67%

 by 2025

80%

 by 2030

100%

 by 2050


Edinburgh has committed to work towards being

CARBON NEUTRAL

by

2030

That leaves a **big gap** but we can close it by the following options

COST-EFFECTIVE OPTIONS

Cost-effective options such as better housing and transport could close the 2030 gap by

51%



These would reduce Edinburgh's energy bill by

£553m

per year, and would create nearly

11,790

years of extra employment



MORE AMBITIOUS OPTIONS

More ambitious but expensive options could

close the 2030 gap by

65%

These would have **benefits for health, equality, travel and the environment**



Doing all of the above leaves a

35%

shortfall to reach by

2030



REACHING OUR TARGET

Edinburgh can close the gap by

100% by 2030

through a range of **INNOVATIVE INTERVENTIONS**



These include

decarbonising heating and planting trees - changing some behaviours and consumption habits would take us further still



Net Zero by 2030



*Net-zero, like "carbon neutral", refers to achieving an overall balance between emissions produced and emissions taken out of the atmosphere, with any residual emissions removed through carbon sinks.

Edinburgh's Emissions Footprint



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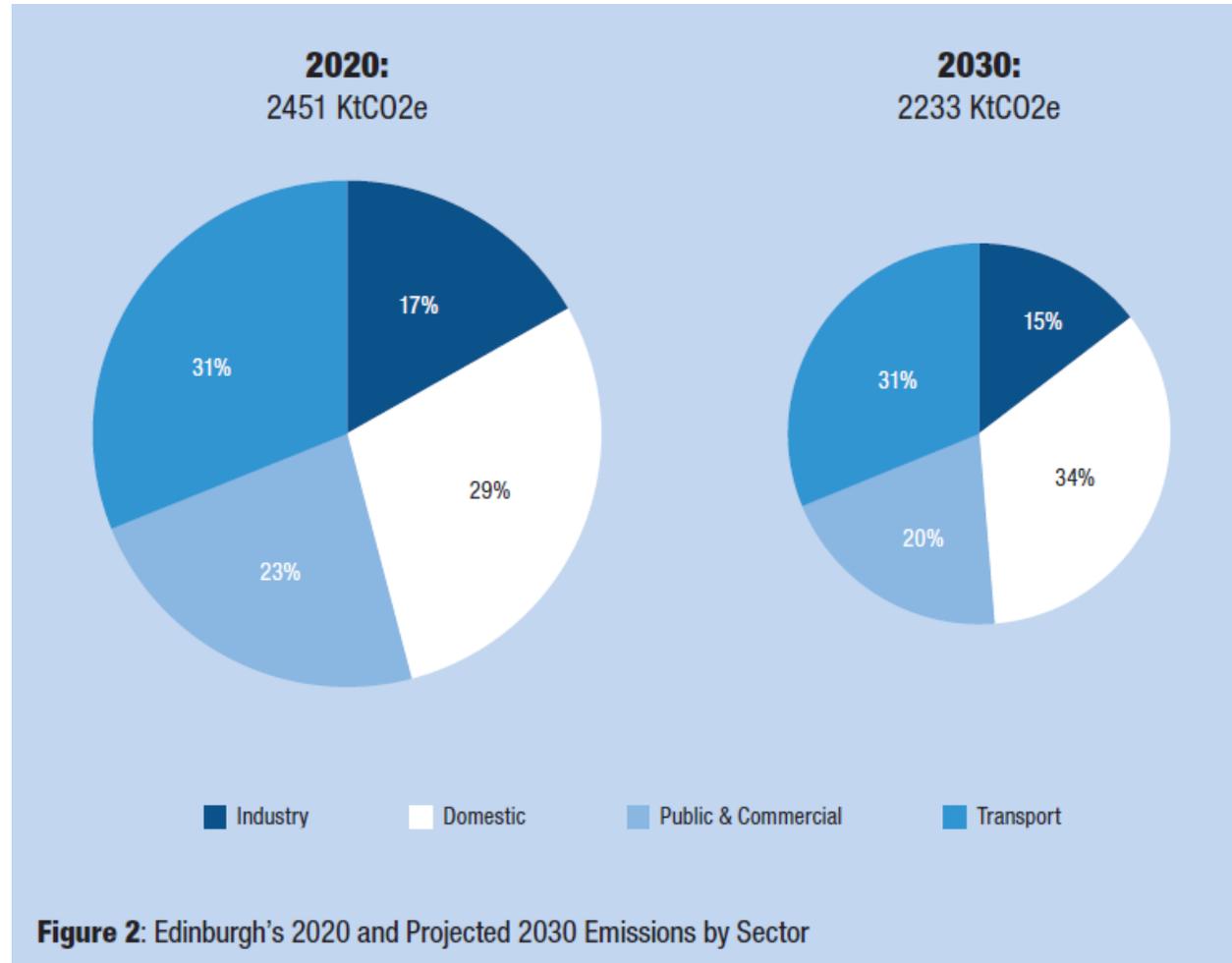


Figure 2: Edinburgh's 2020 and Projected 2030 Emissions by Sector

Edinburgh has set an ambitious target for **carbon neutrality by 2030**.

This means reducing our current city emissions of **2.5 million tonnes** of carbon per year to **zero** over the next 10 years.



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Developing Targeted City Action Planning Approaches

Breaking down Edinburgh's emissions by source, and the mitigation measures for addressing them by costs and benefits, provides us with different pathways to tackling emissions:

- **Targeting emissions at source**, by designing approaches to reflect the nature of those sources and the best way to reach them effectively
- Targeting emissions based on their **potential climate impact and economic costs**, developing different strategies to reflect the type and level of intervention needed to deliver these



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Targeting Emissions by Source



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We can design approaches that recognise the very different nature of emissions sources, their origin and ownership, and the different types of intervention we may need to address them.

- **Industry (17%):** While Edinburgh is not a heavily industrialised city, we can use emissions data to **identify any major emissions sources within Edinburgh and target their owners** to accelerate their plans for emission reduction.
- **Public & Commercial Buildings (23%):** We can use emissions data and other surrogates (e.g. turnover, employee numbers, square footage of office space) to **identify the main emissions 'owners' from the city's building stock**, and look to collaborative approaches which accelerate citywide plans for emissions reduction.
- **Housing (29%):** Many of the most cost and carbon effective measures for emissions reduction are for domestic emissions. Despite this, **domestic emissions often prove most difficult to address because of the complexity of the ownership structure**, of where the investment will come from and where cost benefits will be realised.
- **Transport (31%):** Reducing transport emissions needs a greater focus on **enablers, incentives and policies that will encourage and enable different transport choices** among individuals, and different operational and logistical models among organisations.



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Targeting Emissions by Source



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Public & Commercial Buildings (23%)	<p>The most efficient city approach would be a targeted collaboration with the main emissions owners and largest organisations, where their commitment to change is likely to have most impact and influence.</p>
Industry (17%)	
Transport (31%)	<p>The complex challenges of domestic and personal transport emissions need designed interventions that identify and address key barriers and enablers to widespread adoption of emissions reduction measures.</p>
Housing (29%)	



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City Partnerships for Net Zero



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Bring together biggest employers, emitters and influencers to co-design plans and commitments to accelerate the net zero transition:

- **Operations:** analyse their current business model and where it has the most climate impact.
- **Estates:** performance and development (e.g. energy efficiency, build policies), and use (e.g. energy generation, green infrastructure).
- **Transport:** review policies and logistics models enabling us to reopen as a greener future economy.
- **Influence:** their impact on the operations and choices of suppliers, employees, customers, and other city stakeholders.



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Targeting Measures by Impact

Most Carbon Effective Measures

Carbon Effectiveness	Potential Aggregated Carbon Savings	Category	Measure
Highly Effective	>2.4 Mt CO ₂	Domestic Insulation Improvements	Cavity-Wall
			External Wall
			Floor & Suspended Floor
			Internal Wall
			Loft & Loft Top-Up
		Domestic Heating Provisions & Controls	High-Efficiency Combination Boilers
			Air-Source Heat Pumps
			Thermostatic Radiator Valves
		Commercial Cooling Mechanisms	Thermostat Controls
			SFP2.0l/s
Office Building Stock Fabric Condition	Passive Chilled Beams		
	Chiller CoP5.4		
	Fabric Improvements		
Very effective	880kt to 2.3Mt CO ₂	Transport Electrification	Air Tightness Improvements
			Private-EV Penetration (100% in 2037)
		Domestic Electricity/Heat Demand Reductions	Turning Unnecessary Lighting Off
			Reducing Internal Temperature by 1C
			A++ Rated Cold Appliances
		Commercial Heating Provisions	A+ Wet Appliances
			Air-Source Heat Pumps
		Domestic Lighting	Low Energy Lighting

Most Cost Effective Measures

Cost Effectiveness	Potential Cost Savings	Category	Measure
Highly Effective	>250 £2018M	Domestic Building Stock Insulation	Cavity-Wall
			Loft & Loft Top-Up
		Domestic Demand Reductions	A++ Rated Cold Appliances
			A+ Wet Appliances
			A Rated Ovens
			Induction Hubs
			Low Energy Lighting
		Commercial Building Stock Improvements	SFP2.0l/s
			Chiller CoP5.4
			Air Tightness
			Fabric Improvements
			Low Energy Retail & Office Cooling Systems
		Domestic Heating Provisions & Controls	High-Efficiency Combination Boilers
			Heat Pumps
			Thermostatic Valve Controls
Tank Insulation			
Domestic Electricity/Heat Demand Reductions	Turning Unnecessary Lighting Off		
	Reducing Internal Temperature by 1C		
	A++ Rated Cold Appliances		
Moderately Effective	<25 £2018M	Commercial Building Stock Heating Provisions	A+ Wet Appliances
			Air-Source Heat Pumps
		Domestic Lighting	Low Energy Lighting
			Private-EV Penetration (100% in 2037)
		Transport Electrification	Electric Bus Penetration
			Pumping Equipment Upgrades
		Industrial Processes & Equipment	Compressed Air Systems
			Fan Improvements
			Boilers and Steam Piping Upgrades
		Commercial and Domestic Fabric	Draught Proofing Measures



Cost-Effective Measures



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51% of Net Zero
in Edinburgh by 2030

Climate Impact	51% Reduction in Overall Emissions
Return on Investment	Economic Return on Commercial Terms £553M/year in Energy Cost Savings across the city Payback in 7.5 years
Economic Opportunities	11,790 Jobs Created Savings for Individuals, Businesses & Communities
Social, Environmental and Economic Benefits	Improved Public Health Reduced Fuel Poverty Improved Economic Productivity

Investment Required £3.796 Bn



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Designing Interventions: Assessing Climate Action Readiness



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Assessment	Barriers and Enablers
Technical Readiness	Are the technologies/behaviors needed to reduce energy use/carbon emissions available and ready to deploy now?
Policy Readiness	Have we got the policies/plans needed to support delivery in place now, locally, regionally and nationally?
Financial Readiness	Are the funds available, are there investable options with business models ready to be deployed?
Community Readiness	Do we have support and buy-in from the public and/or from the business community, or from some sectors of the public/business?
Delivery Readiness	Do we have the skills, the supply chains and the organisations ready to deliver?



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Designing Interventions: Assessing Climate Action Readiness



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Climate Action Readiness Assessment can enable two things to support city climate action planning:

- We can **rank and prioritise groups of emissions reduction measures** for city action based on their readiness assessment.
- We can highlight **where and what interventions are needed to accelerate adoption** of groups of climate mitigation measures.



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Developing Citywide Action Planning



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Breaking down city emissions challenges by source, cost and impact can create structures for problem-specific action planning to design targeted interventions. Three broad approaches can help to accelerate progress towards our city's net zero target:

1. **City Partnerships:** targeting the biggest organisations in the city for collective commitment and action to deliver the city's net zero ambitions.
2. **Assessing Climate Action Readiness:** convening city challenge owners to apply an action readiness methodology to more complex emissions challenges, in particular around housing, transport, and retrofit of city building stock.
3. **Mobilising City Investment:** developing the economic case to stimulate city investment, building new approaches to mobilise city capital, and embedding climate impact into city decision making.



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Embedding Climate Impact into City Decision Making



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The *Carbon Scenario Tool*:

- Produce a carbon footprint for the area-wide Local Authority or Regions, broken down by activity, category and sector
- Forecast Business as Usual scenario (including population growth, decarbonisation of the grid, additional emission sources)
- Evaluate project options based on operational carbon, capital cost and operational cost
- Provide a qualitative dashboard for other sustainability objectives
- Create pathway scenarios from groups of projects



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