7th June 2022

MEETING OF CLIMATE AND CITY RESILIENCE COMMITTEE

Dear Alderman/Councillor

The above-named Committee will meet in the Council Chamber and remotely via Microsoft Teams on Thursday, 9th June, 2022 at 5.15 pm, for the transaction of the business noted below.

You are requested to attend.

Yours faithfully

JOHN WALSH

Chief Executive

AGENDA:

1. Routine matters

   (i) Apologies

   (ii) Minutes

   (iii) Declarations of Interest

2. Presentation from Lisa-Dee Collery of the Shared Island Unit followed by Q&A (Pages 1 - 14)

3. Belfast Stories update including Geothermal Feasibility Study (Pages 15 - 22)

4. Belfast Net Carbon Roadmap Report (Pages 23 - 54)

5. Recap on suggestions for future meetings

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Rialtas na hÉireann
Government of Ireland

Tionscadal Éireann
Project Ireland 2040

National Development Plan 2021-2030

Prepared by the Department of Public Expenditure and Reform

gov.ie/2040

Chapter 17:
A Shared Island

Overview

The reviewed National Development Plan sets an enhanced level of ambition for collaborative cross-border public investment, to build a more connected, prosperous and sustainable island, for all communities and traditions that share the island.

The Government will work through strong all-island partnerships, to co-design, co-fund and co-deliver investments to enhance the shared island and address common strategic concerns including on balanced regional development, pandemic recovery, and climate action.

The Government's Shared Island Fund, the EU PEACE PLUS programme, and partnership approaches with the Northern Ireland Executive and UK Government, provide a strong basis for delivery on strategic investment priorities for a shared island out to 2030.

For 2021-2030, there is a total all-island investment commitment of more than €3.5billion through the Shared Island Fund, the Project Ireland 2040 funds, the Government's annual funding for North/South cooperation, and the PEACE PLUS programme delivered with the EU, UK and the Northern Ireland Executive. In addition, in the roll out of all aspects of this Plan there will be a focus on identifying and progressing Shared Island projects.

17.1 Policy Context

Delivery to Date

The National Development Plan and the National Planning Framework set out a positive vision for the future of the island. There has been important progress on implementation to date, including:

- Investment in transport infrastructure in border regions including road, rail and active travel.
- Completion of Phase 1 of the Ulster Canal restoration.
- Resourcing of €165m in 2020 for the North South Implementation Bodies and Tourism Ireland and for delivery of cross-border health services.
- Support for the North-West Strategic Growth Partnership between Donegal and Derry, including through the North West Development Fund, with a further commitment to the Fund in 2021 confirmed by the Government in July 2021, and projects funded under the PEACE IV and INTRREG VA programmes.
- Successful implementation of the 2014-2020 PEACE IV and INTERREG VA programmes by the Special EU Programmes Body with total funding of €566m awarded to projects.
- Development of the 2021-27 PEACE PLUS EU programme, combining the PEACE and INTERREG EU funding instruments, with a total value of over €1 billion, funded by the European Union, UK Government, Northern Ireland Executive and Government of Ireland.
- Establishment of the Shared Island Fund with €500m in capital funding between 2021 and 2025 for North/South investments.

Enhanced Shared Island ambition

The 2020 Programme for Government mission on 'A Shared Island' significantly develops the Government's objectives for strategic cooperation and investment for mutual benefit on the island, and affirms the commitments made by the Irish Government under the New Decade, New Approach agreement of January 2020.

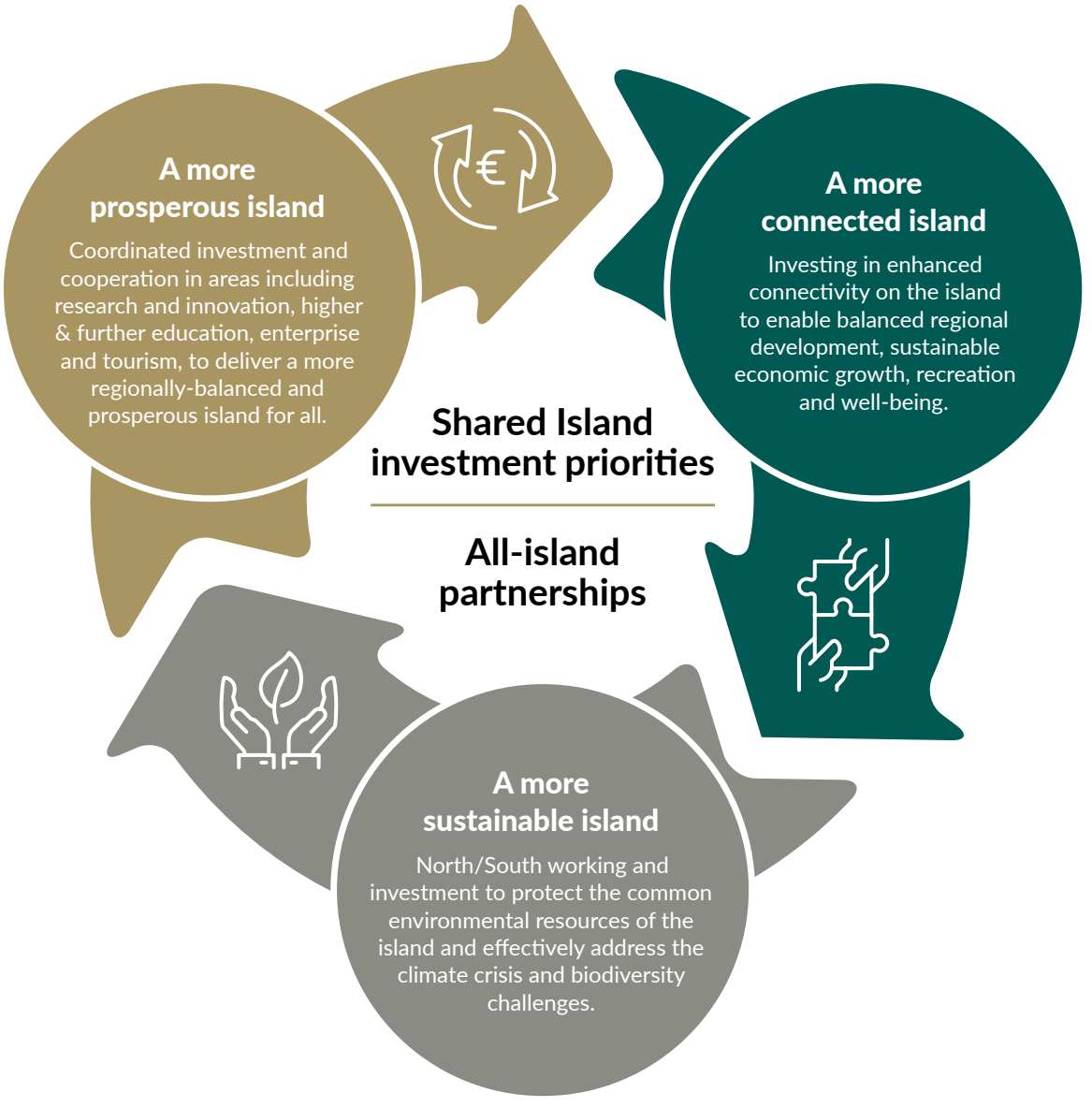
The Shared Island initiative is backed up by the establishment in Budget2021 of the Shared Island Fund, with €500m in capital funding being made available out to 2025, allocated by the Government for investment in North/South projects that contribute to the Shared Island objectives set out in the Programme for Government.

Allocations from the Shared Island Fund for approved projects are being made alongside funding from other public funding sources, and in collaborative investment approaches with the Northern Ireland Executive, UK Government, European Union and local authorities.

The Government's Shared Island initiative has registered important progress so far in 2021, with a number of new investments confirmed, progressing objectives in the Programme for Government, including:

- Establishment of a new North South Research programme with a commitment of €40m from the Shared Island Fund over five years to support strengthening of links between higher education institutions, researchers and research communities on the island.
- Funding to complete Phase 2 of the restoration of Ulster Canal with an allocation of €6m from the Shared Island Fund and €5.6m from the Rural Regeneration Fund, and €1m from the Shared Island Fund for development work on Phase 3 of the project.
- Funding to progress the Narrow Water Bridge project to tender stage and affirmed commitment by the Government to deliver this cross-border link between the Mourne Mountains and Cooley peninsula, providing tourism and connectivity boosts for the east border region.
- Launch of the all-island strategic rail review, commissioned by the Department of Transport in co-operation with the Department for Infrastructure in Northern Ireland, to examine how the rail network can improve sustainable connectivity between cities and regions, including the feasibility of high and higher speed options.

Through the reviewed NDP, the Government will build on this progress, to develop and deliver a new generation of collaborative cross-border investments that significantly enhance the shared island.



Under the reviewed NDP, the Government will allocate ring-fenced, multi-annual capital resourcing for all-island investment out to 2030, at least at the current level of the Shared Island Fund.

For 2021-2030, there is a total all-island investment commitment of more than €3.5 billion through the Shared Island Fund and the Project Ireland 2040 funds, the Government's annual funding for North/South cooperation and the PEACE PLUS programme delivered with the EU, UK and Northern Ireland Executive. In addition, in the roll out of all aspects of this Plan there will be a focus on identifying and progressing Shared Island projects.

In this context, the reviewed NDP sets out a significantly enhanced ambition for collaborative cross-border investment out to 2030 with the goal of building a more connected, sustainable, and prosperous shared island, for all communities and traditions.

17.2 Framework for delivery – All–Island partnerships

Through all-island partnerships we will co-design, co-fund and co-deliver effective actions that address common strategic challenges for the island as a whole, take up the opportunities of investment at an all-island level, and contribute to the vitality of North/South and East/West relationships in the years ahead.

North/South partnership

All-island planning frameworks

The National Planning Framework sets out 9 National Policy Objectives to support all-island cooperation across themes of: working together for economic advantage; coordination of investment in infrastructure; and, managing our shared environment responsibly.

Box 17.1: Looking to 2040

By 2040, the island we share will be home to around 8 million people, an increase of more than 1 million, with a commensurately larger consumer market and highly skilled labour pool.

We need to plan and invest for a shared future for all on the island of Ireland, in cooperative ways, recognising the connected environmental, economic, and infrastructure challenges and opportunities now and for the years ahead, which pertain for the island as a whole. As we look at the delivery challenges in the period ahead, there is a real opportunity to deploy our skills, training and labour market on an all-island basis to maximise our capacity and productivity, in traditional and new technology sectors, with significant business opportunities, in Northern Ireland and in the South.

There is also considerable potential through joint and coordinated actions to attract new inward investment across the island - including by maximising the full capacity, scale, market access and supply-chain linkages of cross-border regions; and by investing together in strategic infrastructure, on research and development, and to meet skills needs. We can collectively enhance the FDI attractiveness of the island as a whole, particularly border regions, delivering good jobs and supporting wider regional enterprise development.

Under the strategic investment priorities for a Shared Island, the Government will work to develop and deliver joint and coordinated investments with the Northern Ireland Executive, the UK Government, with local authority partners, and as a committed Member State of the European Union to realise:

A more connected island: including enhanced connectivity by rail, road and air; landmark projects including the Ulster Canal, Narrow Water Bridge and an island-wide greenway network; deeper interaction of Health and Education sectors; and, investment in diverse heritage, arts, culture, sports and community connections.

A more sustainable island: including strategic all-island infrastructure for energy transformation, such as the North/South Interconnector; all-island action to tackle climate change, protect biodiversity and expand the circular economy; and conserving the common water, coastal and marine resources of the island.

A more prosperous island: taking up opportunities to harness all-island research and innovation potential; enable island-wide supply chains; support higher and further education institutions in meeting the future skills needs of the island as a whole; and, championing enterprise development, investment promotion and sustainable tourism growth across the island.

These objectives emphasise the importance of cooperation with the Executive; supporting cross-border regional cooperation at local authority levels; working with the UK Government; and, harnessing the opportunities of our EU Membership to meet shared planning challenges on the island of Ireland.

These policy objectives will continue to guide the approach to planning and investment on a shared island basis under the reviewed NDP.

The Framework for Co-operation on Spatial Strategies between Ireland and Northern Ireland also provides a strong basis for cross-border working, and will be updated and reviewed as required. The related programme of support for cross-border working between local authorities on statutory planning matters supporting environmental considerations will be continued.

Delivery with the Northern Ireland Executive

Our ambition is to work closely with the Northern Ireland Executive to advance all-island investment objectives under the reviewed NDP.

The Executive's Investment Strategy for Northern Ireland is currently being updated. There is potential for considerable alignment of public investment priorities, North and South on the island in the decade ahead, including on climate action; digitisation; sustainable transport connectivity; and, balanced regional development.

There are clear opportunities for more coherent, efficient and impactful actions to deliver on shared goals for the two Administrations on the island through coordinated and joint investment, which offers opportunities to:

- take up advantages of investment at scale at an all-island level;
- combine complementary capacities, North and South;
- harness the full potential of border regions; and,
- coordinate and enhance transport and other connectivity across the island.

An all-island perspective can also assist in meeting skills and labour market demands in both jurisdictions, connected to public investment and wider economic development in the decade ahead.

In progressing NDP Shared Island investment priorities, the Government will work with the Executive to pursue these opportunities in public investment planning and delivery.

The Government and Executive have worked together over the last two decades, including through the North South Ministerial Council and the work of the North South Implementation Bodies, to make mutually-beneficial joint investments for the island. These include the Radiotherapy Unit at Altnagelvin Hospital; the Middletown Centre for Autism; supporting cross-border enterprise development; and, promoting abroad the world-class tourism offering of the island of Ireland.

The Shared Island investment priorities under the reviewed NDP provide a framework for building on this record to significantly enhance the beneficial impacts of North/South partnership in the years ahead.

The Government will also continue our successful partnership with the Executive to implement the PEACE PLUS programme, co-funded by the European Union, UK Government, Northern Ireland Executive and Irish Government, delivered through the Special EU Programmes Body.

East-West cooperation:

The Programme for Government sets objectives to work with the UK Government as well as the Northern Ireland Executive to achieve greater transport connectivity on the island; commit to investment and development opportunities in the North West and Border communities; and, cooperate on tackling climate breakdown and the biodiversity crisis. Other areas, such as enhancing the research capacity on these islands, also offer real opportunities to work together. These objectives are affirmed and expanded in this reviewed NDP.

The Government will work with the UK Government and the Executive to identify opportunities for coordinated investments that deliver on shared objectives to the benefit of these islands.

A strong and refreshed British-Irish relationship for the post-Brexit context is an important priority in support of the peace process and peace and prosperity on these islands.

In addition, the British Irish Council provides a valuable forum for East-West engagement between the 8 participating governments and administrations. The Government is committed to continued active engagement in the British Irish Council, including on sharing experience and planning on public investment through Work Sectors on Collaborative Spatial Planning, Demography, Environment and Housing.

Box 17.2: North West Strategic Growth Partnership

The North West city region, which includes Derry, Letterkenny and Strabane, has a population in excess of 300,000 people, representing the fourth largest urban agglomeration on the island and a discrete cross-border functional economic area.

The North West Strategic Growth Partnership brings together Donegal County Council and Derry City and Strabane District Council, with the Irish Government and Northern Ireland Executive, taking an ambitious approach to integrated cross-border regional working, to drive and co-ordinate resources and regional policy development for sustainable growth in the North West region.

The North West City Region Councils developed an updated statement of regional priorities for the North South Ministerial Council in February 2021. Priorities for the North West City Region in cooperating on and delivering public investment in the decade ahead include:

- Enhanced high-quality transport links for the region by road, rail, air and sea;
- Investment in innovation and skills through strengthened third level education access with increased collaboration between third level institutions and innovation hubs;
- Implementation of a Green Growth strategy, developing the region's potential in clean and renewable energies; and,
- Enhanced cross-border healthcare provision, including shared patient catchment and e-health opportunities.

Box 17.3: Irish Central Border Area Network

The Irish Central Border Area Network (ICBAN) was formed in 1995 and brings together eight member Local Authorities from North and South, working through non-statutory, multi-stakeholder, collaborative approaches for the almost 900,000 people across the Central Border area. The region is predominantly rural with outstanding natural environment and an economy driven primarily by SMEs.

ICBAN published a Framework of Regional Priorities for the Central Border region of Ireland/ Northern Ireland in March 2021, identifying five interlocking strategic pillars of: economic development; infrastructure and connectivity; human capital; liveable communities; and, greening the region.

Key ICBAN objectives for cross-border capital investment in the years ahead include:

- Core infrastructure projects including road upgrades, enhanced broadband connectivity and regional digital hubs;
- Natural infrastructure initiatives and zones, enhancing the sustainable tourism and well-being potential of the region including through development of a network of cross-border greenways and blueways; mountain biking, food and heritage trails; and, river catchment and water management projects;
- Enabling infrastructure to harness the region's capacity and potential including in the bio-economy and agri-food sectors and sub-regional sectoral strengths.

Strategic regional cooperation

The National Planning Framework recognises the importance of cross-border working in supporting regional development in the North-West, the Central Border region and the Dublin-Belfast corridor.

Cross-border local authority regional development initiatives have built track records and developed strategic frameworks for cooperation, reflecting an increased capacity and level of ambition for the years ahead.

The Shared Island investment priorities set out in the reviewed NDP were developed taking account of consultation with the North West Strategic Growth Partnership, Irish Central Border Area Network, East Border Region and Dublin Belfast Economic Corridor initiative.

Each of these initiatives, and other sub-regional cooperation groupings, can significantly contribute to sustainable development on a cross-border basis, through agreed frameworks for pursuing more integrated regional development, which are underpinned by broad stakeholder engagement and sustained political support and participation of member Councils.

The Government will continue to support fully the work of cross-border local authority partnerships and pursue opportunities for collaborative investment and working in implementing the Shared Island NDP investment priorities.

Box 17.4: East Border Region

Established in 1976, East Border Region (EBR) is one of the longest established local authority-led cross-border groups in Europe, bringing six Local Authorities together and serving a population of just under 1 million people.

The East Border Region has more than 10 significant urban town centres alongside rural areas, and with access to road, sea and air connections is well-linked to national and international markets. East Border Region Ltd. has played a key role in the administration of cross-border EU funding on the island, with over €150million in funding successfully delivered to projects over 25 years.

In June 2021, EBR Councils agreed and published a Charter of regional priorities for cooperation, with the aim of positioning the East Border Region as "a smart, competitive, sustainable and inclusive cross-border region". The Charter identifies a range of illustrative actions for the region in delivering these priorities:

- A smart, competitive region: including SME growth and competitiveness; development of the East Border Region tourism product; and, smart towns villages and rural areas;
- A sustainable region: including sustainable transport with greenways and blueways; sustainable energy and energy efficiency measures; and, coastal management;
- An inclusive region: including tackling labour market exclusion, health (including mental health) issues; and, recognising and celebrating cultural diversity.

Box 17.5: Dublin Belfast Economic Corridor

The Dublin-Belfast Economic Corridor (DBEC) is home to over two million people, across eight Council areas, anchored by the two largest cities on the island. Key features of the Corridor as a functional region include: a large talent pool for employers; national and international transport connectivity; and, strong inward investment and enterprise bases.

The Dublin-Belfast Economic Corridor was given fresh impetus with the launch in March 2021 of an initiative by the eight Councils with two Universities, to work collectively to realise the benefits of further development of the region as a whole. This includes spreading growth through the Corridor and beyond, lessening pressures on the urban centres.

The DBEC initiative is pursuing cooperation to create a stronger and broader-based trajectory for growth, for the region and the island more generally, including through investments under Project Ireland 2040 and the Belfast Region City Deal. Areas of potential cooperation identified by the Corridor initiative include:

- Enhanced attraction of private and public investment through promotion;
- Developing regional networks and clusters for regional or sub-regional strengths including tradeable services, advanced manufacturing, construction and agri-food;
- Working on enabling infrastructure including in transport, for tourism, and on research and innovation capacities;
- Enhancing educational attainment in the corridor to meet skills demands.

17.3 Shared Island investment objectives

In line with our NDP Shared Island investment priorities, the Government will deliver existing commitments and develop a new generation of cross-border public investment projects to achieve a more connected, sustainable and prosperous island, through all-island partnership in the years ahead.

Available funding streams include the Shared Island Fund; the Project Ireland 2040 funds for rural development, urban regeneration, climate action and innovation; the EU PEACE PLUS programme 2021-27; and, other cross-border funding partnerships with the Northern Ireland Executive, UK Government and European Union.

1. A more connected island

Investing to enhance connectivity on the island is a crucial enabler of balanced regional development, sustainable economic growth, recreation and well-being, as well as beneficial community interactions across the island of Ireland.

Enhancing connectivity on our shared island encompasses all-island transport infrastructure; tourism and recreation assets; connectivity of public services in health and education; and, supporting vibrant and diverse arts, culture and conserved heritage across the island.

Box 17.6: Working for a Healthier island

As we emerge from the biggest public health challenge in decades, the Government is redoubling our commitment to deepening and strengthening North-South health links, to deliver better health care and outcomes for people on the island.

We can build on the successes of recent years, including all-island provision of paediatric cardiac surgery in Dublin and cross-border provision of radiotherapy and coronary intervention services in Derry.

The COVID-19 pandemic has demonstrated the value of both health services working closely together to share technology and expertise in ICT and eHealth. We will seek to work with the Executive, including through the NSMC, to together develop an overarching strategy for healthcare cooperation, to better identify needs and opportunities and set priority actions; to share experience, innovation and support more all-island research; and, to ensure that specialist health services are available on the island for all who need them.

Strategic investment priorities for a more connected island

The Government will work with the Executive on Healthcare cooperation to pursue investment opportunities to:

- Increase regional access to diagnostic and other services on a cross-border basis;
- Deliver new eHealth solutions, through a developing all-island ecosystem in digital health;
- Provide specialist health services on an all-island basis, building on the success of the All-Island Congenital Heart Disease Network; and,
- Upgrade ambulance services facilities in border regions.

PEACE PLUS (2021-27) will also make available an indicative €80m to build upon and deliver new cross-border collaborative approaches to health and social care service delivery and the Government will continue to support the all-island work of the Food Safety Promotion Board.

Creating an island-wide greenway network, linking the Atlantic coast with the Eastern seaboard through greenway projects across the border region, creating a transformational green infrastructure asset, benefitting residents and growing sustainable tourism.

Current greenway projects include: Inishowen; Foyle Valley; North-West, Sligo-Enniskillen; Cavan-Leitrim; Cavan Railway; Ulster Canal and Carlingford Lough.

Delivery of the Narrow Water Bridge project, through the Shared Island Fund, to link the Mourne Mountains and Cooley peninsula, providing tourism, recreation and connectivity boosts in the east border region.

Completion of all Phases of the Ulster Canal restoration project, with support from the Shared Island Fund and other partners, with blueways and greenways extending from Upper Lough Erne to Middletown, delivering a landmark sustainable tourism and recreation amenity for the central border region.

Enhanced rail connectivity taking account of the all-island strategic rail review to be completed in 2022. The review is examining improved inter-urban and inter-regional connectivity on the island, including the potential for high-/higher-speed links; rail freight potential; and, improved connectivity for the North-West of the island.

An early priority is the introduction of an hourly rail service on the Dublin-Belfast line through investment in new and additional rolling stock, with funding under the PEACE PLUS programme and by the Government and Executive.

Potential for increased air connectivity on the island, taking account of the outcome of a review on the viability of air routes from Cork to Belfast and Dublin to Derry.

Road infrastructure improvements to support all-island and border region connectivity, with a particular priority to the A5 Transport Corridor to the North West, where the Government has already committed £75 million.

More all-island Education connections including through continued investment in the Middletown Centre for Autism as an internationally-renowned centre, and seeking other opportunities to share experience and resources in early years, special needs, and tackling educational underachievement.

PEACE PLUS (2021-27) will also make available an indicative €45m for the Shared Learning Together Programme in border counties and Northern Ireland, and across the island, including for: shared education; collaborative opportunities for disadvantaged education settings; use of technology in the classroom; and, post-primary school and youth-based organisation partnerships on a cross-border and cross-community basis.

Investing in the diverse heritage, arts, culture and sports of the island:

The border regions of our shared island are places of rich and diverse cultural traditions, layered history and a unique natural and scenic beauty. The built heritage, parkland and waterways infrastructure resonates an architectural signature of a rich vernacular, social, agricultural and industrial history. We will invest in the unique elements of built and natural heritage of border regions, to better recognise their diverse community and cultural traditions, and support a connected heritage tourism offering. We will do so working in North-South partnership and with local communities, including to develop new cross-border heritage parks, like the Marble Arch Caves UNESCO Global Geopark in Fermanagh and Cavan, and cross-border community parks such as the Riverine Community Park in Strabane and Lifford. We will leverage investment in the Ulster Canal as an artery of connectivity between key points of cultural, community and heritage interest along its route, including the repurposing and rehabilitation of heritage infrastructure.

The Government will also:

- Continue to grow funding for a wide range of cross-border initiatives in arts, culture, music, and film, including through the Creative Ireland initiative.
- Engage positively on the further development of sport on the island, including by exploring the potential for new all-island sporting competitions and opportunities to make Ireland-Northern Ireland and Ireland-UK bids for major international sporting events, including the 2030 FIFA World Cup.
- Protect and develop the Irish language and Ulster Scots traditions across the island through the North South language bodies and funding commitments for the Irish language in Northern Ireland.

2. A more sustainable island

Both jurisdictions on the island are committed to making rapid transition to a net zero-carbon future. Public investment strategy, North and South, is fundamental to achieving this common goal. The island is a single ecological entity, integrated in crucial environmental, economic and social domains. Well-coordinated North/South approaches are therefore imperative for effective policy and public investment actions on the island, in addressing the generational challenges of climate breakdown and the biodiversity crisis, and protecting the common environmental resources of the island.

Connecting people - the Government's Reconciliation Fund was increased again in 2021, supporting more grants to organisations working to build better relations across traditions in Northern Ireland, between North and South, and Ireland and Britain.

The Government will also, in cooperation with the Executive, pay particular attention to the needs of minorities in border counties and explore options, including the establishment of dedicated funding streams, to address gaps in current support.

PEACE PLUS (2021-27) will also make available an indicative €20m for maintaining and forging relationships between citizens across the island including for cooperation around specific shared challenges; and for North South joint events and activities that develop mutual understanding and cement partnership.

Box 17.7: Joined-up environmental protection across the island of Ireland

The Government will take a multi-level approach to secure joined-up protections and actions for our shared island environment. The European Green Deal will shape Ireland's approach to addressing climate change and environmental degradation, and we will work with the Executive through the North South Ministerial Council and with the UK Government to coordinate and optimise approaches for the island of Ireland as a whole. The Environmental Protection Agency, Marine Institute, the National Parks and Wildlife Service and other agencies will work in close partnership with their Northern Ireland counterparts. We will also support wider engagement - including by researchers, environmental, economic and civil society stakeholders on the island - for the necessary whole of society action on tackling climate change and environmental conservation in the decade ahead. Delivery of island-wide electric vehicle and other sustainable transport networks and renewable energy infrastructure are strategic priorities. The Government will also pursue coordinated all-island approaches including on the circular economy, protection of our shared marine and coastal environment and biodiversity protection.

Strategic investment priorities for a more sustainable island

Energy transformation for a net zero-carbon future is a fundamental task and will benefit from North/South as well as East/West cooperation in the decade ahead.

Priorities include:

- Delivery of the North/South Interconnector which will enhance the performance of the Single Electricity Market, and facilitate the integration of renewable electricity into the power system.
- Exploring potential cross-border and all-island approaches on renewable energy, such as renewable electricity, energy efficiency and the potential of hydrogen power.
- Coordinated investment to roll-out Electric Vehicle charging networks across the island.

Climate action funding to take up opportunities for effective cross-border climate action partnerships and interventions.

Coordinated investment to conserve cross-border region peatlands to support biodiversity, provide valuable ecosystem services and act as carbon sinks.

Supporting more all-island approaches to biodiversity protection, building on the success of the All-Ireland Pollinator Plan.

Investing for more efficient operation of the circular economy on an all-island basis.

Coordinated North/South investment on river basin management and water infrastructure and support for the work of Waterways Ireland in maintaining, developing and promoting over 1,000 km of inland navigable waterways across the island.

Cooperation on preservation of coastal regions and marine resources.

In addition to the potential for support from the Shared Island Fund for approved projects and other public funding sources, the PEACE PLUS programme (2021-27) will make available an indicative €100m to support sustainability actions across: Biodiversity, Nature Recovery and Resilience; Marine and Coastal management; Water Quality Management; and, Geothermal Energy.

3. A more prosperous island

By investing and working together on the island, we can have greater impact on the key drivers of prosperity for all regions, and better harness the potential of border areas as the geographic core of a growing, high-value all-island economy.

Research and innovation, higher and further education, infrastructure, an enabling enterprise and investment environment, and tourism strategy are pillars for sustainable growth on the island out to 2030. Through coordinated investment and cooperation on the island in these areas, the Government will work for a more regionally-balanced and prosperous island for all.

Box 17.8: Looking to the future of Higher, and Further Education, Research and Innovation on the island

Building on the launch of the €40m North South Research Programme in 2021, the Government will work with the Executive and UK Government and with the higher and further education sector to realise the huge potential of cross-border collaboration in supporting world-class, inclusive, innovative universities and colleges that serve and contribute to society across the island and beyond. International best-practice and the impact of the COVID-19 pandemic is accelerating trends in distance learning, hybrid campus models, more integrated and networked institutions, and joint collaborative programmes. This opens up exciting new opportunities for cross-border cooperation that can improve accessibility and institutional excellence, expand learning options and provide valuable opportunities for students, researchers, enterprises and wider society to interact across the island.

Through the new Department for Further and Higher Education, Research, Innovation and Science, the Government will work with our Northern Ireland and UK counterparts and with education and research stakeholders to support more strategic cooperation, realise new opportunities and shape higher, further education and research sectors that will meet the needs and capacity of the shared island in the decade ahead.

Strategic investment priorities for a more prosperous island

Enhanced cooperation on higher and further education including to:

- Further develop third-level education infrastructure of the North West region in integrated and sustainable ways, including with Ulster University Magee Campus in Derry, working with Letterkenny Institute of Technology and other Higher and Further Education institutions in the region;
- Deepen cooperation between further education institutions on an all-island basis;
- Ensure access to the Erasmus+ programme for students in higher and further education institutions in Northern Ireland;
- Support student mobility on the island; and,
- Develop cross-border apprenticeship programmes.

Delivering the new North/South research programme with €40m over 5 years from the Shared Island Fund, to harness the capacity of institutions and researchers across the island to conduct research, providing a knowledge base on strategic issues faced on the island as a whole.

Creating new all-island research centres and further collaborations, funded through Science Foundation Ireland, the Shared Island Fund and with Northern Ireland and UK partners, and working with industry, to better harness all-island capacities to conduct world-leading research and innovation. The centres will be in areas of common priority for both jurisdictions, such as Biotherapeutics, Climate, Cybersecurity, Digital Healthcare, Food Security, Infectious Diseases and Precision Medicine.

Continuing and growing all-island research partnerships with the United States, including the US-Ireland R&D Partnership Programme and the Ireland-Northern Ireland-US National Cancer Institute Cancer Consortium.

Supporting the work of InterTradeIreland to help businesses across the island grow all-island trade, increase productivity and innovation, and support clustering and development of high-potential sectors for the island including on bio-economy, advanced manufacturing, health and life sciences and the green economy.

Build on the success of the Border and Regional Enterprise Development Funds and work through the Regional Enterprise Plans to promote and facilitate enterprise development on a cross-border basis including to enhance clustering, innovation diffusion and collaboration.

PEACE PLUS (2021-27) will make available an indicative €113m to support: SME development, competitiveness, digitisation and clustering; an Innovation Challenge Fund to enhance research and innovation capacities; and a cross-border skills programme.

Infrastructure investments to support all-island supply chains and networks, including at ports and airports.

Supporting cross-border approaches to attract investment, including through the North West City Region and the Dublin Belfast Economic Corridor initiatives.

Pursuing all-island opportunities to promote the sustainable development of the Agri-Food sector as part of the new agri-food strategy 'Food Vision 2030'.

Supporting the mission of Tourism Ireland to grow tourism into the island of Ireland to promote the recovery of the sector following the pandemic.

Working with the Executive on large scale North-South tourism initiatives which support the sustainable growth of the sector including cross-border walking/cycling trails as well as new marketing opportunities.

Box 17.9: EU PEACE programmes - partnership for peace, prosperity and reconciliation

The PEACE PLUS programme (2021-27), with a total value of over €1 billion funded by the European Union, UK Government, Northern Ireland Executive and Government of Ireland, will support peace and prosperity across Northern Ireland and the border counties of Ireland, building upon the work of the preceding PEACE IV and INTERREG VA Programmes.

The Programmes reflect the importance of peace-building activity, and also of actions that contribute positively to connectivity, prosperity and sustainability.

Among the successes of the PEACE IV and INTERREG VA programmes are:

Connectivity:

€23.5m for sustainable transport through the North West Multi-Modal Transport Hub.

€6.4m for the increased use of electric vehicles with a cross-border EV charging network.

Sustainability:

€14m in two projects for biodiversity in cross-border blanket bogs and wetland habitats.

€18.3m across four projects to support marine conservation.

€53.6m across three projects for water quality and catchment management.

Prosperity:

€16.6m to support R&I capability development for SMEs in Ireland and Northern Ireland.

€54.8m to support cross-border research and innovation in health and life sciences. renewable energy and advanced manufacturing.

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Belfast City Council

CLIMATE AND CITY RESILIENCE COMMITTEE

Subject:	Belfast Stories – Update including shallow geothermal feasibility study
Date:	09 June 2022
Reporting Officer:	Wendy Langham, Programme Director, Belfast Stories
Contact Officer:	Richard Treacy, Energy and CO2 Manager, Physical Programmes

Restricted Reports				
Is this report restricted?	**Yes**		**No**	X
If Yes, when will the report become unrestricted?				
After Committee Decision				
After Council Decision				
Sometime in the future				
Never				

Call-in				
Is the decision eligible for Call-in?	**Yes**		**No**	

1.0	**Purpose of Report or Summary of Main Issues**
1.1	The purpose of this report is to: - Update Members on the Belfast Stories (BS) programme as part of the Belfast Region City Deal. - Provide Members with an update on the ambition for net zero including the findings from the Belfast Stories shallow geothermal feasibility study.
2.0	**Recommendations**
2.1	The Committee is asked to: - Note the contents of this report. - Receive a presentation and update on the net zero ambitions for Belfast Stories. - Note the findings from the shallow geothermal feasibility study. - Following the presentation, discuss and agree the next steps.

3.0	**Main report**
3.1	Members will be aware that Belfast Stories is the Council's flagship project under the Belfast Region City Deal and is due to open in 2028. Located in the city centre on a strategic site of 5,000sqms with the estimated indoor space 8,500sqms and outdoor space 2,500sqms. Several important milestones in relation to the project have been achieved including the acquisition of the site for Belfast Stories in October 2021, the signing of the Deal Document for the BRCD and the Belfast Stories press announcement in December 2021.
3.2	Strategic Policy and Resources Committee agreed at its meeting on 19th November 2021 to progress a number of key pieces of work, in order to meet the 2028 anticipated opening date including the appointment of the integrated design team and the exhibition design team and to progress the Belfast stories collection.
3.3	A progress update was provided to CG&R Committee 11th May 2022 including the thematic Story Collection Framework and plans for engagement including a public consultation August – October 2022.
3.4	Included in the work programme was the completion of shallow geothermal energy feasibility study and presentation on the findings from this study was made to the Climate and Resilience Board on 5th May 2022.
3.5	Belfast Stories aspires to be a sustainable, net zero carbon exemplar for the city and region, at the forefront of environmentally sensitive design, minimising energy consumption and maximising the potential for enhancing biodiversity, on-site energy generation and sustainable transport. The design process which underpins the development therefore requires early consideration of the elements relating to best practice that will support this ambition.
4.0	**<u>Net Zero ambitions</u>**
4.1	In August 2021 council officers arranged a site visit with key stakeholders to QUB's new Riddell Hall extension to educate and inform us on the potential use of geothermal energy for further consideration by the Belfast Stories team.
4.2	This visit and subsequent interactions with geothermal experts and other energy advisors led to the consideration of energy sources for Belfast Stories to see how it could meet the goals and ambitions outlined within the Future Proofed City Ambitions Document: *A Climate Plan for Belfast (Dec 2020).* Within the plan, Belfast Stories is named as a standalone

	project (No. 26) with the potential to be '*a bold demonstration of intent on Belfast's ambition to be a net zero emissions, climate-resilient city'*.
4.3	Belfast Stories is currently in the process of procuring the Integrated Design Team. Various sustainability assessments and standards are being considered to ensure the design will support the intent and ambition. These include BREEAM, Passivhaus and One Planet Living.
4.4	BREEAM is the world's leading sustainability assessment method for master planning projects, infrastructure and buildings. It recognises and reflects the value in higher performing assets across the built environment lifecycle, from new construction to in-use and refurbishment.
4.5	Passivhaus is a performance-based set of design criteria for very low-use energy buildings, which can help create buildings which use around 90% less energy than standard UK buildings.
4.6	One Planet Living is a vision of a world where we can live happily within our one Earth's resources and is a simple framework that may be suitable for the project's operational phase.
4.7	In October 2021 the Climate and Resilience Board supported the commissioning and appointment of suitably qualified consultants to undertake a feasibility study for the further consideration of the use of geothermal energy solutions. The study was to: - Establish local thermogeological, geological, hydrogeological setting. - Determine opportunities / limitations for ground-based site energy. - Explain the operational concept of ground sourced solutions. - Compare options over a 30-year lifecycle. - Undertake a data gap analysis and consider any regulatory issues to be addressed.
4.8	TetraTech Environmental Planning (NI) Limited (TetraTech) was commissioned by the Council in December 2021 to deliver the contract. The Executive Summary of the report findings is attached in **Appendix A.** The report concludes that Geothermal is a viable option for the site. A closed loop geothermal solution is preferred to an open loop system.
4.9	A number of assumptions have been made given the early stage of project design. It is possible to consider other developments of similar size and scale and make some assumptions at this stage. It should be noted this is a starting point on a journey towards

	consideration of the suitability of geothermal energy for Belfast Stories alongside other renewable energy options.
4.10	In summary the report concludes that: - The site has suitable geological/hydrological/thermogeological properties for a shallow geothermal scheme. - A closed loop geothermal system is the preferred solution when compared with other heating and cooling solutions. - The CO2 emissions (TCO2) saving is *est*. 950 tonnes over a 30-year period. - The capital cost (CAPEX) is more expensive than air to water est. +£1m (as would be expected). - A closed loop geothermal system provides potential operational expenditure (OPEX) savings over a 30-year period compared to air to water est. 500k.
5.0	**<u>Proposed Next Steps</u>**
5.1	In identifying the suitability, cost-benefit and environmental considerations of geothermal energy sourcing, it needs to be outlined at the outset that the Belfast Stories energy consumption requirements are not yet known due to the project being at an early stage of development (RIBA 0/1).
5.2	The Integrated Design Team (IDT) scope of works and specification will outline the Council's ambition for the project to be a net zero exemplar for the city. The IDT will be required to include a sustainability expert within the team. The IDT is due to be appointed by the end 2022.
5.3	It is proposed that BREEAM is the sustainability assessment to be included within the IDT specification with the aspiration of the project to be 'outstanding'. The Geothermal Feasibility Study will be made available to the successful IDT for their consideration.
5.4	As highlighted the capital cost of a geothermal energy solution is more expensive than other options. Consideration of opportunities to secure additional capital funding including Peace Plus are ongoing. There is a potential Peace Plus opportunity for funding under Theme 5.5 Geothermal Energy Demonstration Programme. A meeting was held in February regarding a funding bid, Chaired by Codema (Dublin's Energy Agency). The potential bid being considered is for 2 deep geothermal and 2 shallow geothermal projects, with 1 of each on each side of the border. The shallow geothermal project being considered north of the border is Belfast Stories. The total potential amount of funding is €20 million

	for all 4 projects. The Peace Plus Call is expected in Jul-22 with an award made in Oct-22. The funding is to be spent before 2030.
5.5	Prior to BCC committing to be part of a Peace Plus bid, a full report would be brought to SP&R Committee for their consideration.
6.0	**Financial and Resources Implications** None
7.0	**Equality or Good Relations Implications /Rural Needs Implications** None
	Appendices
	Appendix A: Belfast Stories – Shallow Geothermal Feasibility Study Executive Summary

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Executive Summary

Background & Project Description	Belfast City Council (BCC) are developing a new build flagship tourism and visitor experience centre (Belfast Stories) in central Belfast. To align with Belfast City Council's (BCC's) Net-Zero Carbon Roadmap for Belfast and their Resilience Strategy published in December 2020, BCC commissioned a study to look at the potential for using geothermal technology to meet the buildings heating and cooling requirements. An assessment of the site with respect to its potential to use ground source shallow geothermal technology has been completed. No detailed design for the development was available at the time of this study preparation, however a concept layout for the site and development was available from which an initial building model was developed. This enabled Tetra Tech to complete an initial assessment of the buildings heating and cooling requirements. The work also permitted an initial comparison of heating and cooling technologies for the site.
Site Setting	The site is located at the junction of Royal Avenue and North Street in central Belfast, Northern Ireland. The site has been partially cleared of previous buildings. The former Bank of Ireland building remains and its entrance fronts onto Royal Avenue. It is expected that the former bank building will be retained and integrated into the Belfast Stories development. Other more modern buildings are also present along this side, some of which may also be retained.
Geological/Hydrogeological /Thermogeological Setting	The site sits within the Lagan Valley, it is underlain by 10-25m of unconsolidated superficial deposits, below which lies the Sherwood Sandstone aquifer (bedrock), The bedrock is expected to reach thicknesses of several hundred metres below the site. The Sherwood Sandstone is a significant aquifer resource which has the potential to sustain large abstractions. The aquifer has a long history of use supporting many different industries, including public water supply, large private water supplies (Belfast Hospitals, QUB) and more recently geothermal. Available information for the Sherwood Sandstone bedrock indicates it has favourable thermal properties, and has good heat transfer capability compared to many other bedrock types in Northern Ireland.
Technology Options Assessment	The site setting is such that a range of established ground source heating and cooling options are potentially viable. These options include open loop – which involves physically pumping groundwater from the underlying aquifer and subsequently discharging groundwater back into the ground. A closed loop solution is considered potentially viable. This involves the connection of heat pumps to the ground via pipework installed in boreholes and/or piles. Each option has implications for the building design. Further site investigation and or modelling would be required once the buildings heating and cooling requirements are better understood (i.e. once a design has been developed). This will then all BCC to confirm the viability of each option or establish the maximum contribution that each technology could make to the buildings overall heating and cooling requirements. The investigations and modelling will also allow BCC to refine the carbon savings and CAPEX/OPEX costs presented in this initial feasibility assessment. The outcome of the financial and carbon analysis completed as part of this study shows that, in principle, ground source heat pumps are a viable option for the site. A geothermal solution has the potential to provide significant carbon reductions and boasts competitive operational costs when compared to alternative technologies on the market today.
Conclusions	Geothermal is a viable option for the site. A closed loop geothermal solution is preferred for the site relative to an open loop system. Ground investigation work and modelling will be required. The data gathered from this work can be used to inform a geothermal design for Belfast Stories once the building heating and cooling demands have been derived. **CO2** Based on the data available and the assumptions made during the preparation of this feasibility assessment, a closed loop geothermal system comes out on top as a low carbon solution when compared to other heating and cooling solutions (30 year emission estimate: Gas 1241 tC02, Biomass/gas 711 tC02, Geothermal 284 tC02 and Air Source 346 tCO2). For geothermal this equates to a C02 saving compared to Gas of 957 tC02 over 30 years. This option would align with BCC's Resilience Strategy and Net Zero Carbon Road map.

	However, on the grounds of CAPEX and OPEX costs over a 30-year period, a closed loop geothermal system is more expensive. **CAPEX** For CAPEX the derived geothermal estimate cost of £1.45M compares to Gas – £0.21M, Biomass/gas – £0.34M and Air Source £0.47M. **OPEX** For OPEX the geothermal estimate cost of £1.6M compares to Gas – £1.38M, Biomass/gas – £1.46M and Air Source £2.16M. Based on the estimates made, the geothermal solution is therefore c.£13,300 per annum (on average) more costly over a 30 year period compared to the next lowest CO2 emission technology of Air Source (air to water).

Belfast City Council

CLIMATE AND CITY RESILIENCE COMMITTEE

Subject:	Belfast Net-Zero Carbon Roadmap
Date:	12 May 2022
Reporting Officer:	Debbie Caldwell
Contact Officers:	Richard McLernon

Restricted Reports				
Is this report restricted?	**Yes**		**No**	X
If Yes, when will the report become unrestricted?				
After Committee Decision				
After Council Decision				
Some time in the future				
Never				

Call-in				
Is the decision eligible for Call-in?	**Yes**	X	**No**	

1.0	**Purpose of Report or Summary of Main Issues**
1.1	The purpose of this report is to provide Members with an overview of the Belfast Net-Zero Carbon Roadmap, which was commissioned for Belfast through the Place Based Climate Action Network (PCAN) and which is attached for information.
2.0	**Recommendations**
2.1	The Committee are asked to adopt the recommended emissions reduction targets for Belfast as set out in the Belfast Net-Zero Carbon Roadmap, which are: 66% by 2025 80% by 2030 88% by 2035 93% by 2040

	97% by 2045 100% by 2050
3.0	**Main report**
3.1	**A Net-Zero Carbon Roadmap for Belfast - Setting Science-Based Carbon Reduction Targets for Belfast.** The Intergovernmental Panel on Climate Change (IPCC) argued that from 2020, keeping within a global carbon budget of 344 gigatonnes (i.e. 344 billion tonnes) of CO2 emissions would give us a 66% chance of limiting average warming to 1.5ºC and therefore avoiding dangerous levels of climate change. The Net-Zero Carbon Roadmap analysis divides this global figure up on an equal basis by population and adjusts the budget to consider other gases that contribute to climate change, which gives Belfast a total carbon budget of c.14 megatonnes over the period between the present and 2050. At the current rate of emissions output, Belfast would use up this budget in just over a decade at some point during the winter of 2030. However, Belfast could stay within its carbon budget by reducing its emissions by c.8.4% year on year. This would mean that to transition from the current position where emissions are 42% lower than 2000 levels to a local pathway that is consistent with the world giving itself a 66% chance of avoiding dangerous, runaway climate change, Belfast should adopt the following carbon reduction targets (on 2000 levels): 66% by 2025 80% by 2030 88% by 2035 93% by 2040 97% by 2045 100% by 2050
3.2	Adopting these targets supports a number of initiatives to address the climate emergency that Council declared in October 2019, including Belfast's annual report to the Carbon Disclosure Project (CDP), the development of the City Climate Plan, and aligns with the draft NI Climate Change Bill which sets a target of Net-Zero for Northern Ireland by 2050. The Belfast Net-Zero Carbon Roadmap makes a series of recommendations in relation to sectors and identifies buildings and transport as the largest source of Scope 1 and 2 emissions in Belfast.

4.0	**Financial & Resource Implications**
4.1	Members are asked to note that meeting the recommended targets will require significant additional investment at the city level which to a large extent will depend on the policies, proposals and sectoral plans developed by Northern Ireland departments as well as the resources made available to support decarbonisation projects. Accordingly, the production of the city climate plan will be accompanied by the development of a city climate investment plan.
5.0	**Equality or Good Relations Implications/Rural Needs Implications**
5.1	None
6.0	**Appendices – Documents Attached**
6.1	Belfast Net-Zero Carbon Roadmap

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A NET-ZERO CARBON ROADMAP FOR BELFAST

Andy Gouldson, Andrew Sudmant, Jessica Boyd, Robert Fraser Williamson, John Barry & Amanda Slevin

UKRI Economic and Social Research Council
PCAN PLACE-BASED CLIMATE ACTION NETWORK
UNIVERSITY OF LEEDS
wrc
QUEEN'S UNIVERSITY BELFAST
Belfast City Council

Please reference as:

Gouldson, A., Sudmant, A., Boyd, J., Williamson, R., Barry, J., and Slevin, A. (2020)

A Net-Zero Carbon Roadmap for Belfast, Belfast Climate Commission/ Place-Based Climate Action Network.

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https://belfastclimate.org.uk

A NET-ZERO CARBON ROADMAP FOR BELFAST

CONTENTS

PREFACE

Background

Belfast signed its climate emergency declaration in October of 2019, and is due to set a target date in 2021 for the city to reach net-zero emissions. Produced by the ESRC Place-Based Climate Action Network for the Belfast Climate Commission, this net-zero roadmap is designed to feed into Belfast's deliberations on its target date for net-zero, and to inform how it can work towards an ambitious target in the coming years, including through the adoption of a green recovery programme.

Policy Change and the Need to Deliver

In June 2019, the UK Government passed legislation with a commitment to reach net-zero emissions by 2050. The Northern Ireland Assembly declared a climate emergency in February of 2020.

At the local level, 2019 saw a wave of local climate emergency declarations, with many local authorities setting their own, usually more ambitious targets to reach net-zero emissions. By February 2020, 68% of UK district, county, unitary and metropolitan councils including 3 authorities in Northern Ireland had declared a climate emergency*. It is clear though that declaring a climate emergency is just the first step – declarations need to be turned into action plans, and these need to be delivered before we can claim to have responded effectively.

Covid and a Green Recovery

Clearly the world changed dramatically with the Covid pandemic. From a climate perspective, the first, and we hope main phase of national lockdown in the spring and early summer of 2020 did reduce our carbon footprint for a short period – and it triggered some changes in our behaviour that could help us in the longer term – but we clearly need a more positive way of addressing the climate challenge in the context of a healthy, inclusive and vibrant city.

This roadmap shows how in the years to come Belfast could apply some guiding principles for a green recovery – to go faster, to build better, to think bigger, to be bolder - to radically reduce its carbon footprint whilst also becoming a better place, with cleaner air, improved public health, reduced poverty and inequality, increased employment and enhanced prosperity.

John Barry and Grainia Long, Co-Chairs, Belfast Climate Commission

Belfast Climate Commission

The Belfast Climate Commission was established in 2020 to support the city to make positive choices on issues relating to energy, carbon, weather and climate. Members of the Commission are drawn from key organisations and groups across the city from the public, private and civic sectors.

The Belfast Climate Commission is an independent voice in the city, providing authoritative advice on steps towards a low carbon, climate resilient future to inform policies and shape the actions of local stakeholders and decision makers. It monitors progress towards meeting the city's carbon reduction targets, recommends actions to keep the city on track and advises on the assessment of the climate-related risks and adaptation opportunities in the city and on progress towards climate resilience.

The Commission aims to foster collaboration on projects that result in measurable contributions towards meeting the city's climate reduction targets and the delivery of enhanced climate resilience. It promotes best practice in public engagement on climate change in order to support robust decision-making and acts as a forum where organisations can exchange ideas, research findings, information and best practice.

https://www.belfastclimate.org.uk

*Source: https://www.climateemergency.uk/

BELFAST CARBON ROADMAP
PATHWAY TO NET-ZERO*

PCAN | BELFAST CLIMATE COMMISSION

BACKGROUND

1.5ºC

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 1.5ºC of warming

GLOBAL TO LOCAL

14m

tonnes

Belfast's share of the global carbon budget (to keep to 1.5ºC of warming)

Belfast is emitting

1.5m

tonnes

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

2030

BASELINES AND TARGETS

42%

The decline in Belfast's carbon emissions since 2000

This needs to be increased to

66% by 2025
80% by 2030
100% by 2050

Belfast has committed to work towards being

CARBON NEUTRAL

by

2050

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

35%

These would reduce Belfast's energy bill by

£263m

per year, and would create nearly

4,779

years of extra employment

MORE AMBITIOUS OPTIONS

More ambitious but expensive options could

close the 2030 gap by

51%

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

Doing all of the above leaves a

41%

shortfall to reach by

2050

REACHING OUR TARGET

Belfast can close the gap by

100% by 2033

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

*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.

EXECUTIVE SUMMARY

Background

- Scientific evidence calls for rapid reductions in global carbon[1] emissions if we are to limit average levels of warming to 1.5°C and so avoid the risks associated with dangerous or runaway climate change.
- Globally, the Intergovernmental Panel on Climate Change (IPCC) suggests that we will have used up the global carbon budget that gives us a good chance of limiting warming to 1.5°C degrees within a decade. This science underpins calls for the declaration of a climate emergency.
- Dividing the global carbon budget up by population gives Belfast a total carbon budget of 14 million tonnes from 2020. Based only on the fuel and electricity used within its boundaries, Belfast currently emits c.1.5 million tonnes of carbon a year, and as such it would use up its carbon budget by 2030.
- This assessment does not include its broader carbon footprint – for example relating to longer distance travel or the goods and services that are produced elsewhere but consumed within Belfast (i.e. its Scope 3 emissions).

Baselines and Targets

- Scope 1 and 2 carbon emissions from Belfast have fallen by 42% since the turn of the Millennium. With on-going decarbonisation of grid electricity, and taking into account population and economic growth within the city region, we project that Belfast's 2000 level of annual emissions output will have fallen by a total of 51% in 2050.
- If it is to stay within its carbon budget, Belfast needs to add to the emissions reductions already achieved to secure 66% reductions on its 2000 level of emissions by 2025, 80% by 2030, 88% by 2035, 93% by 2040, 97% by 2045 and 100% by 2050. In short, the majority of all emissions reductions across the city need to be delivered within the next ten years.
- Without further activity to address its carbon emissions, we project that Belfast's annual emissions will exceed its carbon budget by 1.4 million tonnes in 2030, and 1.3 million tonnes in 2050.

[1]For simplicity, we use the term "carbon" as shorthand for all greenhouse gases, with all figures in this report relating to the carbon dioxide equivalent (CO2e) of all greenhouse gases unless otherwise stated. Note that our assessment therefore differs from other assessments that focus only on CO_2.

Cost-Effective Options

- To meet these carbon reduction targets, Belfast will need to adopt low carbon options that close the gap between its projected emissions in future and net-zero emissions. This can be partially realised through cost-effective options that would more than pay for themselves through the energy cost reductions they would generate whilst generating wide social and environmental benefits in the area.
- More specifically, the analysis shows that Belfast could close the gap between its projected emissions in 2050 and net-zero emissions by 35% purely through the adoption of cost-effective options in houses, public and commercial buildings, transport and industry.
- Adopting these options would reduce Belfast's total projected energy bill in 2050 by £263 million per year whilst also creating 4,779 years of employment in the city. They could also help to generate wider benefits, including helping to tackle fuel poverty, reducing congestion and productivity losses, improving air quality, and enhancements to public health.
- The most carbon-effective options for the city to deliver these carbon cuts include improved deep retrofitting of heating, lighting and insulation in houses, cooling and insulation in offices, shops and restaurants, and a range of measures across the transport sector including modal shift to non-motorised transport and the wider up-take of electric vehicles.

More Ambitious Options

- The analysis also shows that Belfast could close the gap to net-zero emissions in 2050 by 51% through the adoption of options that are already available, but that some of these options would not pay for themselves directly through the energy savings that they would generate. Many of these options would, however, create wider indirect benefits both economically and socially in the city.
- This means that although it can achieve significant reductions in emissions by focusing on established cost-effective and technically viable measures, Belfast still has to identify other more innovative interventions that could deliver the last 41% of shortfall between projected emissions in 2050 and a net-zero target.
- Options identified elsewhere that could be considered in Belfast include promoting the use of low carbon vehicles, electrification of heating and cooking, and planting trees. Carbon emissions could be cut further still through behavioural and consumption-based changes such as the promotion of active travel (e.g. walking and cycling), reductions in meat and dairy consumption and the generation of food waste, and reduced consumption of concrete and steel with more emphasis on green infrastructure.
- The scale of activity and investment needed to reach or even get close to the carbon emissions reduction targets set is significant. We find that across the city, many hundreds of thousands of homes and square-metres of floorspace will require retrofitting and widespread changes will be needed in the travel patterns and the way that people travel.

EXECUTIVE SUMMARY

Next Steps

- Belfast needs to adopt a clear and ambitious climate action plan. The case for the adoption of such a plan is supported by the evidence that much – but not all – of the action that is required can be based on the exploitation of win-win low-carbon options that will simultaneously improve economic, social and health outcomes across the city.
- The climate action plan should adopt science-based targets for emissions reduction. As well as longer term targets, it should include five-yearly carbon reduction targets.
- The action plan should focus initially on Belfast's direct (Scope 1 and 2) carbon footprint as these emissions are most directly under the city's influence, but in time it should also widen its scope to consider its broader (Scope 3) carbon footprint.
- The action plan should also set out the ways in which Belfast will work towards achieving these science-based targets, drawing on the deployment KPIs listed in this report. Action should also be taken to monitor and report progress on emissions reductions.
- It is important to stress that delivering on these targets will require action across the city and the active support of the public, private and third sectors. Establishing an independent Belfast Climate Commission has already helped to draw actors together and to build capacities to take and track action.
- Driven by the Belfast Climate Commission, leadership groups should be formed for key sectors such as homes, public and commercial buildings, transport and industry, to develop clear plans for the delivery of priority actions in each sector. All large organisations and businesses in the city should also be asked to match broader carbon reduction commitments and to report back on progress.

INTRODUCTION

Climate science has proven the connection between the concentration of greenhouse gases in the atmosphere and the extent to which the atmosphere traps heat and so leads to global warming. The science tells us – with a very high level of confidence – that such warming will lead to increasingly severe disruption to our weather patterns and water and food systems, and to ecosystems and biodiversity. Perhaps most worryingly, the science predicts that there may be a point where this process becomes self-fuelling, for example where warming leads to the thawing of permafrost such that significant quantities of greenhouse gases are released, leading to further warming. Beyond this point or threshold, the evidence suggests that we may lose control of our future climate and become subject to what has been referred to as dangerous or "runaway" climate change.

Until recently, scientists felt that this threshold existed at around 2ºC of global warming, measured as a global average of surface temperatures. However, more recent scientific assessments (especially by the IPCC in 2018) have suggested that the threshold should instead be set at 1.5ºC. This change in the suggested threshold from 2ºC to 1.5ºC has led to calls for targets for decarbonisation to be made both stricter (e.g. for the UK to move from an 80% decarbonisation target to a net-zero target, which it did in 2019), and to be brought forward (e.g. from 2050 to 2030, which the UK has not done, although many local authorities and other places have set themselves this ambitious goal).

Globally, the IPCC suggests that from 2020 we can only emit 344 billion tonnes of CO_2 if we want to give ourselves a 66% chance of avoiding dangerous climate change. We are currently emitting over 37 billion tonnes of CO_2 every year, which means that we will have used up our global carbon budget within a decade. It is this realisation – and the ever accumulating science on the scale of the impacts of climate change – that led to calls for organisations and areas to declare a climate emergency and to develop and implement plans to rapidly reduce carbon emissions.

OUR APPROACH

(a). Measuring an Area's Carbon Footprint

Any area's carbon footprint – measured in terms of the total impact of all of its greenhouse gas emissions – can be divided into three types of greenhouse gas emissions.

- Those coming from the fuel (e.g. petrol, diesel or gas) that is directly used within an area and from other sources such as landfill sites or industry within the area. These are known as Scope 1 emissions.
- Those coming from the electricity that is used within the area, even if it is generated somewhere else. These are known as Scope 2 emissions. Together Scope 1 and 2 emissions are sometimes referred to as "territorial" emissions.
- Those associated with the goods and services that are produced elsewhere but imported and consumed within the area. After taking into account the carbon footprint of any goods and services produced in the area but that are exported and consumed elsewhere, these are known as Scope 3 or consumption-based emissions.

In this report[2] we focus on Scope 1 and 2 emissions, and exclude consideration of long-distance travel and of Scope 3 or consumption-based emissions. We do this because Scope 1 and 2 emissions are more directly under the control of actors within an area, and because the carbon accounting and management options for these emissions are better developed.

We stress though that emissions from longer distance travel (especially aviation) and consumption are very significant, and also need to be addressed.

(b). Developing a Baseline of Past, Present and Future Emissions

Having a baseline of carbon emissions is key to tracking progress over time. We use local authority emissions data to chart changes in emissions from 2005 to 2018. We also break this down to show the share of emissions that can be attributed to households, public and commercial buildings, transport and industry.

We then project current emissions levels for the period through to 2050. To do this, we assume on-going decarbonisation of electricity in line with government commitments and a continuation of background trends in a) economic and population growth, and b) energy use and energy efficiency. Specific numbers for the key variables taken into account in the forecasts are presented in the technical annex published separately. As with all forecasts, the level of uncertainty attached increases as the time period in question extends. Even so, it is useful to look into the future to gauge the scale of the challenge to be addressed in each area, especially as it relates to the projected gap between the forecasted emissions levels and those that are required if an area's emissions are to be consistent with a global strategy to limit average warming to 1.5ºC.

[2] Further details of the data, assumptions and methodology are set out in a separate technical annex that is available at https://pcancities.org.uk/reports.

(c). Setting Science-Based Carbon Reduction Targets

To set science-based carbon reduction targets for an area, we take the total global level of emissions that the IPCC suggests gives us a 66% chance of limiting average levels of warming to 1.5ºC, and divide it according to the share of the global population living in the area in question. This enables us to set the total carbon budget for an area that is consistent with a global budget. To set targets for carbon reduction, we then calculate the annual percentage reductions from the current level that are required to enable an area to stay within its overall carbon budget.

(d). Identifying and Evaluating Carbon Reduction Opportunities

Our analysis then includes assessment of the potential contribution of approximately 130 energy saving or low carbon measures for:

- **Households and for both public and commercial buildings** (including better insulation, improved heating, more efficient appliances, some small scale renewables)
- **Transport** (including more walking and cycling, enhanced public transport, electric and more fuel efficient vehicles)
- **Industry** (including better lighting, improved process efficiencies and a wide range of other energy efficiency measures).

We stress that the list of options that is assessed may not be exhaustive; other options could be available and the list can potentially be expanded.

For the options included, we assess the costs of their purchase, installation and maintenance, the direct benefits (through energy and fuel savings) of their adoption in different settings and their viable lifetimes. We also consider the scope for, and potential rates of deployment of each option. This allows us to generate league tables of the most carbon- and cost-effective options that could be deployed within an area.

It is important to note that we base the analysis on current capital costs, although future costs and benefits are adjusted for inflation and discounting factors. This could be overly cautious if costs fall and benefits increase as some options become more widely adopted, or if the costs increase as the rates of deployment increase. It is also important to note that, although we consider the employment generation potential of different options, we do not consider the wider indirect impacts of the different options relating to their social, economic or environmental implications.

Beyond the range of currently available options, we also consider the need for more innovative or "stretch" options to be developed and adopted within the area if it is to meet its carbon reduction targets. These need to be developed in each area, but the some of the ideas for innovative options identified elsewhere include targeting a full transition to net-zero homes and public/commercial buildings by 2030, promoting the rapid acceleration of active travel (e.g. walking and cycling), tackling food waste, reducing meat and dairy consumption and reducing concrete and steel consumption/ promoting adoption of green infrastructure.

OUR APPROACH

(e). Aggregating Up to See the Bigger Picture

Based on this bottom up analysis of the potential for different options to be adopted within the area, we then aggregate up to assess the potential for decarbonisation within that area, and the costs and benefits of different levels of decarbonisation. We then merge the aggregated analysis of the scope for decarbonisation with the baseline projections of future emissions to highlight the extent to which the gap between the projected and required emissions levels that can be met through different levels and forms of action.

To break this gap down, we merge interventions into three broader groupings:

- **Cost-Effective (CE)** options where the direct costs of adoption are outweighed by the direct benefits that they generate through the energy savings they secure, meaning the portfolio of measures as a whole has a positive economic impact in present value. These options may also generate indirect benefits, for example through job creation, fuel poverty and improved air quality and public health.
- **Cost-Neutral (CN)** options where the portfolio of interventions mentioned above is expanded to consider investments that may not be as cost effective on their own terms, but where the range of measures as a whole will have near-zero net cost.
- **Technical Potential (TP)** options where the direct costs are not (at present) covered by the direct benefits. However, the cost of many low carbon options is falling quickly, and again these options could generate important indirect benefits such as those listed above.

As it is unlikely that adopting all of the cost-effective or even technically viable options will enable an area to reach net-zero emissions, we also highlight the need for a fourth group of measures:

- **Innovative or "stretch" options** that include low-carbon measures that are not yet widely adopted. Some of the options within this group may well be cost- and carbon-effective, and they may also generate significant indirect benefits, but whilst we can predict their carbon saving potential, data on their costs and benefits is not yet available.

(f). Developing Targets and Performance Indicators

Linked to the analysis detailed above, we extend our evaluation of potential emissions reductions across Belfast's economy to substantive, real-life indicators for the levels of investment and deployment required to achieve targets. These Key Performance Indicators (KPIs) illustrate the scale of ambition required to reach the emissions savings presented in the Technical Potential scenario and are disaggregated by sector.

(g). Focusing on Key Sectors

As well as presenting an aggregated picture, we also focus on the emissions saving potential in the housing, public and commercial buildings, transport, and industry sectors. We focus in on overall investment needs and returns, and present more detailed league tables of the most carbon- and cost-effective options that could be adopted in each sector.

DEVELOPING A BASELINE OF PAST, PRESENT AND FUTURE EMISSIONS FOR BELFAST

Analysis shows that Belfast's baseline (Scope 1 and 2) emissions have fallen by 42% since 2000, due to a combination of increasingly decarbonised electricity supply, structural change in the economy, and the gradual adoption of more efficient buildings, vehicles and businesses.

With full decarbonisation of UK electricity by 2045, and taking into account economic growth (assumed at 1.5% p.a.), population growth (assumed at 0.1% p.a.) and on-going improvements in energy and fuel efficiency, we project that Belfast's baseline (Scope 1 and 2) emissions will only fall by a further 6% by 2030, 10% by 2040, and 11% by 2050. This is a total of just over 51% between 2000 and 2050.

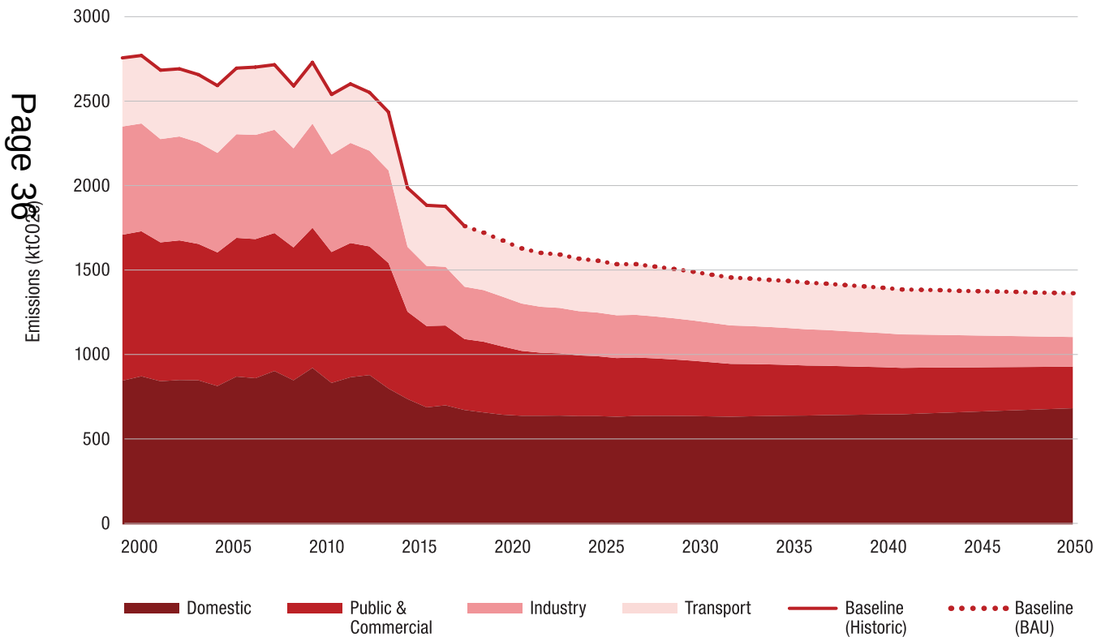


Figure 1: Belfast's Scope 1 and 2 Carbon Emissions (2000-2050)

Currently, 39% of Belfast's emissions come from the domestic housing sector, with transport responsible for 20% of emissions, public and commercial buildings for 24% and industry 18%. Emissions related to land use contribute c.0.5% and are not considered technically in this report. By 2050, under BAU, we project emissions from transport will decrease very slightly (still producing c.19%) with a significant 11% increase in the proportion of emissions from housing. Small decreases are forecast in the proportion of emissions from public and commercial buildings and industry, largely as a result of expansion in the output of the domestic buildings sector over this period.

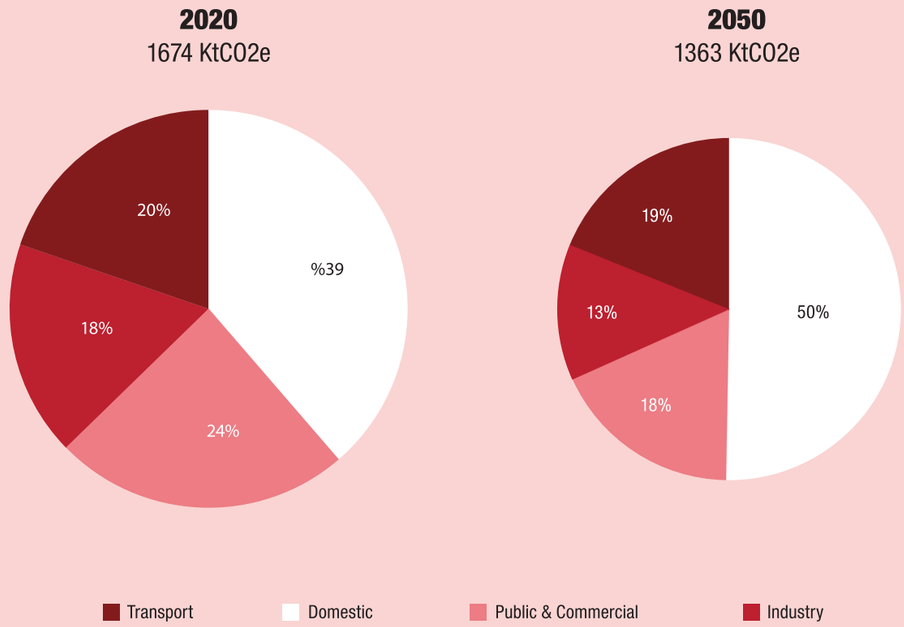


Figure 2: Belfast's Present and Projected Emissions by Sector

DEVELOPING A BASELINE OF PAST, PRESENT AND FUTURE EMISSIONS FOR BELFAST

Related to this emissions baseline, after evaluating the range of energy sources Belfast consumes (spanning electricity, gas, all solid and liquid fuels across sectors) we find that in 2019, £296 million was spent on energy across the city. Transport fuels generated the majority of this demand (52%), followed by domestic buildings (30%) then public and commercial buildings and industry (15% and 3% respectively). By projecting demand and energy prices into future with reasonable baseline assumptions over population, inflationary measures and efficiency gains across the economy, we find that Belfast's business-as-usual (BAU) energy expenditure will likely grow to just over £332 million per year in 2030 and c.£466 million per year in 2050, with transport expenditure growing slightly (53%) in Belfast's total (see Figure 3 below).

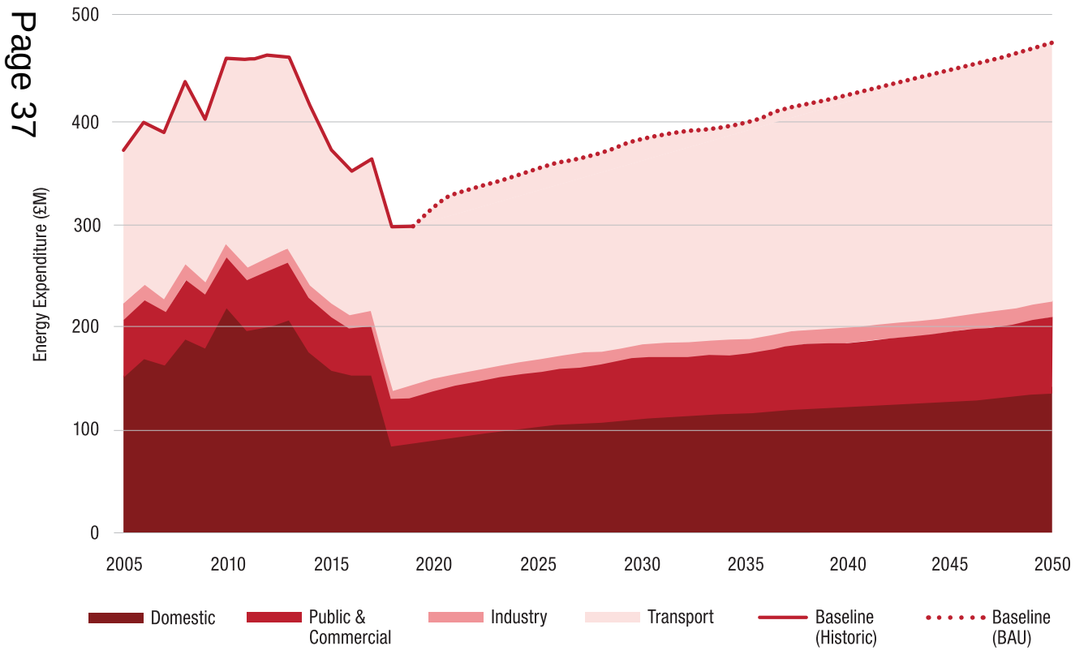


Figure 3: Belfast's Present and Projected Energy Expenditure by Sector

SETTING SCIENCE-BASED CARBON REDUCTION TARGETS FOR BELFAST

The Intergovernmental Panel on Climate Change (IPCC) has argued that from 2020, keeping within a global carbon budget of 344 gigatonnes (i.e. 344 billion tonnes) of CO_2 emissions would give us a 66% chance of limiting average warming to 1.5ºC and therefore avoiding dangerous levels of climate change. If we divide this global figure up on an equal basis by population, and adjust the budget to consider other gases that contribute to climate change, this gives Belfast a total carbon budget of c.14 megatonnes over the period between the present and 2050.

At current rates of emissions output, Belfast would use up this budget in just over a decade at some point during the winter of 2030. However, Belfast could stay within its carbon budget by reducing its emissions by c.8.4% year on year. This would mean that to transition from the current position where emissions are 42% lower than 2000 levels to a local pathway that is consistent with the world giving itself a 66% chance of avoiding dangerous, runaway climate change, Belfast should adopt the following carbon reduction targets (on 2000 levels):

66% by 2025

80% by 2030

88% by 2035

93% by 2040

97% by 2045

100% by 2050

Such a trajectory would mean that the majority of all carbon cuts needed for Belfast to transition to a 1.5ºC consistent pathway need to be delivered by 2030.

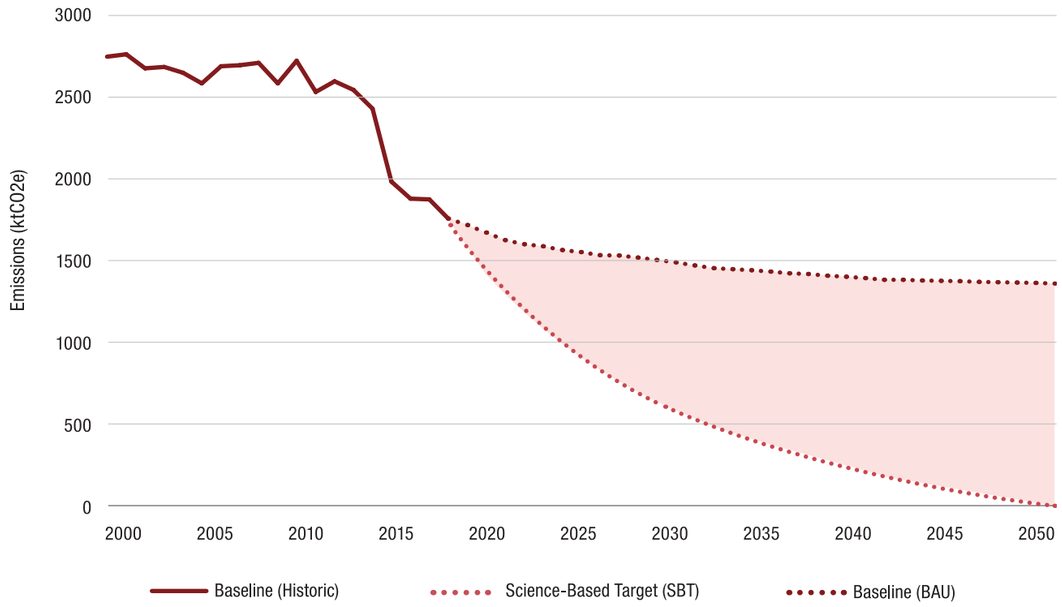


Figure 4: Belfast's Baseline and Science-Based-Target Emissions Pathways

AGGREGATING UP: THE BIGGER PICTURE FOR BELFAST

a) Emissions reductions

Our analysis predicts that the gap between the Belfast business-as-usual (BAU) emissions in 2050 and the net-zero target could be closed by 41% (513 ktCO2e) through the adoption of Cost-Effective (CE) options, by a further 11% (139 ktCO2e) through the adoption of additional Cost-Neutral (CN) options at no net cost, and then by an additional 7% (93 ktCO2e) through the further adoption of all technically viable (TP) options. This means that Belfast still has to identify the innovative or stretch options that could deliver the last 41% (512 ktCO2e) of the gap between the business-as-usual scenario and net-zero in 2030 following science-based targets (SBT).

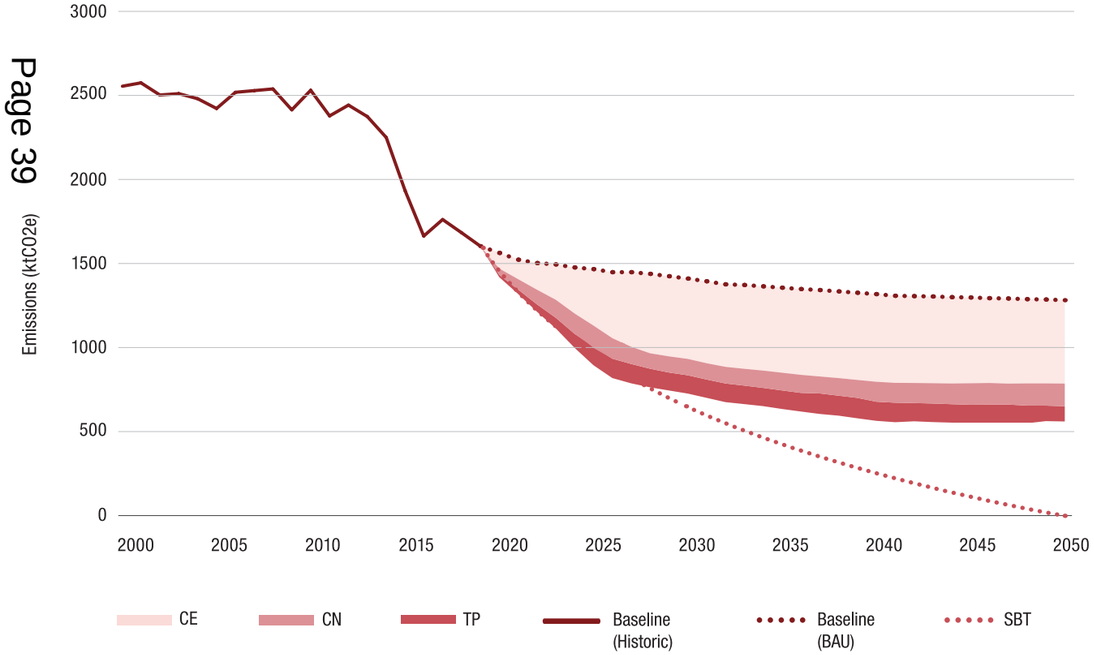


Figure 5: Belfast's BAU Baseline with Cost-Effective (CE), Cost-Neutral (CN), & Technical Potential (TP) Scenarios

		2025	2030	2035	2040	2045	2050
Reduction on BAU Baseline (2050)	**CE**	24%	35%	39%	42%	41%	41%
	CN	33%	43%	47%	51%	52%	52%
	TP	41%	51%	56%	60%	61%	59%
Reduction on 2020 Emissions	**CE**	22%	32%	34%	35%	34%	33%
	CN	31%	38%	41%	43%	43%	42%
	TP	38%	46%	48%	50%	50%	48%

Table 1: Belfast's Potential Five-Year Emissions Reduction Percentages

b) The most carbon- and cost-effect options

Figure 6 (see p26) presents the emissions savings that could be achieved through different groups of measures in Belfast. Appendices 1 and 2 present league tables of specific measures and their potential emissions savings over this period.

AGGREGATING UP: THE BIGGER PICTURE FOR BELFAST

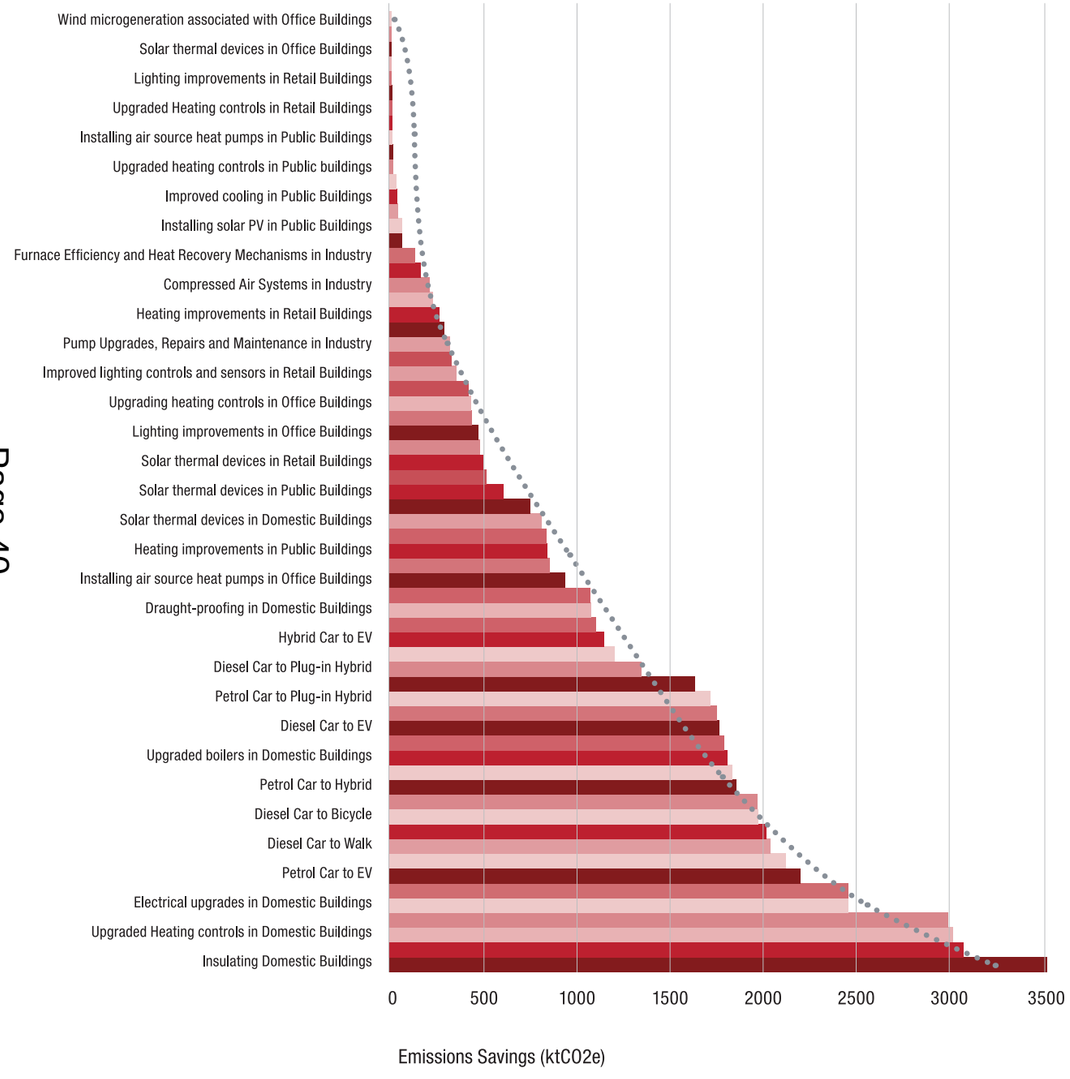


Figure 6: Simplified Emissions Reduction Potential by Measure for Belfast

Simplified league tables of the most cost- and carbon-effective options in Belfast are presented below (see Appendices 1 & 2 for more detailed league tables).

Rank	Measure	Cost Effectiveness (£/tCO2e)
1	Compressed Air Systems in Industry	-603
2	Diesel Car to Diesel Bus Journeys	-492
3	Pump Upgrades, Repairs and Maintenance in Industry	-478
4	Fabric improvements in Retail Buildings	-432
5	Petrol Car to Diesel Bus Journeys	-376
6	Fabric improvements in Public Buildings	-367
7	Diesel Car to Walk Journeys	-362
8	Petrol Car to Walk Journeys	-356
9	Improved Cooling in Retail Buildings	-326
10	Diesel Car to Bicycle Journeys	-322

Table 2: Belfast's Top Ten Most Cost-Effective Emission Reduction Options

Rank	Measure	Emissions Reduction Potential (ktCO2e)
1	Insulating Domestic Buildings	1,162
2	Petrol Car to Bicycle Journeys	1,014
3	Upgraded Heating controls in Domestic Buildings	998
4	Petrol Car to Walk Journeys	982
5	Electrical upgrades in Domestic Buildings	811
6	Installing heat pumps in Domestic Buildings	808
7	Petrol Car to EV Journeys	725
8	Petrol Car to Electric Bus Journeys	700
9	Diesel Car to Walk Journeys	675
10	Fabric improvements in Public Buildings	663

Table 3: Belfast's Top Ten Most Carbon-Effective Emission Reduction Options

AGGREGATING UP: THE BIGGER PICTURE FOR BELFAST

Some of the ideas for innovative options identified elsewhere, that could also be considered for Belfast, include targeting a full transition to net-zero homes and public/commercial buildings by 2030, promoting the rapid acceleration of active travel (e.g. walking and cycling), tackling food waste, reducing meat and dairy consumption and reducing concrete and steel consumption/promoting adoption of green infrastructure. These are highlighted at the end of our report ("Innovative Stretch Measures for Belfast").

c) Investment needs, paybacks and employment creation

Exploiting the cost-effective options in households, public and commercial buildings, transport, industry and waste could be economically beneficial. Although such measures would require total investments of around £1.6 billion over their lifetimes (equating to investments of £160m a year across all organisations and households in the city for the next decade), once adopted they would reduce Belfast's total energy bill by £286 million p.a. in 2050 whilst also creating 4,779 years of employment (239 full-time jobs for 20 years).

By expanding this portfolio of measures to at no net cost to Belfast's economy (the Cost-Neutral scenario), investments of £4 billion over their lifetimes (or £400m a year for the next decade) would generate 11,751 years of employment (587 full-time jobs for 20 years) whilst reducing Belfast's emissions by 52% of projected 2030 levels.

Exploiting all technically viable options would be more expensive (at least at current prices, c.£5 billion or £500m a year for the next decade) but realise further emissions savings – eliminating 59% of the projected shortfall in Belfast's 2050 emissions, whilst saving hundreds of millions of pounds on an annual basis.

		2025	2030	2035	2040	2045	2050
Cumulative Investment (£M)	**CE**	1,126	1,604	1,623	1,625	1,625	1,625
	CN	2,454	3,846	3,924	3,944	3,952	3,952
	TP	2,691	4,572	4,630	4,650	4,657	4,657
Annual Energy Expenditure Savings (£M)	**CE**	172	263	318	349	325	286
	CN	177	241	293	337	306	255
	TP	185	283	326	343	317	200

Table 4: Potential Five-Year Investments and Energy Expenditure Savings

Sector	Scenario	Investment (£M)
Domestic	**CE**	676
	CN	1,450
	TP	1,519
Public & Commercial	**CE**	451
	CN	925
	TP	935
Industry	**CE**	258
	CN	1,043
	TP	1,670
Transport	**CE**	240
	CN	534
	TP	534

Table 5: Potential Investments by Sector & Economic Scenario

		Total	Domestic	Industry	Transport	Public & Commercial
Years of Employment	**CE**	4,779	1,445	884	329	2,122
	CN	11,751	3,100	3,568	731	4,352
	TP	14,089	3,247	5,713	731	4,398
Jobs (20-year Period)	**CE**	239	72	44	16	106
	CN	588	155	178	37	218
	TP	704	162	286	37	220

Table 6: Potential Job Creation by Sector & Economic Scenario

DEVELOPING TARGETS AND PERFORMANCE INDICATORS

To give an indication of the levels of activity required to deliver on these broader targets, the tables below detail total deployment across different sectors in Belfast through to 2050. We also give an indication of the rate of deployment required in the city if it is to even come close to its climate targets. These lists are not exhaustive, and also apply by measure; any one building or industrial facility will usually require the application of several measures over the period. These figures effectively become Key Performance Indicators (KPIs) for the delivery of climate action across the city.

Domestic Homes

Measure	Total Homes Applied	Mean Annual Rate of Installation (homes)
Lighting Upgrades	91,166	5,065
Glazing Upgrades	74,163	4,149
Solar PV	72,002	3,984
Floor Insulation	71,004	3,972
Gas Boiler Upgrades & Repairs	66,390	3,672
Solar thermal	53,604	2,960
Thermostats & Heating Controls	53,343	2,940
Loft insulation	50,745	2,833
Wall Insulation	35,228	1,961
Cavity wall Insulation	31,188	1,722
Draught Proofing	29,442	1,649
Heat Pumps	6,056	334

Table 7 (a): Belfast's Sectoral Emissions Reduction KPIs for Domestic Homes

Public & Commercial Buildings

Measure	Floorspace Applied (m^2)	Mean Annual Rate of Installation (m^2)
Lighting/Heating Controls and Sensors	2,678,717	154,695
Retail Heating Upgrades	2,654,476	155,070
Wind Turbines	1,901,359	105,631
Office Lighting Upgrades	747,819	41,923
Office Fabric Improvements	715,552	41,025
Office Solar PV	317,287	17,932
Office Heat Pumps	298,623	16,843

Table 7 (b): Belfast's Sectoral Emissions Reduction KPIs for Public & Commercial Buildings

Transport

Measure	Deployment
High Quality Protected Cycling Highways Built	6 kilometres
Additional Electric Buses Procured and In Service	40 per annum
Increase in Public Transport Ridership	2M trips per annum
Additional EVs Replacing Conventional Private Cars	3000 per annum

Table 7 (c): Belfast's Sectoral Emissions Reduction KPIs for Transport

FOCUSING ON KEY SECTORS IN BELFAST

At full deployment (technical potential) across Belfast, we calculate that there is potential to avoid 21 MtCO2e in emissions that will otherwise be produced in the city between 2020 and 2050. The domestic sector will contribute most significantly toward this total, with a decarbonisation potential of between 6 MtCO2e (cost-effective scenario) and 9 MtCO2e (technical potential) through the period.

However, transport, industry and public and commercial buildings also play a major role; upgrading and retrofitting of Belfast's built environment (including public and commercial sectors) could reduce emissions by up to 5 MtCO2e over the same period at full technical potential, with transport similarly showing the potential to decarbonise over 5 MtCO2e under the same conditions.

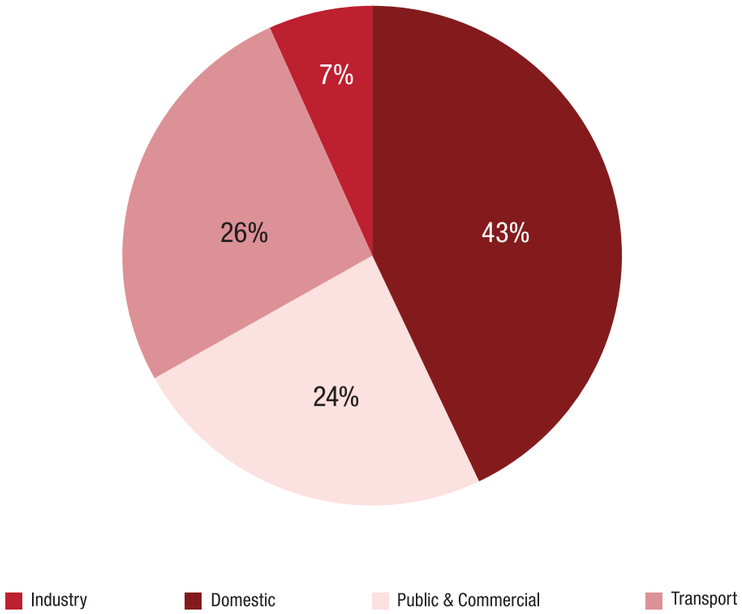


Figure 7: Belfast's Emissions Reduction Potential (2020-2050) by Sector

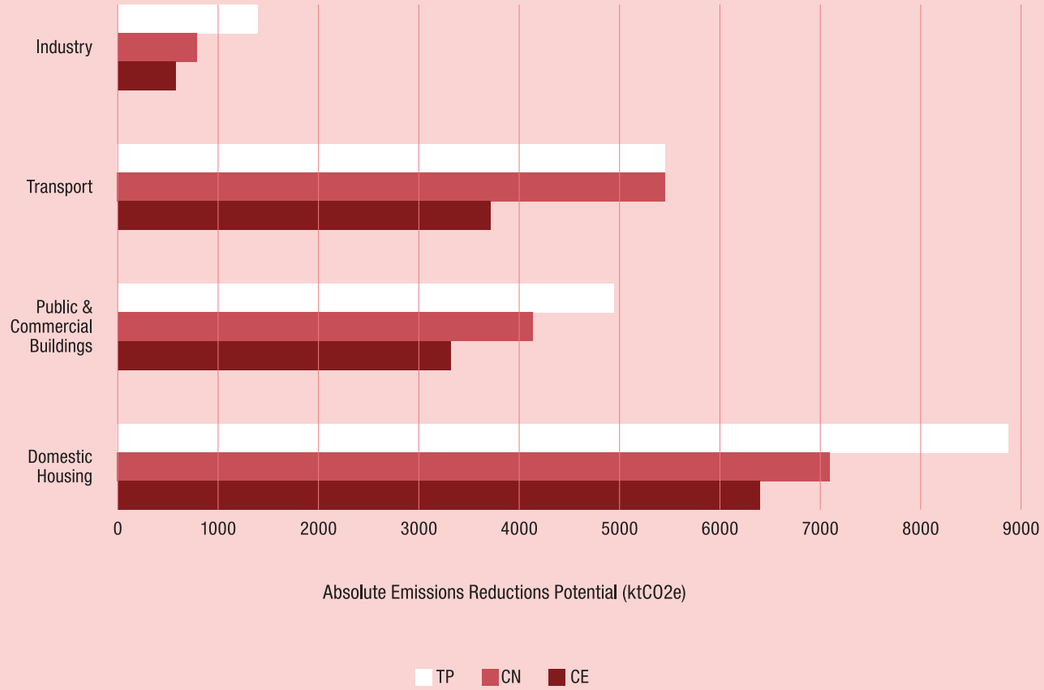


Figure 8: Belfast's Emissions Reduction Potential By Sector & Economic Scenario (2020-2050)

FOCUSING ON KEY SECTORS IN BELFAST

In the following section summaries of the emissions reduction potential and economic implications of investment are presented for the four main sectors. For display and continuity purposes, each sector is displayed with a summary of the same metrics: (1) emissions reduction potential over time in the three economic scenarios, (2) five-year totals for cumulative emissions savings, investment requirements and annual energy expenditure reductions, and (3) a simplified table of the most cost-effective low carbon measures applied in each sector across Belfast.

(a). Domestic Housing

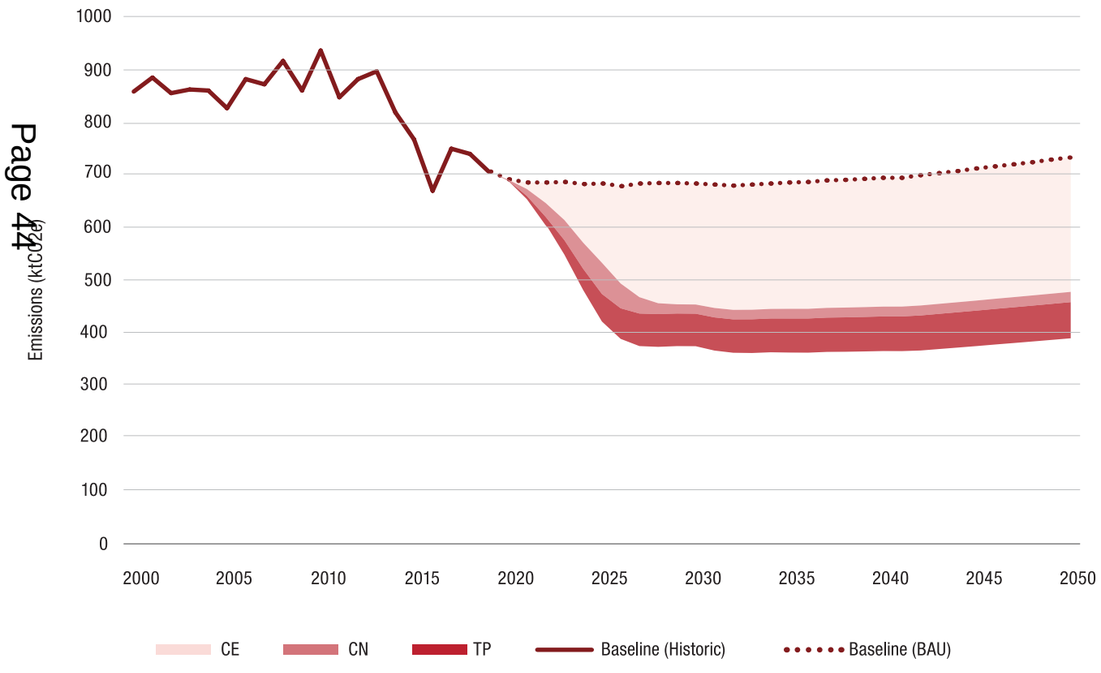


Figure 9: Housing BAU Baseline with Cost-Effective, Cost-Neutral and Technical Potential Scenarios

		2025	2030	2035	2040	2045	2050
Emissions Reductions (ktCO2e)	**CE**	151	231	241	245	252	256
	CN	210	248	260	264	271	276
	TP	263	310	325	330	338	345
Annual Energy Expenditure Savings (£M)	**CE**	73	109	143	165	165	169
	CN	72	92	120	152	147	143
	TP	77	124	148	161	152	83
Cumulative Investment (£M)	**CE**	480	665	676	676	676	676
	CN	950	1,418	1,450	1,450	1,450	1,450
	TP	959	1,503	1,519	1,519	1,519	1,519

Table 8: Housing Emissions Reductions, Expenditure Savings and Investment Levels

Rank	Measure	Cost Effectiveness (£/tCO2e)
1	Lighting improvements and Efficiency Upgrades	-172
2	Electrical Appliance & Fixture Upgrades	-167
3	Electricity Demand Reduction	-111
4	Insulatiion (various forms)	-59
5	Draught-proofing and Fabric Improvements	-34
6	Glazing Improvements and Installations	-31
7	Installing Heat Pumps	-29
8	Upgraded Heating Controls	-27
9	Installing Biomass Boilers	-17
10	Solar Thermal Devices	-15

Table 9: The Most Cost-Effective Measures for Housing

FOCUSING ON KEY SECTORS IN BELFAST

(b). Public & Commercial Buildings

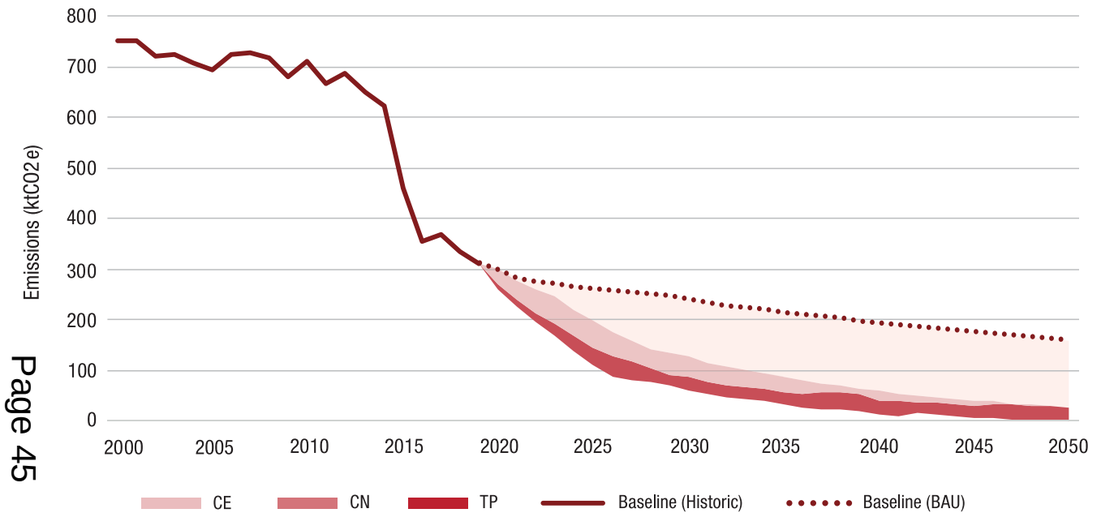


Figure 10: Public and Commercial Buildings BAU Baseline with Cost-Effective, Cost-Neutral and Technical Potential Scenarios

		2025	2030	2035	2040	2045	2050
Emissions Reductions (ktCO2e)	**CE**	65	114	129	135	136	133
	CN	116	155	159	154	147	135
	TP	152	180	183	181	170	159
Annual Energy Expenditure Savings (£M)	**CE**	40	74	86	96	88	73
	CN	44	66	80	91	83	68
	TP	48	76	85	88	89	73
Cumulative Investment (£M)	**CE**	303	447	451	451	451	451
	CN	572	912	925	925	925	925
	TP	591	925	935	935	935	935

Table 10: Public and Commercial Buildings Emissions Reductions, Expenditure Savings and Investment Levels

Rank	Measure	Cost Effectiveness (£/tCO2e)
1	Fabric Improvements in Retail Buildings	-432
2	Fabric Improvements in Public Buildings	-367
3	Improved Cooling in Retail Buildings	-326
4	Lighting Improvements in Public Buildings	-207
5	Improved Cooling in Office Buildings	-163
6	Lighting Improvements in Retail Buildings	-138
7	Heating Improvements in Public Buildings	-115
8	Improved Cooling in Public Buildings	-97
9	Heating Improvements in Office Buildings	-62
10	Lighting Improvements in Office Buildings	-62

Table 11: The Most Cost-Effective Measures for Public and Commercial Buildings

FOCUSING ON KEY SECTORS IN BELFAST

(c). Transport

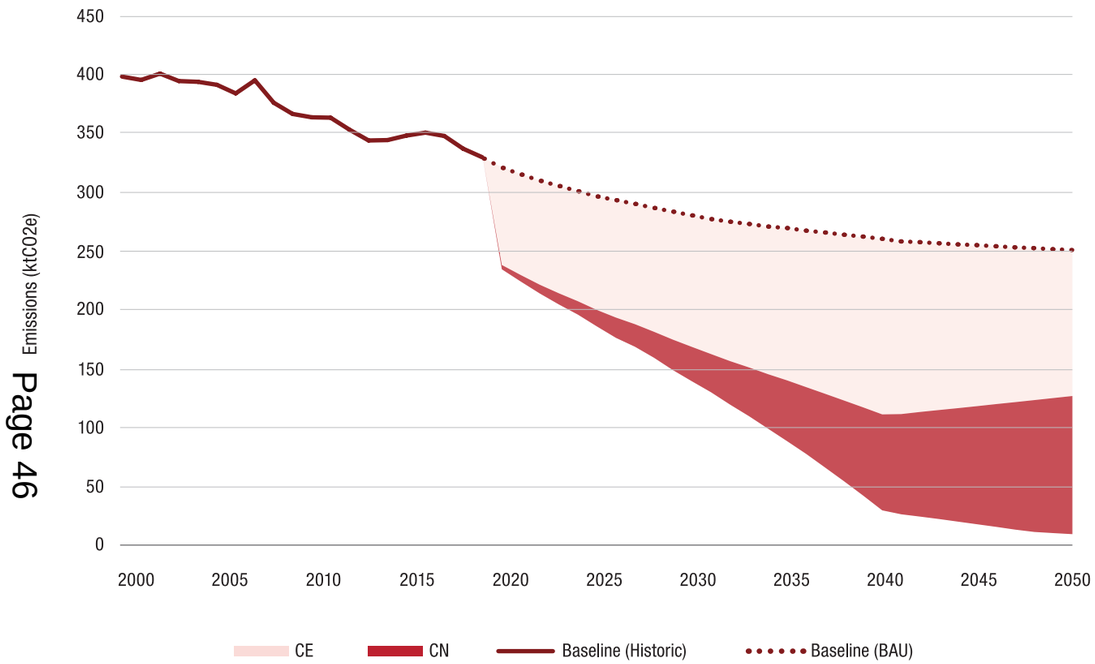


Figure 11: Transport BAU Baseline with Cost-Effective and Cost-Neutral Scenarios[3]

		2025	2030	2035	2040	2045	2050
Emissions Reductions (ktCO2e)	**CE**	97	112	129	149	136	123
	CN	111	141	181	230	237	241
	TP	111	141	181	230	237	241
Annual Energy Expenditure Savings (£M)	**CE**	40	45	49	53	51	45
	CN	42	48	54	59	55	44
	TP	42	48	54	59	55	44
Cumulative Investment (£M)	**CE**	187	234	238	240	240	240
	CN	307	473	506	527	534	534
	TP	307	473	506	527	534	534

Table 12: Transport Emissions Reductions, Expenditure Savings and Investment Levels

Rank	Measure (as Journey Shift)	Cost Effectiveness (£/tCO2e)
1	Diesel Car to Diesel Bus Journey	-492
2	Petrol Car to Diesel Bus Journey	-376
3	Diesel Car to Walk Journey	-362
4	Petrol Car to Walk Journey	-356
5	Diesel Car to Bicycle Journey	-322
6	Petrol Car to Bicycle Journey	-304
7	Petrol Car to Plug-in Hybrid Journey	-249
8	Diesel Car to Plug-in Hybrid Journey	-159
9	Petrol Car to EV Journey	-153
10	Petrol Car to Hybrid Journey	-152

Table 13: The Most Cost-Effective Measures for Transport

[3] Due to the high inherent cost effectiveness of many transport modal shift options, the TP scenario has been removed and emissions pathways are covered by CE and CN only.

FOCUSING ON KEY SECTORS IN BELFAST

(d). Industry

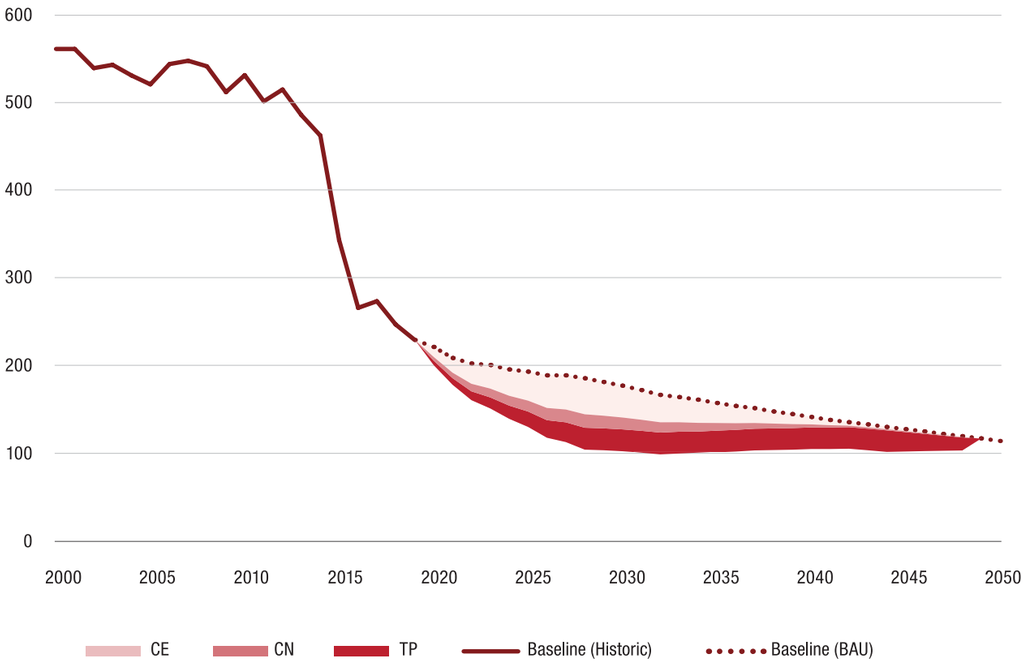


Figure 12: Industry BAU Baseline with Cost-Effective, Cost-Neutral and Technical Potential Scenarios

		2025	2030	2035	2040	2045	2050
Emissions Reductions (ktCO2e)	**CE**	33	36	23	9	2	1
	CN	46	50	32	12	3	2
	TP	63	75	56	37	25	16
Annual Energy Expenditure Savings (£M)	**CE**	19	35	39	35	22	11
	CN	19	35	39	35	22	11
	TP	19	35	39	35	22	11
Cumulative Investment (£M)	**CE**	155	258	258	258	258	258
	CN	626	1,043	1,043	1,043	1,043	1,043
	TP	835	1,670	1,670	1,670	1,670	1,670

Table 14: Industry Emissions Reductions, Expenditure Savings and Investment Levels

Rank	Measure[4]	Cost Effectiveness (£/tCO2e)
1	Compressed Air Systems in Industry	-603
2	Pump Upgrades, Repairs and Maintenance in Industry	-478
3	Fan Correction, Repairs, & Upgrades in Industry	-293
4	Compressors and Variable Speed Systems in Industry	-239
5	Improving Efficiency of Boilers and Steam Piping in Industry	-70
6	Refrigeration Efficiency and Technical Upgrades in Industry	16
7	Condensing & Insulation Measures to Boilers & Steam Piping in Industry	45
8	Furnace Efficiency and Heat Recovery Mechanisms in Industry	540

Table 15: The Most Cost-Effective Measures for Industry

[4] For display purposes interventions in industry have been aggregated here into process type.

INNOVATIVE STRETCH MEASURES FOR BELFAST

Even with full delivery of the broad programme of cross-sectoral, city-wide low carbon investment described above, there remains an emissions shortfall of 41% between Belfast's 2050 BAU baseline and the net-zero target. Here we briefly consider the productivity of certain key technologies and interventions that may well be able to plug this gap into the future. Many of these so-called "stretch options" are innovative by nature but they will be required to reach Belfast's targets in future.

		2025	2030	2035
Annual Emissions Reduction Potential (ktCO2e)	Zero Carbon Heavy Goods Transport	31	145	143
	Industrial Heat and Cooling Electrification	18	17	10
	1,400 Ha. Reforested Annually 2020-29*	66	172	209
	Electrification of Domestic Heat	12	60	87
	Electrification of Domestic Cooking	4	20	29
	Electrification of Commercial/Public Heating	6	19	6

Table 16: Decarbonising Potential of Stretch Measures (*Sequestration Values)

Figure 13 below shows the impact that the adoption of these stretch measures would have on Belfast's carbon emissions, with the black dotted line showing the business-as-usual baseline, the red dotted line showing emissions after adoption of all technically viable options and the grey dotted line showing emissions after all technically viable and stretch options. This indicates that Belfast would still have some residual emissions through to 2050. For illustration, the grey shaded area shows that in theory Belfast could offset its residual emissions through a UK based tree planting scheme; however this would require the planting of 62 million trees, which even with the densest possible planting would require 14000 hectares of land, equivalent to 122% of the total land area of the city.

Carbon emissions could be cut further still through with the adoption of behavioural and consumption-based changes such as the promotion of active travel (e.g. walking and cycling), reductions in meat and dairy consumption and the generation of food waste, and reduced consumption of concrete and steel, with more emphasis on green infrastructure. Such consumption-based changes – which would impact on the broader Scope 3 carbon footprint of the city – will be the focus of future work.

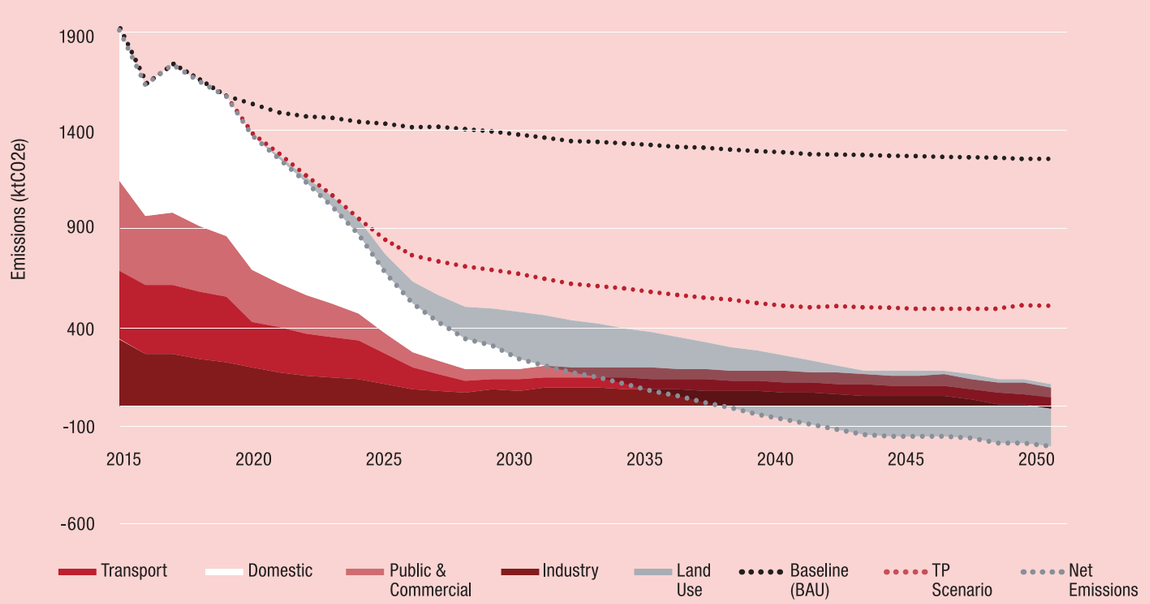


Figure 13: Sectoral Emissions Shortfall Reduction with Stretch Measures

NEXT STEPS FOR BELFAST

Based on the analysis presented here we recommend that if Belfast wants to stay within its share of the global carbon budget, it needs to adopt a clear and ambitious climate action plan.

The case for the adoption of such a plan is supported by the evidence that much – but not all – of the action that is required can be based on the exploitation of win-win low carbon options that will simultaneously improve economic, social and health outcomes across the city.

A climate action plan for Belfast should adopt science-based targets for emissions reduction, including both longer term targets and five-yearly carbon reduction targets.

The action plan should focus initially on Belfast's direct (Scope 1 and 2) carbon footprint as these emissions are most directly under the city's influence, but in time it should also widen its scope to consider its broader (Scope 3) carbon footprint.

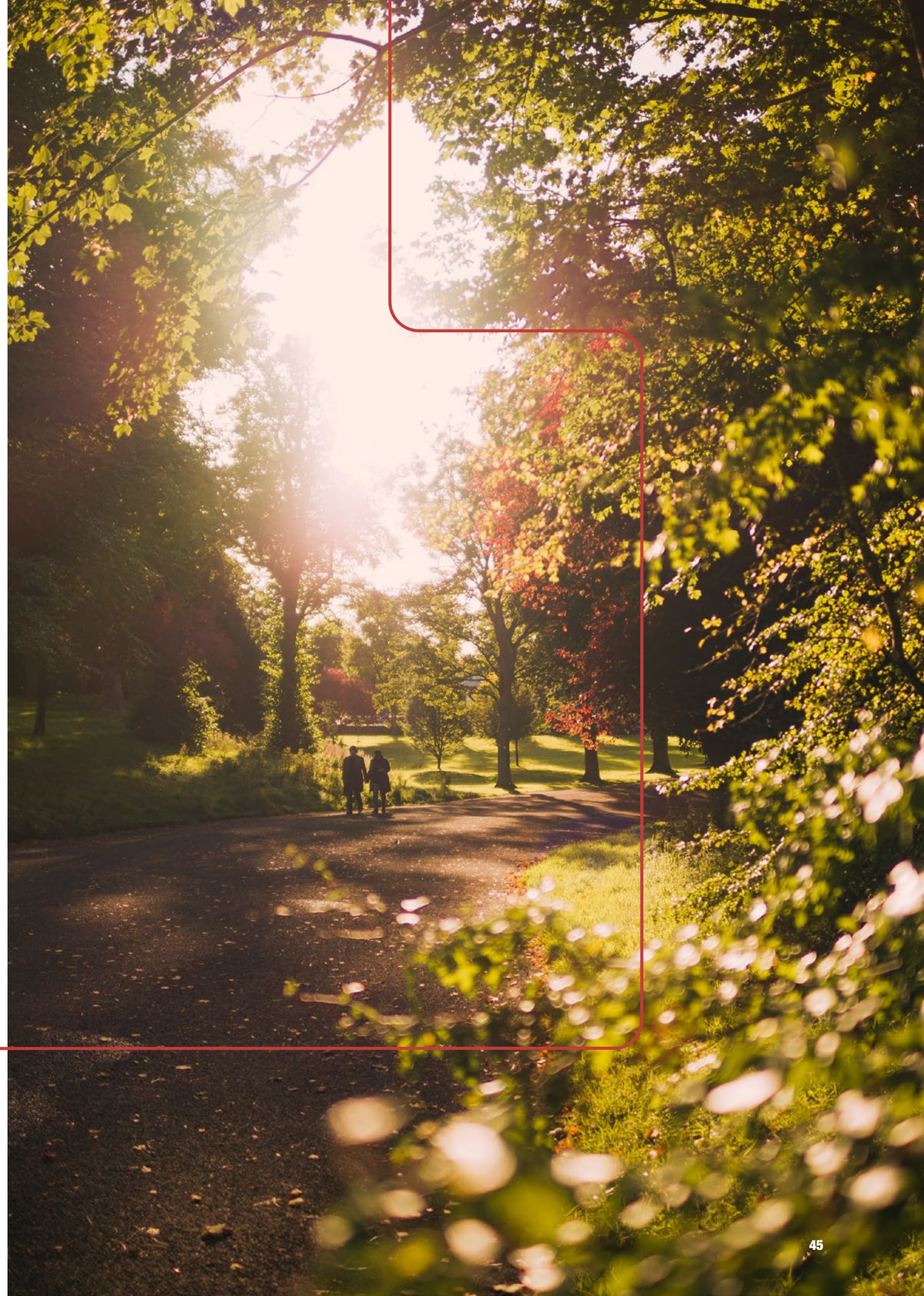
The action plan should clearly set out the ways in which Belfast will work towards achieving these targets, drawing on the deployment KPIs listed in this report. Action should also be taken to monitor and report progress on emissions reductions.

It is important to stress that delivering on these targets will require action across the city and the active support of the public, private and third sectors.

Establishing an independent Belfast Climate Commission is helping to draw actors together and to build capacities to take and track action.

It is important to stress that delivering on these targets will require action across the city and the active support of the public, private and third sectors. The Belfast Climate Commission is acting as a critical friend to the city, helping to promote stakeholder engagement and build buy-in and a sense of common ownership for the climate action plan, as well as in supporting, guiding and tracking progress towards its delivery.

For the future, Belfast Climate Commission can help to establish leadership groups for key sectors such as homes, public and commercial buildings, transport and industry, and to prepare clear plans for the delivery of priority actions in each sector. Working with other Commissions in the Place-Based Climate Action Network, Belfast Climate Commission can also support the development of low carbon projects and programmes and the preparation of a low carbon investment prospectus to encourage new forms of climate finance to accelerate the city's low carbon transition.



APPENDIX 1. LEAGUE TABLE OF THE MOST CARBON-EFFECTIVE OPTIONS FOR BELFAST

Measure	Emissions Reduction Potential (ktCO2e)
Insulating Domestic buildings	1,162
Petrol Car to Bicycle Journeys	1,014
Upgraded Heating controls in Domestic buildings	998
Petrol Car to Walk Journeys	982
Electrical upgrades in Domestic buildings	811
Installing heat pumps in Domestic buildings	808
Petrol Car to EV Journeys	725
Petrol Car to Bus (electric) Journeys	700
Diesel Car to Walk Journeys	675
Fabric improvements in Public buildings	663
Diesel Car to Bicycle Journeys	651
Fabric improvements in Retail buildings	647
Petrol Car to Hybrid Journeys	613
Petrol Car to Bus (diesel) Journeys	608
Upgraded boilers in Domestic buildings	597
Installing solar PV in Domestic Buildings	590
Diesel Car to EV Journeys	584
Diesel Car to Bus (electric) Journeys	578
Petrol Car to Plug-in hybrid Journeys	567
Electricity demand reduction in Domestic buildings	539
Diesel Car to Plug-in hybrid Journeys	444
Diesel Car to Bus (diesel) Journeys	398
Hybrid Car to EV Journeys	380
Condensing & Insulation Measures to Boilers & Steam Piping in Industry	366
Draught-proofing in Domestic buildings	358
Lighting improvements in Domestic buildings	354
Installing air source heat pumps in Office buildings	311
Installing biomass boilers in Domestic buildings	284
Heating improvements in Public buildings	278
Glazing improvements in Domestic buildings	277
Solar thermal devices in Domestic buildings	267
Improving Efficiency of Boilers and Steam Piping in Industry	249
Solar thermal devices in Public buildings	203
Improved lighting controls and sensors in Public buildings	172
Solar thermal devices in Retail buildings	166
Improved cooling in Office buildings	161
Lighting improvements in Office buildings	158
Wind microgeneration associated with Public buildings	147
Upgrading heating controls in Office buildings	144
Diesel Car to Hybrid Journeys	140
Improved lighting controls and sensors in Retail buildings	119
Improved lighting controls and sensors in Office buildings	111
Pump Upgrades, Repairs and Maintenance in Industry	108
Lighting improvements in Public buildings	98
Heating improvements in Retail buildings	89
Fan Correction, Repairs, & Upgrades in Industry	77
Compressed Air Systems in Industry	65
Compressors and Variable Speed Systems in Industry	55
Furnace Efficiency and Heat Recovery Mechanisms in Industry	46
Refrigeration Efficiency and Technical Upgrades in Industry	23
Installing solar PV in Public buildings	23
Fabric improvements in Office buildings	16
Improved cooling in Public buildings	15
Improved cooling in Retail buildings	13
Upgraded heating controls in Public buildings	8
Installing solar PV in Office buildings	7
Installing air source heat pumps in Public buildings	7
Heating improvements in Office buildings	6
Installing air source heat pumps in Retail buildings	5
Upgraded heating controls in Retail buildings	5
Lighting improvements in Retail buildings	5
Wind microgeneration associated with Retail buildings	5
Solar thermal devices in Office buildings	4
Installing solar PV in Retail buildings	4
Wind microgeneration associated with Office buildings	4
TOTAL	**20,686**

APPENDIX 2. LEAGUE TABLE OF THE MOST COST-EFFECTIVE OPTIONS FOR BELFAST

Measure	Cost Effectiveness (£/tCO2e)
Compressed Air Systems in Industry	-603
Diesel Car to Bus (diesel) Journeys	-492
Pump Upgrades, Repairs and Maintenance in Industry	-478
Fabric improvements in Retail buildings	-432
Petrol Car to Bus (diesel) Journeys	-376
Fabric improvements in Public buildings	-367
Diesel Car to Walk Journeys	-362
Petrol Car to Walk Journeys	-356
Improved cooling in Retail buildings	-326
Diesel Car to Bicycle Journeys	-322
Petrol Car to Bicycle Journeys	-304
Fan Correction, Repairs, & Upgrades in Industry	-293
Petrol Car to Plug-in hybrid Journeys	-249
Compressors and Variable Speed Systems in Industry	-239
Lighting improvements in Public buildings	-207
Lighting improvements in Domestic buildings	-172
Electrical upgrades in Domestic buildings	-167
Improved cooling in Office buildings	-163
Diesel Car to Plug-in hybrid Journeys	-159
Petrol Car to EV Journeys	-153
Petrol Car to Hybrid Journeys	-152
Petrol Car to Bus (electric) Journeys	-147
Lighting improvements in Retail buildings	-138
Heating improvements in Public buildings	-115
Electricity demand reduction in Domestic buildings	-111
Improved cooling in Public buildings	-97
Improving Efficiency of Boilers and Steam Piping in Industry	-70
Heating improvements in Office buildings	-62
Lighting improvements in Office buildings	-62
Insulating Domestic buildings	-59
Diesel Car to Bus (electric) Journeys	-58
Heating improvements in Retail buildings	-47
Diesel Car to EV Journeys	-45
Draught-proofing in Domestic buildings	-34
Fabric improvements in Office buildings	-31
Glazing improvements in Domestic buildings	-31
Installing heat pumps in Domestic buildings	-29
Upgraded Heating controls in Domestic buildings	-27
Upgrading heating controls in Office buildings	-19
Installing biomass boilers in Domestic buildings	-17
Solar thermal devices in Domestic buildings	-15
Upgraded heating controls in Public buildings	-13
Diesel Car to Hybrid Journeys	-12
Upgraded boilers in Domestic buildings	-10
Upgraded heating controls in Retail buildings	-6
Installing air source heat pumps in Retail buildings	-1
Installing solar PV in Domestic Buildings	2
Hybrid Car to EV Journeys	3
Installing air source heat pumps in Public buildings	8
Refrigeration Efficiency and Technical Upgrades in Industry	16
Solar thermal devices in Retail buildings	24
Installing air source heat pumps in Office buildings	30
Installing solar PV in Public buildings	38
Improved lighting controls and sensors in Retail buildings	41
Condensing & Insulation Measures to Boilers & Steam Piping in Industry	45
Installing solar PV in Office buildings	52
Installing solar PV in Retail buildings	60
Solar thermal devices in Public buildings	64
Improved lighting controls and sensors in Office buildings	68
Solar thermal devices in Office buildings	74
Improved lighting controls and sensors in Public buildings	148
Wind microgeneration associated with Public buildings	207
Wind microgeneration associated with Office buildings	208
Wind microgeneration associated with Retail buildings	271
Furnace Efficiency and Heat Recovery Mechanisms in Industry	540

PLACE-BASED CLIMATE ACTION NETWORK (PCAN)

The Place-based Climate Action Network (PCAN) is about translating climate policy into action “on the ground” in our communities. The network commenced in January 2019 with the aim of establishing an agile, effective and sustainable network for climate action embedded in localities and based around partnerships with local authorities. Its objective is to build broader capacity to effect transformative change.

PCAN is an ESRC-supported network that brings together the research community and decision-makers in the public, private and third sectors. It consists of five innovative platforms to facilitate two-way, multi-level engagement between researchers and stakeholders: three city-based climate commissions (in Leeds, Belfast and Edinburgh) and two theme-based platforms on adaptation and finance, with a business theme integrated into each climate commission.

Our vision is for PCAN to produce a replicable model that delivers climate policies on a global to local scale, facilitating and inspiring places across the UK, and this has started to take off: alongside the original PCAN climate commissions we are delighted to support new commissions that have established in places such as Lincoln, Surrey and Croydon, with ever more new commissions coming on stream across the UK.

The five-year project is led by an experienced team of researchers with strong track records of engaging with public, private and third-sector decision-makers. PCAN builds on the policy connections, networking capacity and research strengths of its host institutions: Queen’s University Belfast, the University of Edinburgh, the University of Leeds and the London School of Economics and Political Science.

For more information, go to **https://pcancities.org.uk** or contact **pcan@lse.ac.uk**

PARTNERSHIPS

UKRI Economic and Social Research Council

PCAN PLACE-BASED CLIMATE ACTION NETWORK

THE UNIVERSITY of EDINBURGH

UNIVERSITY OF LEEDS

QUEEN’S UNIVERSITY BELFAST

LSE THE LONDON SCHOOL OF ECONOMICS AND POLITICAL SCIENCE

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