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.

Contact

a.gouldson@leeds.ac.uk

a.sudmant@leeds.ac.uk

robert@williamsonrc.com

j.barry@qub.ac.uk

a.slevin@qub.ac.uk

https://pcancities.org.uk

https://belfastclimate.org.uk

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.

(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.

[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.

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.

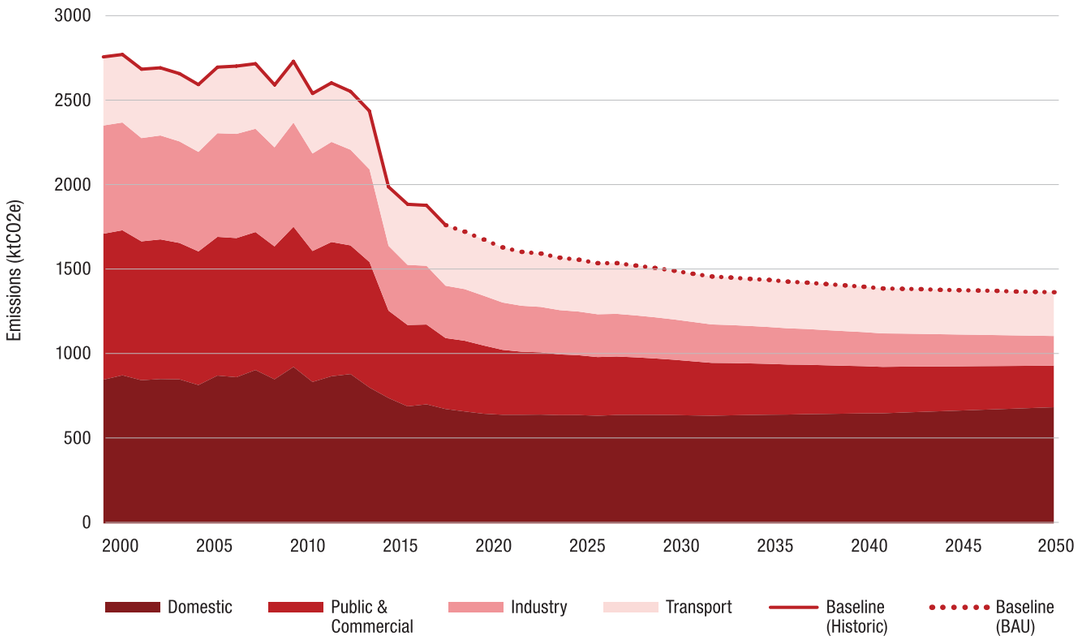


Figure 1: Belfast's Scope 1 and 2 Carbon Emissions (2000-2050)

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.

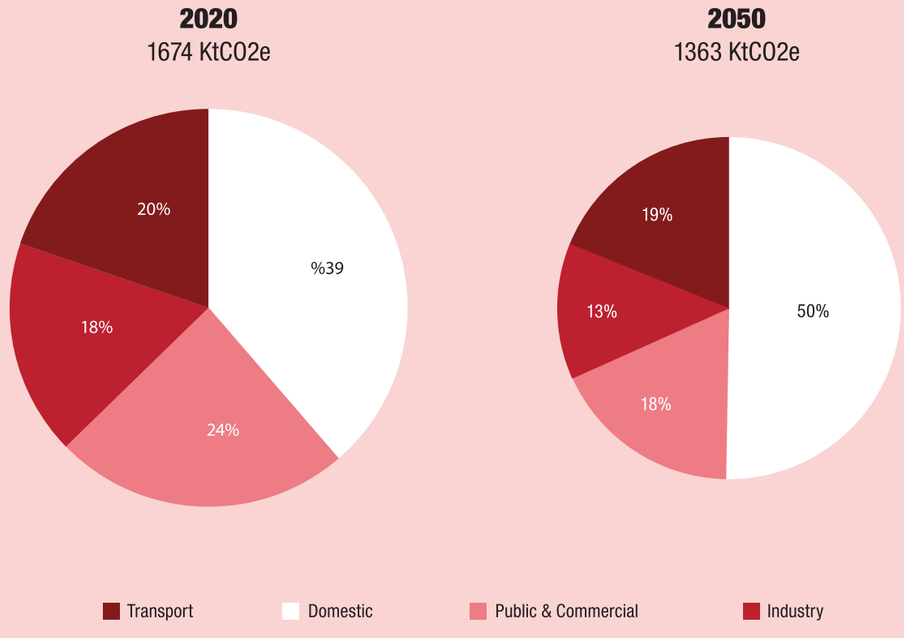


Figure 2: Belfast's Present and Projected Emissions by Sector

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).

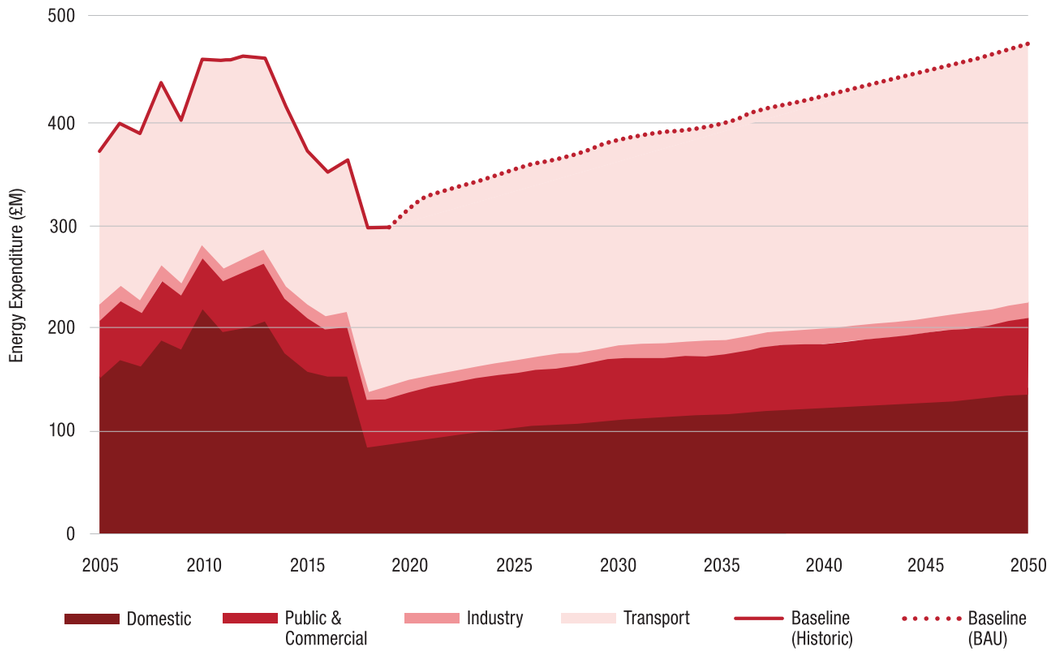


Figure 3: Belfast's Present and Projected Energy Expenditure by Sector

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.

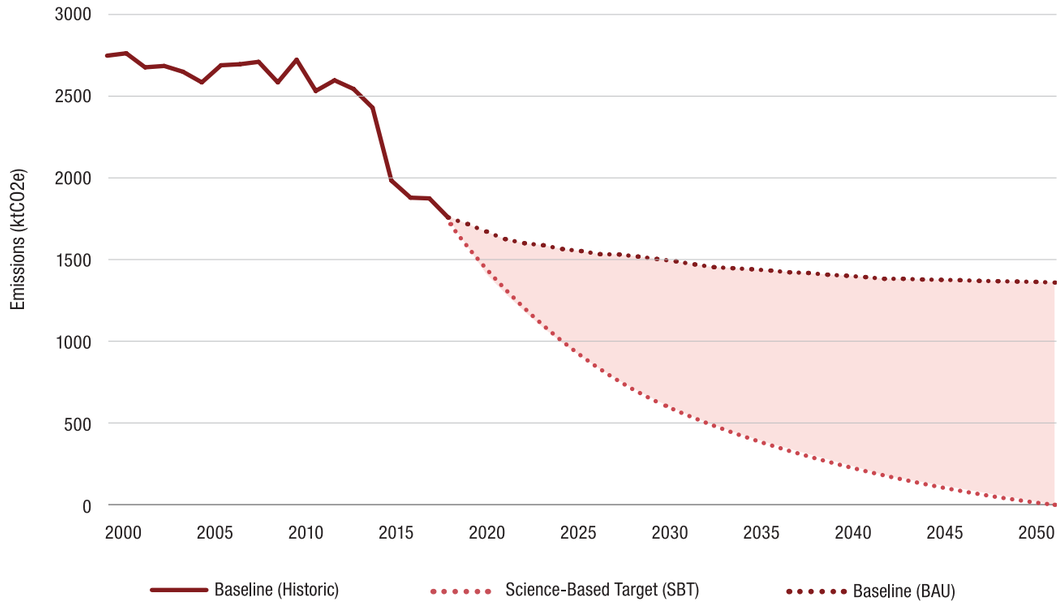


Figure 4: Belfast's Baseline and Science-Based-Target Emissions Pathways

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).

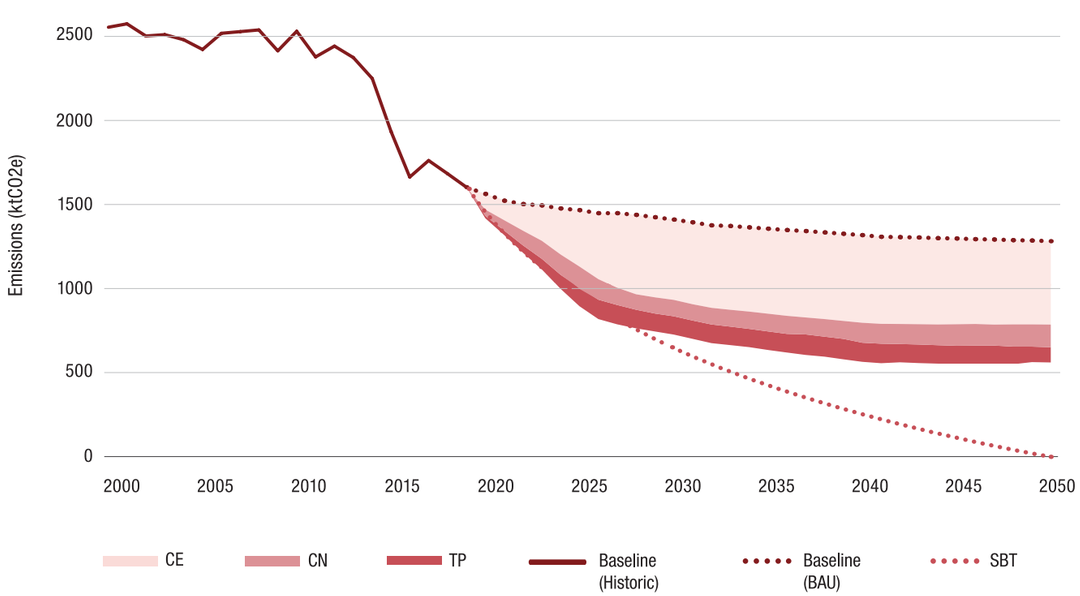


Figure 5: Belfast's BAU Baseline with Cost-Effective (CE), Cost-Neutral (CN), & Technical Potential (TP) Scenarios

		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

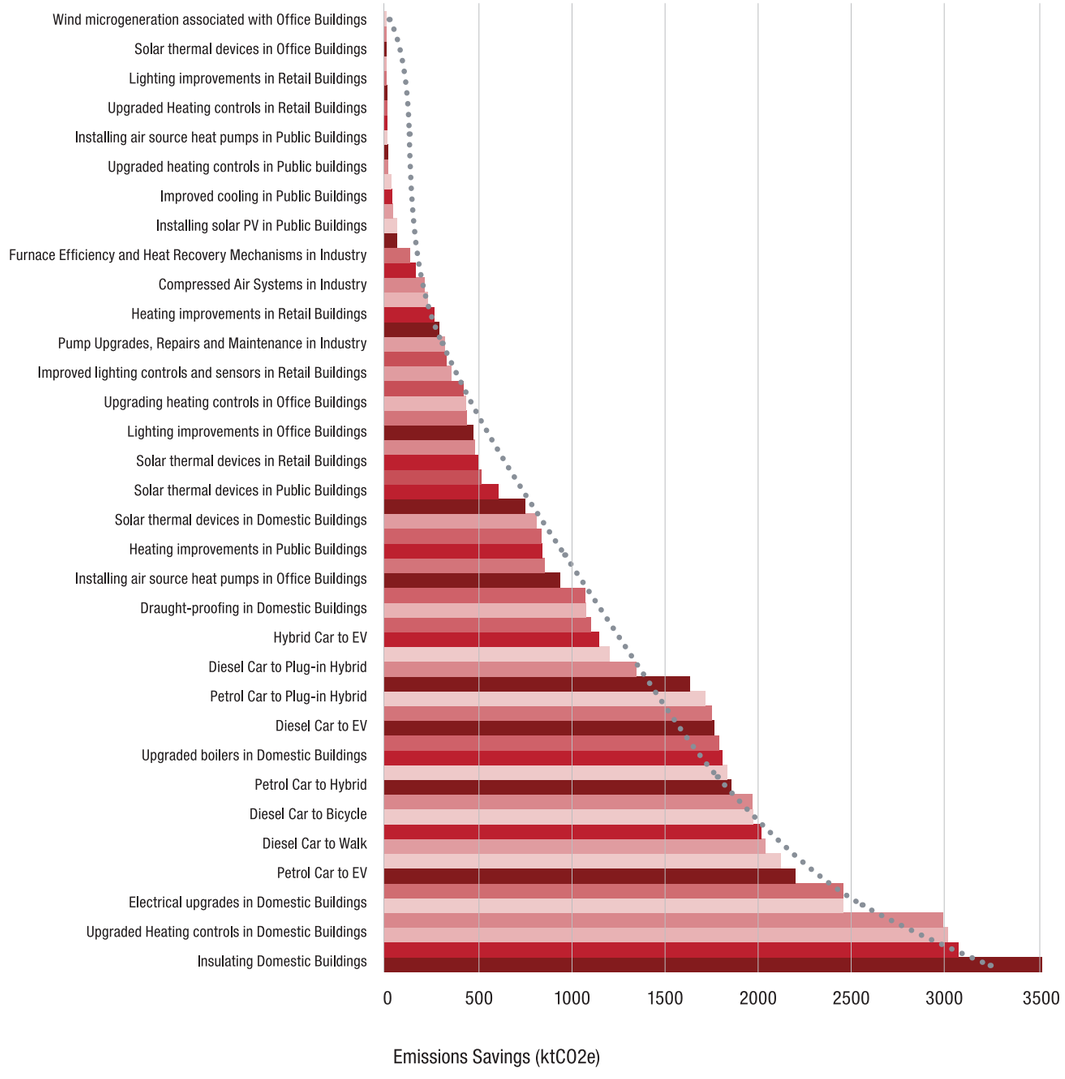


Figure 6: Simplified Emissions Reduction Potential by Measure for Belfast

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.

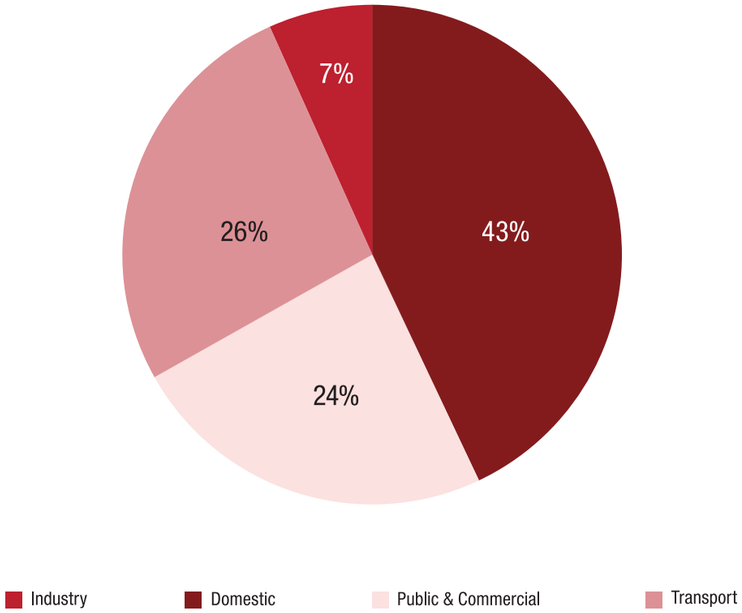


Figure 7: Belfast's Emissions Reduction Potential (2020-2050) by Sector

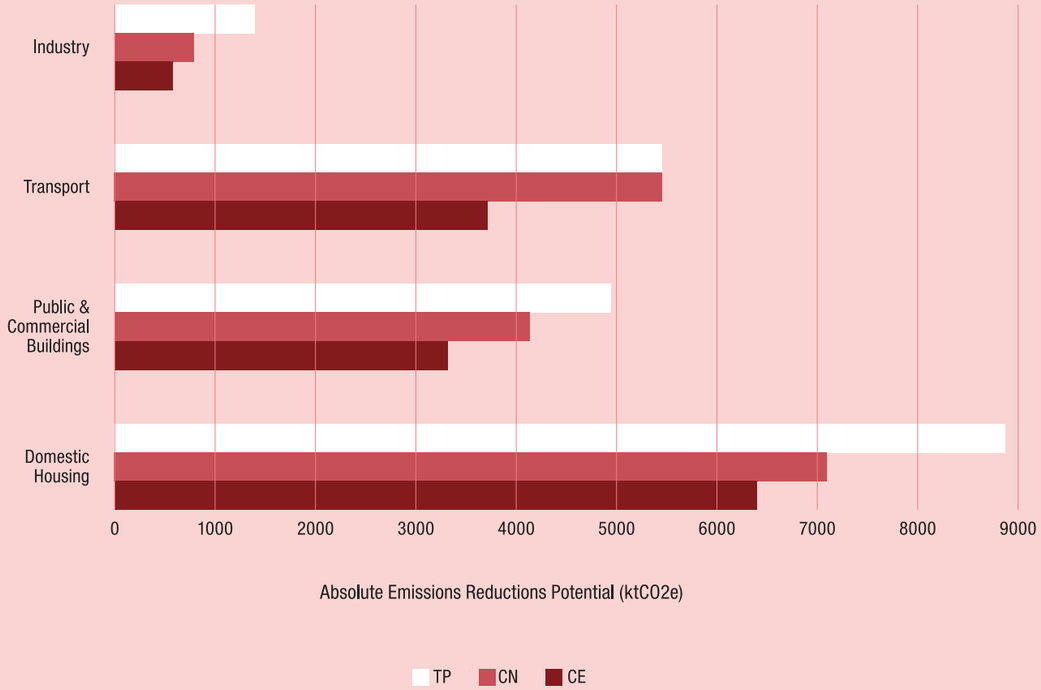


Figure 8: Belfast's Emissions Reduction Potential By Sector & Economic Scenario (2020-2050)

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

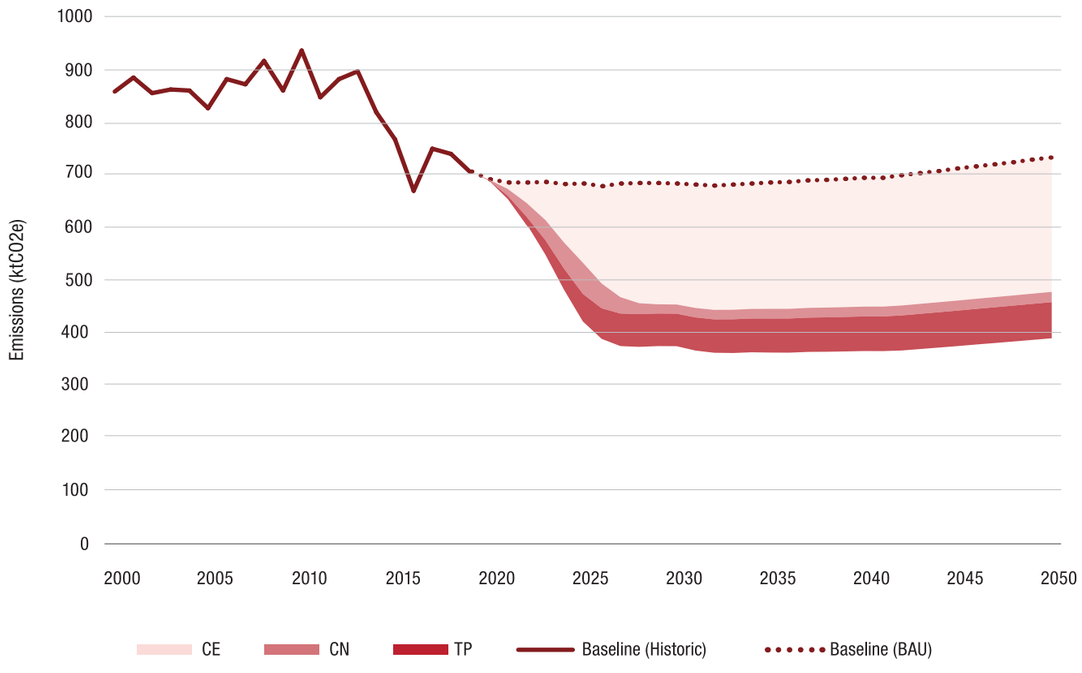


Figure 9: Housing BAU Baseline with Cost-Effective, Cost-Neutral and Technical Potential Scenarios

		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

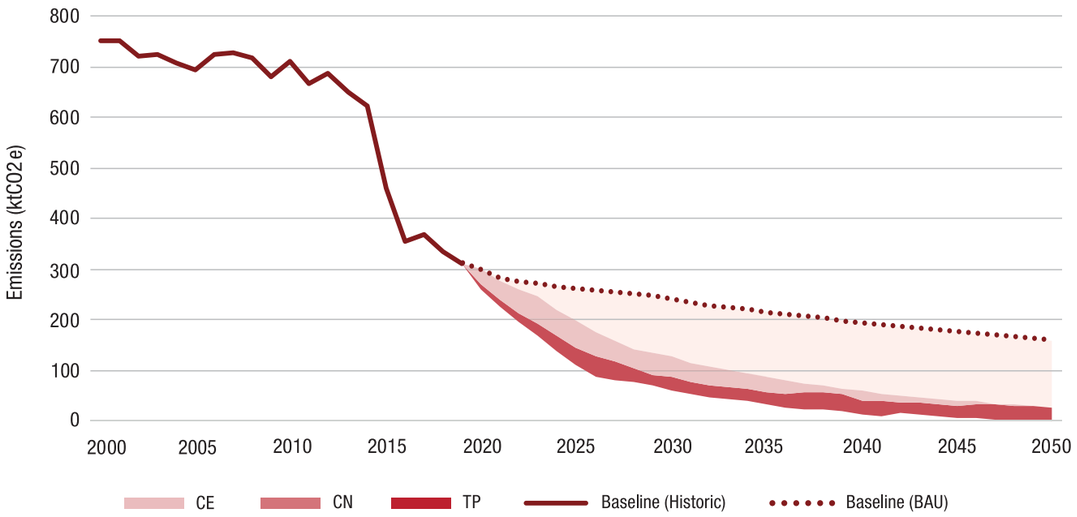


Figure 10: Public and Commercial Buildings BAU Baseline with Cost-Effective, Cost-Neutral and Technical Potential Scenarios

		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

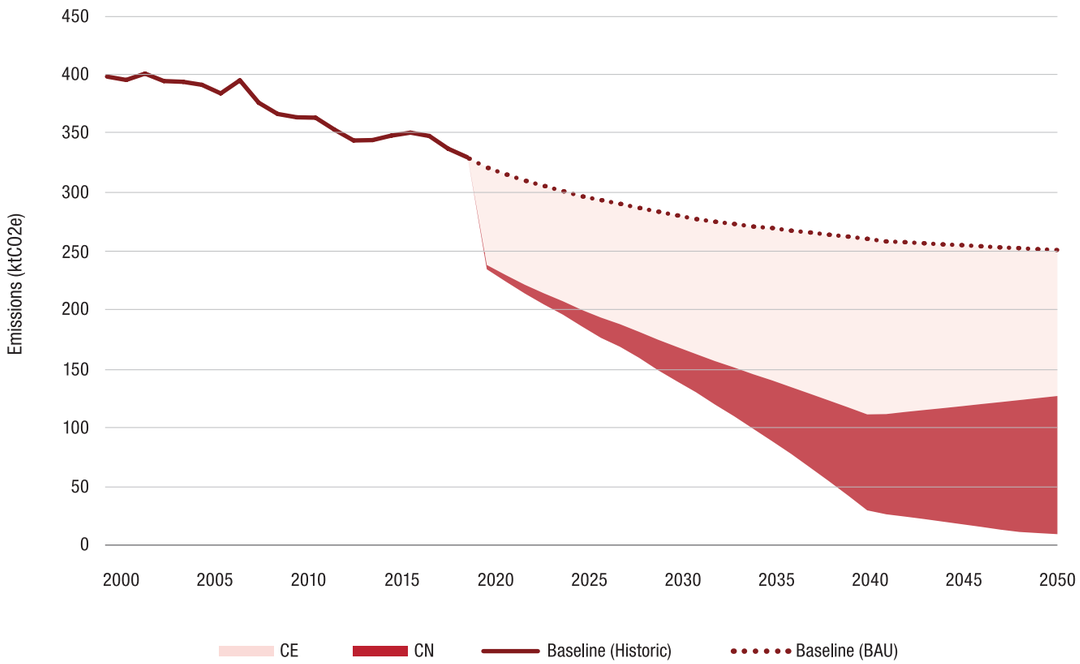


Figure 11: Transport BAU Baseline with Cost-Effective and Cost-Neutral Scenarios[3]

		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

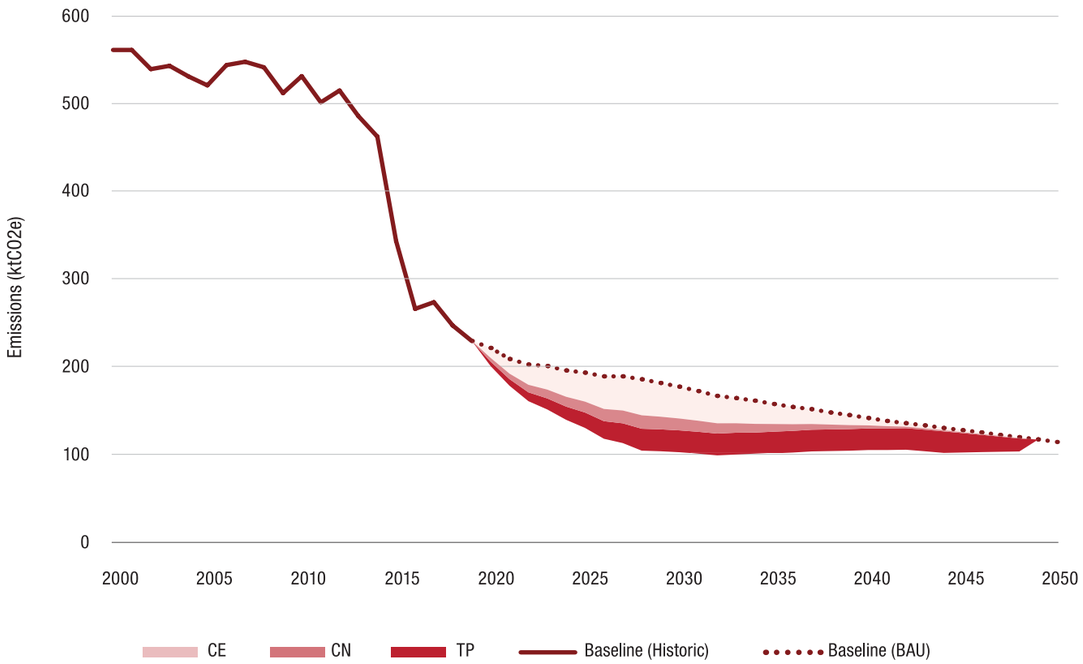


Figure 12: Industry BAU Baseline with Cost-Effective, Cost-Neutral and Technical Potential Scenarios

		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)

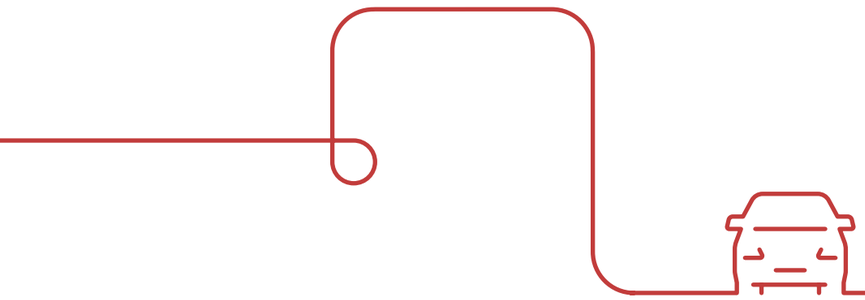


Figure 13 below shows the impact that the adoption of these stretch measures would have on Belfast's carbon emissions, with the black dotted line showing the business-as-usual baseline, the red dotted line showing emissions after adoption of all technically viable options and the grey dotted line showing 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.

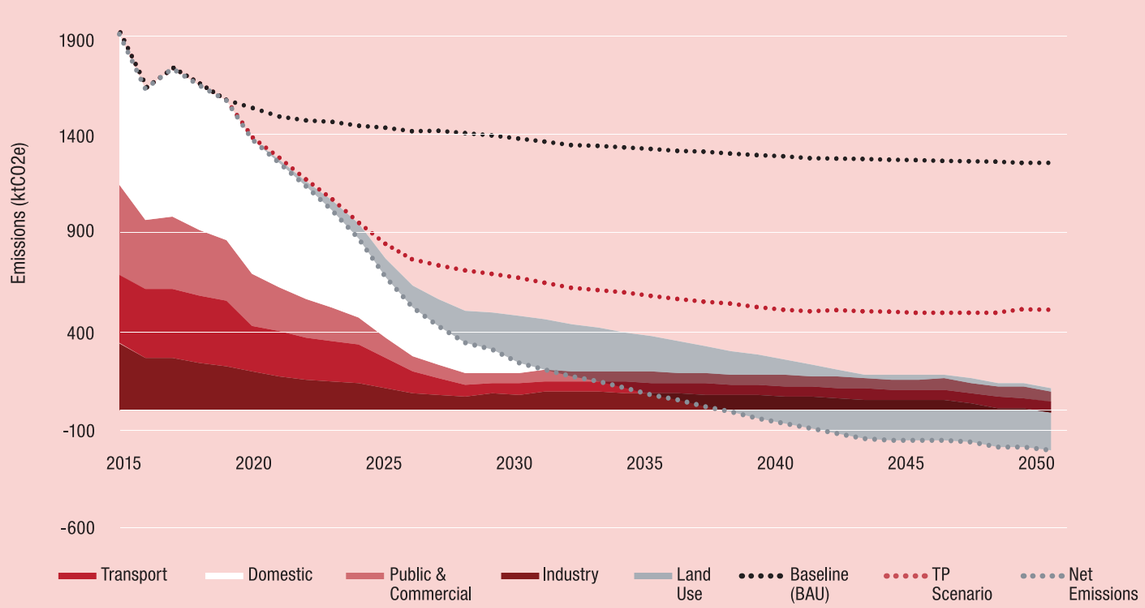


Figure 13: Sectoral Emissions Shortfall Reduction with Stretch Measures

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.

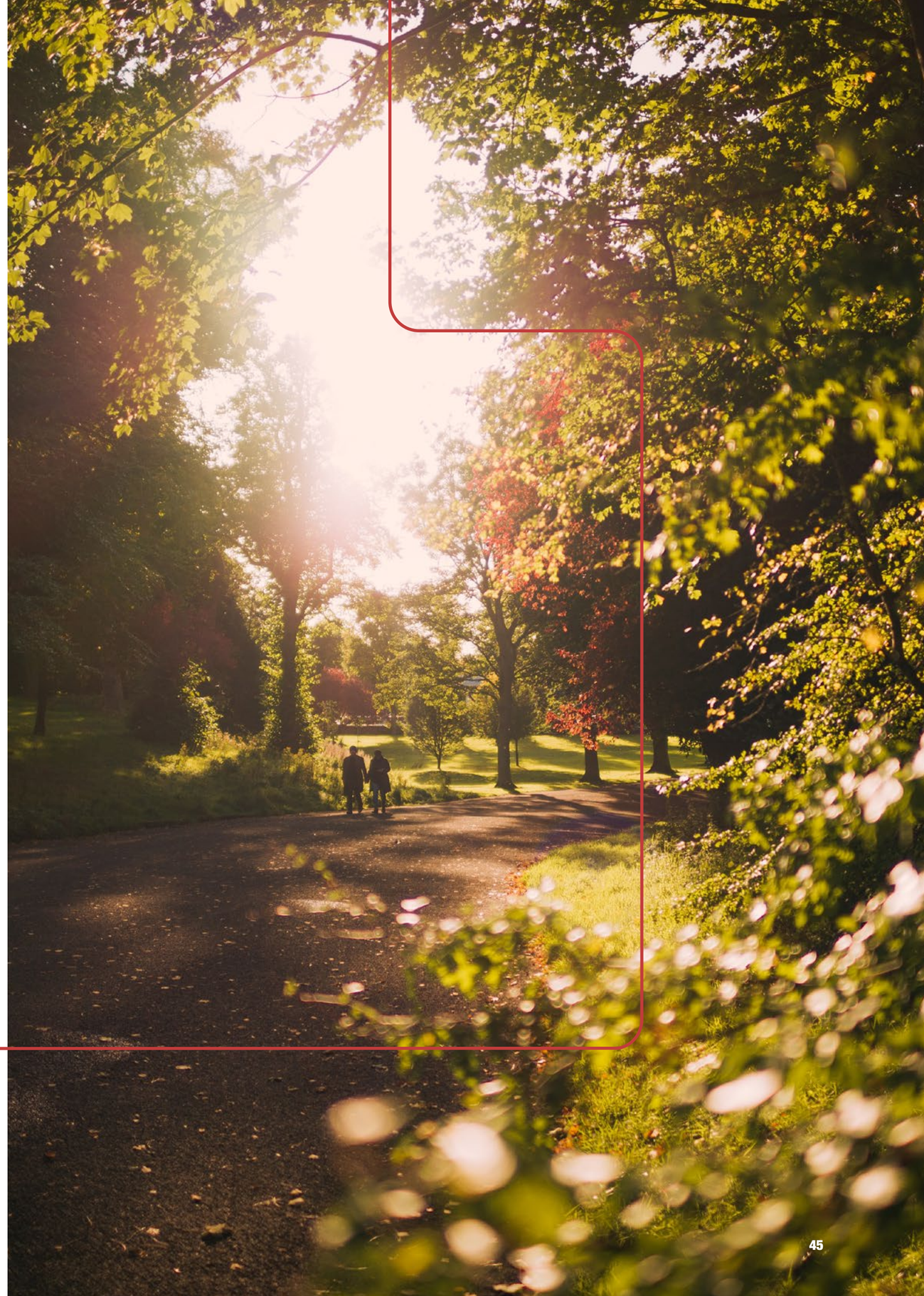
The action plan should clearly set out the ways in which Belfast will work towards achieving these targets, drawing on the deployment KPIs listed in this report. Action should also be taken to monitor and report progress on emissions reductions.

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

Measure	Emissions Reduction Potential (ktCO2e)
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

Measure	Cost Effectiveness (£/tCO2e)
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

Contact

pcan@lse.ac.uk

https://pcancities.org.uk

PCAN PLACE-BASED CLIMATE ACTION NETWORK

Published November 2020

FUTURE PROOFED CITY BELFAST

AMBITIONS DOCUMENT: A CLIMATE PLAN FOR BELFAST

December 2020

RESILIENT BELFAST

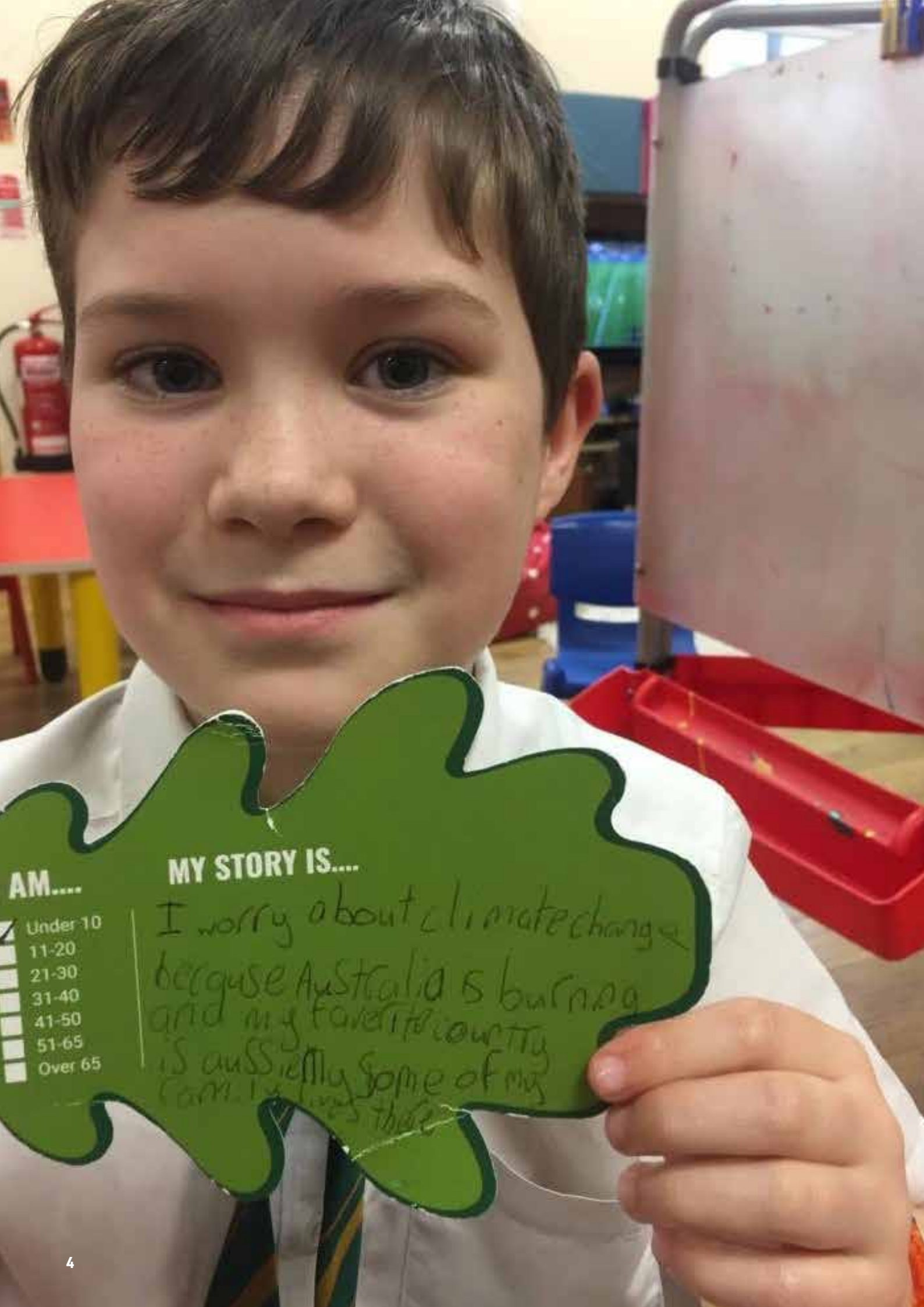
www.belfastcity.gov.uk/resilience


BELFAST DESTINATION

FUTURE PROOFED CITY
BELFAST
AMBITIONS DOCUMENT: A CLIMATE PLAN FOR BELFAST

December 2020

RESILIENT BELFAST


AM....
Under 10
11-20
21-30
31-40
41-50
51-65
Over 65
MY STORY IS....
I worry about climate change
because Australia is burning
and my favorite country
is aussie My some of my
family lives there

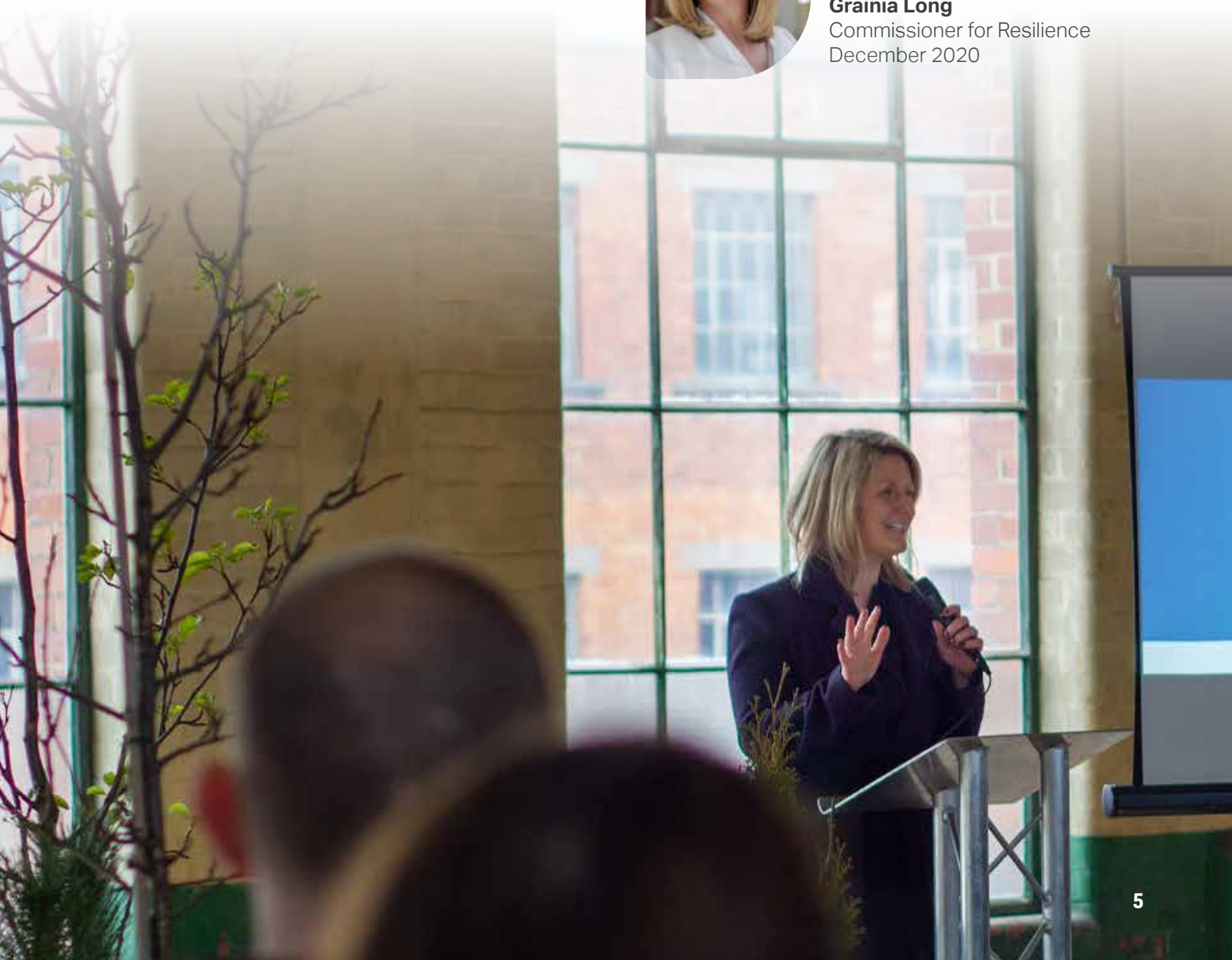
INTRODUCTION

Belfast's Resilience Assessment identified a wide-range of shocks and stresses for the city, improving our knowledge of existing and emerging risks. Coordinated response to these risks is being taken forward by city partners, working collaboratively through the city's Community Planning Partnership Board, and delivering the priorities set out 'Belfast Agenda'.

Public conversation on the draft Resilience Strategy found strong agreement with the shocks and stresses identified. However, there was also consensus that climate change presents acute risks for the city, and that we need a singular focus to prepare Belfast for its effects.

This 'ambitions document' is Belfast's first Climate Plan. It outlines a resilience 'goal' for the city, with a determined focus on climate adaptation, climate mitigation and the green economy. It sets out 30 'transformational programmes'- these are decade-long interventions which will have a positive impact, at scale, across the city. The programmes have been endorsed by the city's Resilience and Sustainability Board, and will be taken forward in a collaborative way by city partners in this decade. We have retained the emphasis on 'multiple problem solvers'- actions that solve several risks at once- and in particular ensuring that children and young people play a central role in climate action in their city.

Grainia Long
Commissioner for Resilience
December 2020



FOREWORD FROM THE OF CHAIR STRATEGIC POLICY AND RESOURCES COMMITTEE

Belfast Agenda, the city's community plan, is clear in its purpose- for Belfast to be a sustainable city. Meeting that vision has required the development of this document- the city's first 'climate plan' – a document which sets out a clear goal, to transition Belfast to an 'inclusive, net zero-emissions, climate- resilient economy in a generation'. Across Belfast, partner organisations have not only help identify the risks that face our city but they have also agreed that the ultimate goal for the city should be to **transition to an inclusive, net zero-emissions economy in a generation.**

This is the first time that Belfast has taken an integrated and collaborative approach to the development of a climate plan, and I am particularly pleased at the level of partnership working involved.

I would like to thank all the members of the Resilience and Sustainability Board who have agreed to work together to deliver thirty programmes, at scale, to meet our goal. We all welcome the variety of programmes that have been designed to be **'multiple problem solvers'** and look forward to witnessing the transition of Belfast into a more climate ready city. This plan is a first of many for Belfast and its timing is important for us all to drive the city forward in its green recovery.

Working together will help us to ultimately deliver the goal and enable city partners across all sectors to deliver these ambitious programmes. We are delighted to be involved from the beginning of this project and we are grateful for the commitment of city leaders, communities, organisations, universities and of course our residents who have supported the development of this plan. I believe this document positions Belfast as a city which can demonstrate its commitment to tackling the climate crisis, in the interests of all our residents- today's and tomorrow's.

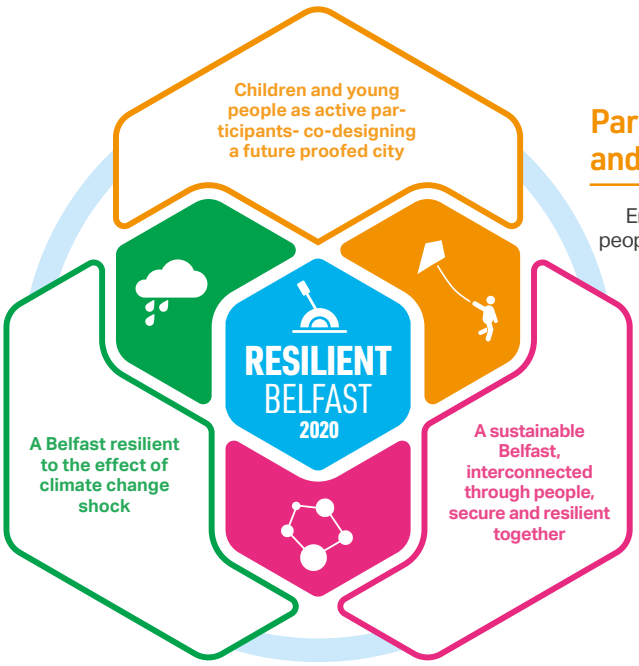
Councillor Christina Black
Chair
Strategic Policy and
Resources Committee

Belfast
City Council

CONTENTS

RESILIENCE GOAL 9

AREAS OF FOCUS 62



Climate adaptation and mitigation

Adapting to, and mitigating climate change across the city

Page: 14

Participation of children and young people

Ensuring the city's children and young people co-design plans for a sustainable, climate resilient city, and have every opportunity to participate in delivery

Page: 18

Connected, net zero-emissions economy

Achieving a step change towards zero emissions, in this decade, through well-design and well-funded infrastructure

Page: 23


A BIGG
THAN
WE STAN
FOR
WHAT WE
STAND
ON
IT'S GETTING
HOT
IN HERE
#FRID
YOUTH

RESILIENCE GOAL

Our goal is to transition Belfast to an inclusive, net zero-emissions, climate resilient economy in a generation.

MULTIPLE PROBLEM SOLVERS

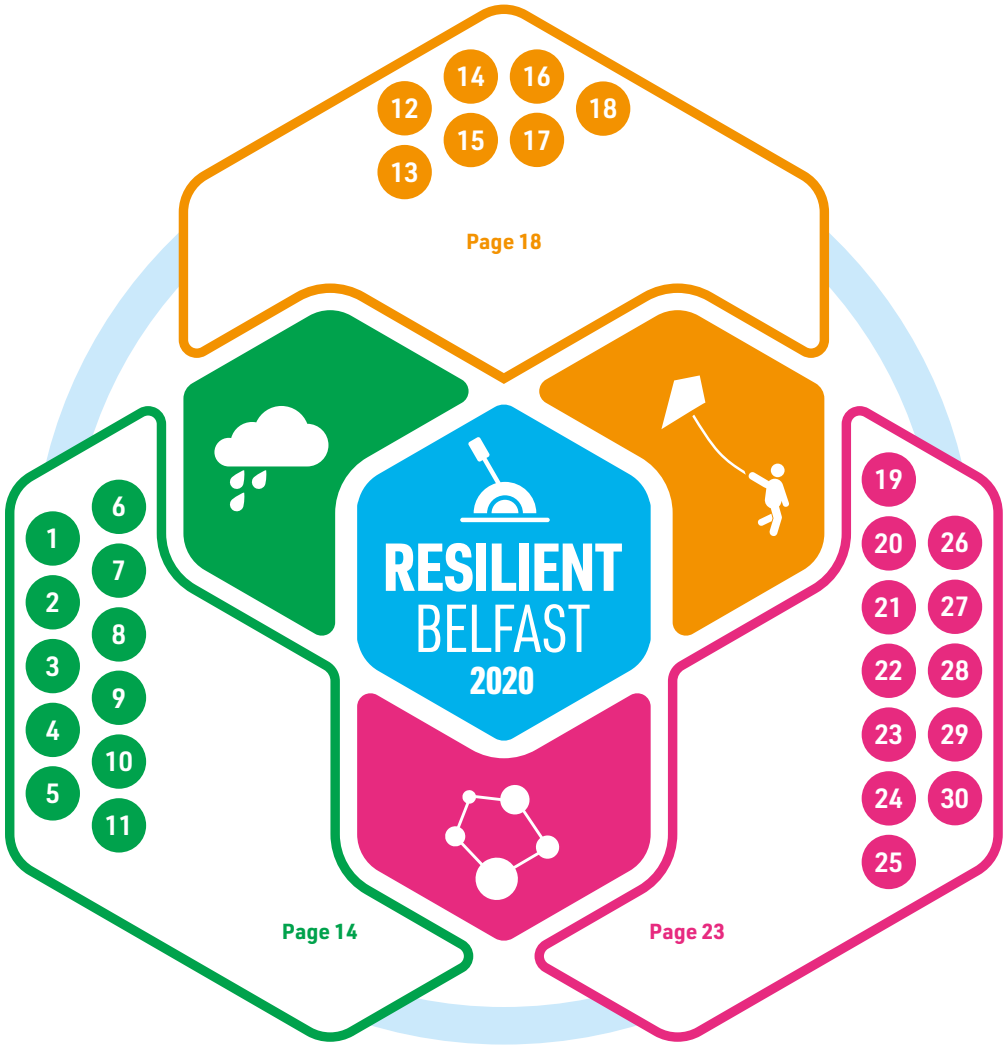
We have identified a series of levers aimed at resolving several risks at once. These 'multiple problem solvers' provide focus and direction towards our transition to an inclusive, net zero emissions climate resilient economy.

MULTIPLE PROBLEM SOLVERS

CLIMATE ADAPTATION AND MITIGATION

PARTICIPATION OF CHILDREN AND YOUNG PEOPLE

CONNECTED, NET ZERO-EMISSIONS ECONOMY



DELIVERY OF UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS

Belfast's Resilience Strategy has been informed by, and is aligned with the UN Sustainable Development Goals.

The 2030 Agenda for Sustainable Development is an historic global agreement to eradicate extreme poverty, fight inequality and injustice and leave no one behind. Agreed by world leaders at the UN in 2015, the 17 Sustainable Development Goals (SDGs) succeed the Millennium Development Goals (MDGs). The SDGs are universal with all signatories - including the UK - expected to contribute to them internationally and deliver them domestically.

Belfast's Resilience Strategy contributes to the delivery of these important global goals.

1 No poverty

2 Zero hunger

3 Good health and well-being

4 Quality education

5 Gender equality

6 Clean water and sanitation

7 Affordable and clean energy

8 Decent work and economic growth

9 Industry, innovation and infrastructure

10 Reduced inequalities

11 Sustainable cities and communities

12 Responsible consumption and production

13 Climate action

14 Life below water

15 Life on land

16 Peace, justice and strong institutions

17 Partnerships for the goals

LEGEND KEY

Area of focus

- Climate action
- Children and young people
- Connected, net zero-emissions economy

Quality of resilience

- Reflective
- Resourceful
- Inclusive
- Integrated
- Robust
- Redundant
- Flexible

Shock or stress

- Infrastructure capacity
- Condition of existing Housing Stock
- UK Exit
- Flooding and extreme weather events
- Cyber resilience
- Public Health
- Economic recovery capacity
- Population change
- Carbon intensive systems
- Housing supply in the city
- Segregation and division
- Climate change
- Poverty and inequality
- Use of prescription drugs
- Mental Ill-health
- Governance and financing of risk

United Nations: Sustainable Development Goal

- No poverty
- Zero hunger
- Good health and well-being
- Quality education
- Gender equality
- Clean water and sanitation
- Affordable and clean energy
- Decent work and economic growth
- Industry, innovation and infrastructure
- Reduced inequalities
- Sustainable cities and communities
- Responsible consumption and production
- Climate action
- Life below water
- Life on land
- Peace, justice and strong institutions
- Partnerships for the goals

CLIMATE ADAPTATION AND MITIGATION

The effects of climate change present the greatest economic, social and environmental risks to the city of Belfast, in this decade and beyond'. The city's future economic growth must therefore be inclusive, sustainable and low-carbon.

"The economic cost of flooding could be profound. Belfast is 'predicted to be the most economically impacted, with aggregated annual average damages of approximately £16m.'"

NI Flood Risk Assessment, 2018

- Belfast must be 'climate ready' i.e. prepared for changes to the city's weather, to our water, and to our biodiversity arising from climate change. The city must prevent economic shocks arising from climate change, and a widening of inequality due to its effects. It must urgently build community resilience to respond to the impacts of climate change, and ultimately transition to a net zero emissions economy.
- Belfast is facing a climate crisis. A harbour city, and already an area of significant flood risk, our proximity to water and the increasing presence of water in our city as the climate warms is a significant risk. Pockets of poor air pollution and our dependence on cars as a form of transport, coupled with the prevalence of hard infrastructure throughout the city highlight a series of interconnected challenges, which if left unchecked will leave the city exposed.
- Our ability to respond to a changing climate will fundamentally impact on the city's economic prosperity in the years to come. The prevalence of extreme weather events will require additional city resources; the design, development and location of future developments will be impacted by climate events and our attractiveness as a destination to live work and enjoy will all be impacted by our ability to prepare for, respond and absorb climate related shocks and stresses.
- The Intergovernmental Panel on Climate Change (IPCC) warned in 2018 that cities have twelve years to make rapid, far-reaching and unprecedented changes in all aspects of society in order to limit global warming to 1.5°C. Belfast must heed that warning and make climate resilience an urgent and strategic focus for the entire city.
- Furthermore, our dependence on energy will increase. While immediate energy demand scenarios are currently uncertain due to the impact of COVID-19, the Belfast Mini Stern demonstrates the scale of the city's long-term economic dependence on energy - it predicts that Belfast will spend c.£466 million per year in 2050.' Belfast therefore faces two energy challenges- to decarbonise rapidly while building the city's energy independence. Doing so provides an immense economic return to the city, as set out in the Mini Stern.

"Belfast is emitting 1.5 million tonnes of carbon a year. At this rate, we will have used up our carbon by 2030."

Belfast Mini Stern

- The 'foundational programmes' endorsed by the city's Resilience and Sustainability Board are strongly informed by the city's 'Mini Stern', by consultation with city partners and with communities, and are intended as a step change in the city's approach to climate adaptation and mitigation.

1 New city-wide structures to collaborate on climate action

Belfast has established two permanent new structures to drive partnership and collaboration to build the city's climate resilience and drive climate action. The Belfast Climate Commission is a 'thinktank' which ensures the right evidence and analysis is available to decision makers. The Resilience and Sustainability Board is a permanent feature of the Community Planning structures for the city. The board is a genuine partnership between agencies and organisations on climate action in Belfast, and over time will ensure integration of systems to increase the city's efficiency and effectiveness.

2 Delivery of Recommendations in Belfast's Mini Stern: A Net Zero Carbon Roadmap for Belfast

Working with Leeds and Edinburgh, Belfast's first Net Zero Carbon Roadmap has been produced, to identify the sources of Scope 1 and 2 emissions, and to set out cost effective and innovative stretch measures needed to reach net zero carbon by 2050. Through the Belfast Climate Commission and the Resilience and Sustainability Board, recommendations within the roadmap will delivered to enable Belfast to reach its goal.

3 Climate change risk assessment

We have commissioned Arup (our 100 Resilient Cities strategic partner) to undertake a high level climate change risk assessment- to provide us with an assessment of the potential impact of climate change on the city's infrastructure. This work has identified significant areas of risk for the city, and areas of focus for climate planning into the future.

4 Belfast City Council Climate Adaptation and Mitigation Plan

Belfast City Council will publish its Climate Adaptation and Mitigation Plan in 2021, based on data from an internal sustainability review, an energy review and the development of climate adaptation priorities. The document will be the first comprehensive and integrated plan by the council on climate adaptation and mitigation.

5 Belfast Harbour - Green Port

Belfast Harbour's ambition is to become one of the 'greenest' ports in the world. Its strategic goals include achieving net zero carbon emissions in Belfast Harbour before 2030, through decarbonisation of our operations and nature based solutions. Its partnership-based action plans will protect and enhance our marine biodiversity and wider environment. With the help of digital innovation, it will help facilitate a circular economy and improve air quality standards throughout its estate. As a socially responsible Green Port, Belfast Harbour's vision is to work with others as a green developer and support our port community, customers and tenants as together we build a sustainable future for all.

6 Queen's University Environmental Solutions Centre

We will explore the feasibility of establishing a city-wide support organisation drawing on the model of Adaptation Scotland to provide advice and support to help public sector, businesses and communities understand what climate change will mean for them, and the best way to plan for its impact. City partners will work collaboratively to support the establishment of an interdisciplinary Environmental Solutions Centre at QUB, a collaboration between academics working on environment and sustainability research. The goal of the centre is to provide solutions to decarbonise economies and radically reduce greenhouse gas emissions to achieve net zero and to provide solutions that reverse the loss of biodiversity worldwide. Queen's has co-designed the centre with key partners in industry, local and regional government and civil society. The centre will focus on data analytics and synthesis and will deliver solutions through co-defined interdisciplinary working groups bringing together stakeholders from across a broad spectrum of relevant partners, and will be a critical asset to the city in its progress to reach net zero.

7 Sustainable District

Belfast Linen Quarter BID, working collaboratively with city partners, will establish the city's first 'Sustainable District' bringing together business, the public sector and the private sector to collaborate and innovate on energy, water and waste efficiency, decarbonisation and sustainable practices, to accelerate the city's transition to a climate-resilient economy.

The vision is to co-create a prosperous, inclusive, climate-resilient district founded on a circular, net zero-carbon economy. Work programmes will include system re-design to develop sustainable products & services; Sustainable waste management; a district-wide green energy contract, to accelerate the move to renewables; New approaches to public realm that reduce car use and increase cycling and walking and a strategy for improved air quality.

8 Belfast Region City Deal

The Digital Innovation Pillar of the Belfast Region City Deal prioritises resilience and sustainability, with a core commitment to triple bottom line delivery in all of its programs taking into account social, economic and environmental sustainability factors. Specific programs will target funding of innovation in energy transition, integrated transport solutions and building technology, in this decade. The Belfast Digital Innovation ambition will also focus on development of platforms such as digital twins, built on committed 5G/ IoT deployments within the city and which coupled with Belfast's leading expertise in cyber and AI technologies, will ensure that our innovation excellence is targeted to ensure our strategic city assets such as housing, energy, transport, water and telecommunications are resilient by design. Opportunities will therefore be sought to invest in enabling infrastructure to meet the city's ambitions while also emphasising skills and business growth at scale.

9 One Million Trees

Inspired by an original idea from the Belfast Metropolitan Residents Group, city partners will plant one million trees across Belfast by 2035. Launched in late 2020, and designed as a major programme to support climate adaptation across the city, it is a collaboration between public, private and voluntary sector partners, and will make a substantial contribution to the DAERA 'Forest of the Future' regional tree planting programme.

10 Local Development Plan: a Critical Lever for Resilience

Belfast's draft Local Development Plan (LDP) provides a robust statutory framework to enable Belfast's transition to an inclusive, net zero emissions, climate-resilient economy. The draft plan provides a 15-year framework to support the city's ambitions, providing the delivery of sustainable development, facilitating growth and allocating sufficient land to meet the needs of the city. Core objectives of the draft LDP include the promotion of a green and active place and building a smart, connected and resilient city. The draft LDP is therefore a critical lever in the delivery of this strategy's objectives.

11 Sustainability and Food

In developing this strategy, we have had insufficient time to look in detail at the city's food needs into the future, however this is a priority for strategy implementation. Working with partners across the city, a workstream examining the climate impacts and opportunities for an ongoing and city wide programme of healthy and sustainable food will be critical to Belfast's resilience.

CASE STUDY: CLIMATE ACTION

Cape Town: water resilience and avoiding day zero

Cape Town made international headlines in 2017 when they faced the prospect of an imminent "Day Zero", a scenario in which the city government would have to turn off the water distribution networks to conserve water, in response to experiencing the driest three-year period since the 1930's. The city's normal recourse was to increase water restrictions but more action was needed.

Capetonians mobilised to take remarkable action. Lawns and water sensitive plants were replaced with less water reliant alternatives. Residents invested in water saving devices such as low-flow taps and shower heads. Community organisations developed their own response strategies. Some corporations went off-grid, turning to groundwater or desalination. The local government worked tirelessly with businesses to share information, hear concerns, plan and became much better at partnering. This collective response would eventually drive down water consumption by over 50%. Day Zero was called off in 2018 and later removed as a possibility for 2019 and again in 2020..

Positively, behaviours have changed permanently as residents' water-saving and efficiency behaviours endured, even as restrictions were gradually lessened. Water consumption is unlikely to ever return to pre-drought levels. Cape Town's achievement is evidence of the positive impact that partnering with residents and stakeholders at all levels can have on a city's governance and operations.

PARTICIPATION OF CHILDREN AND YOUNG PEOPLE

The participation of children and young people in decisions that affects their lives is of critical importance in the design of a sustainable city. Our resilience goal, to transition to an inclusive, net zero emissions, climate-resilient city in a generation is not possible unless we involve children and young people in strategy design, and ensure their participation in its delivery.

We consider this value so important that it is one of three areas of focus, or 'multiple-problem solvers' as we restructure our economy and society, as climate change advances.

In this section, we include several 'foundation programmes' which place children at the centre of decisions on climate adaptation and mitigation in Belfast.

35% of Belfast's population is aged 25 and under. Young people are a major asset for the city, especially given the shocks and stresses outlined earlier, e.g. the risk of population decline, outward migration, and how we build our economic resilience.

A young population provides Belfast with a bright economic future, with a source of future talent. If young people are properly involved in the decisions that affect their lives, they could also help to shape a transformed sustainable economy for the city. Our conversation with children and young people as part of this strategy consultation, found that sustainability and inclusion were key priorities for them, and would frame the choices they take about where to live in the future.

Poor air quality and the prevalence of cars are considered among the biggest barriers to child-friendliness and a key factor affecting independent mobility among children. Less mobility means reduced access to and experience of the city and fewer possibilities to take advantage of the city's opportunities. Designing a sustainable and child-friendly city is also critical to attracting today's skilled and talented workforce to the city, particularly those with children. Cities like Rotterdam and Vancouver have taken ambitious steps to make urban environments attractive to families, retaining skilled workers and driving the local economy.

We have been inspired and encouraged by action taken in New Zealand (particularly Christchurch), in Wales, where there is a strong policy focus on 'Future Generations', and by Medellin in Colombia, which has invested in a Children and Young Persons' 'Unit' in the city government.

A city's design has an immense impact on the health and wellbeing of children. Sustainable healthy cities are also child-friendly cities. Designing a city in the best interests of children is therefore critical to Belfast's resilience.

The physical environment in which children live is a key determinant of their health, behaviour and development. Research and practice from other cities shows that a strategic focus on connectivity - walking, cycling and play - can improve the health and wellbeing of children and young people. Conversely, high-density traffic, poor air quality and a lack of public space can directly discourage people from being physically active, in turn, impacting on their health prospects. Child-centred urban planning is critical to achieving Belfast Agenda priorities on inclusive growth, and importantly to achieving a step change indifferences in life expectancy.

The focus of this strategy, to transition to a net zero emissions city, is also intended to make the city more attractive for children and young people, improving liveability and increasing their social and economic opportunities.

During the formal consultation on this draft strategy, we listened to and considered the views of more than 367 children and young people, and their views have strongly informed the content of our final document.

A snapshot of how young people participated in the process:

- The Commissioner for Resilience met 60 Belfast Youth Forum members.
- 32 young people took part in two online sessions with the Lord Mayor.
- Belfast climate strikers gave talks, came to the kiosk and attended online engagement sessions.
- 40 primary school children engaged through story telling sessions at two after schools clubs.
- 90 young people gave us their #ResilientBelfast stories and pictures.
- 40 children took trees home to plant across the city.
- 87 attendees at a 'Planning Resilient Futures' student conference.
- Resilient discussion with 25 university students.
- 367 young people involved to date.

"A good city is one that is good for its most vulnerable citizens..."

Enrique Peñalosa, (Mayor of Bogotá 1998-2001 and 2016-2019)

Some common themes which emerged were:

- Young people's high levels of anxiety about the potential impacts of climate change on the poorest and most vulnerable communities in Belfast.
- Many children and young people said they felt 'helpless' to the impacts of climate change- that decision makers were not making the crisis a core priority.
- Children's attitudes towards transport are very different to adults – they often do not see owning a car in the future as important or even necessary.
- The value placed by young people on their ability to live in a healthy city - many expressed this as a 'right' and in particular referred to the health impacts of air pollution, which should be made a city priority.
- Many young people emphasised the importance of urgency in delivery of change, saying that not everything has to be perfect before it is done.
- They welcomed the centrality of children and young people to the strategy and the potential for ongoing and meaningful involvement to the future design of climate policy and strategy in the city.
- Many young people felt their knowledge of the climate crisis and what is required is stronger than the decisions makers in the city, and their involvement is necessary to ensure we take the right approach now.
- They cautioned against their involvement being seen as 'tokenistic' and challenged decision makers to demonstrate their commitment by resourcing this work.
- They expressed real concern about other 'shocks and stresses' referred to in the strategy- particularly mental ill-health and digital inequality.

In developing this strategy, we have adopted the seven key principles developed by Arup in its Designing for Urban Childhoods report:

1. The quality of life experienced by urban populations, and particularly by children, will determine our global future.
2. Child-friendly urban planning is a vital part of creating inclusive cities that work better for everyone.
3. Focusing on the needs of children can help act as a unifying theme for the promotion of progressive ideas and ambitious actions.
4. Children's infrastructure can help to enhance the economic value and long-term viability of the urban environment.
5. Providing multifunctional, playable space - beyond the playground - can enable everyday freedoms and create a public realm for all ages to enjoy together.
6. Interventions at the neighbourhood scale offer the greatest potential to create a children's infrastructure network that allows safe and enjoyable journeys.
7. Decision makers should be opportunistic and strategic, and integrate child-friendly thinking into all aspects of city making.

12 A Permanent Platform for Involving Children and Young People on Climate Change

Led by the Belfast Climate Commission, and co-designed by children and young people, we will develop a model for ensuring the participation and involvement of young people, in future climate planning. The model will be developed in 2021, and will initially be developed to ensure their involvement in the UN Climate Conference COP26, but will be used annually to involve children and young people in decisions on the city's future.

13 Quality of urban childhood

Working with partners across the city, Belfast City Council will put in place a series of indicators to measure the quality of 'urban childhood' in Belfast. This will include measuring the amount of time children spend playing outdoors, their level of contact with nature and their ability to get around independently. These will inform decisions by organisations working across Belfast to improve urban childhoods and urban resilience more generally.

14 Ulster University Architects for Change Programme

The 'Architects of Change' programme puts students from Ulster University's School of Architecture and the Built Environment at the heart of developing and delivering a training programme to business leaders across the region. Leading academics will work with students on strategies for smart cities, zero emission definition and delivery aiming to address how gaps in knowledge and skill can be addressed through training.

This training programme will support business leaders to access the relevant knowledge to deliver environmentally, socially sustainable practice within their organisations. Participants will receive mentoring, materials and consultancy from the University to ensure growth beyond the life of the training. Longer term, the project will deliver innovative concepts for design, planning, construction and management of climate resilient, net zero emission buildings and communities. It will help shape Belfast as a smart, green city; improving the health and wellbeing of citizens, users and communities.

15 A Playful City

Belfast City Council will work to establish Belfast as 'A Playful City' by 2023, our designated year of culture, by bringing together the goals within its City Regeneration Strategy, its Cultural Strategy and its Resilience Strategy.

16 City centre public realm play spaces

Working with its city partners, Belfast City Council will invest in a network of city centre public realm play spaces. This should include permanent spaces in the city centre and a network of temporary/ pop-up play spaces across the city. This should include multifunctional use of space and re-use of existing infrastructure such as schoolyards, community hubs and carparks for community activities after hours. Belfast City Council wants to create a colourful, playful city that appeals to people of all ages. Working with city partners, Belfast City Council will build on its development of play spaces and invest in a network of city centre public realm that support diverse, interesting and inclusive family-friendly spaces. This could include permanent spaces in the city centre, embedding incidental play within the public realm and a creating network of pop up play spaces across the city. We will create multi-functional spaces through the re-use of existing infrastructure such as schoolyards, vacant spaces, community hubs and car parks for community activities after hours.

17 Ulster University MSc in Planning and City Resilience

Committed to producing leaders in planning for resilient, inclusive and healthy cities, Ulster University has launched an MSc in Planning and City Resilience. Using the city as a laboratory, studies can explore sustainable development, social and climate justice, inclusive planning and partnerships, and smart interventions.

18 Public transport

To achieve our priorities on climate resilience, city connectivity and urban childhoods, it is recommended that city partners should agree to an ambition to provide all children and young people have access to free public transport in Belfast - by an agreed year in the next decade. In achieving this goal we will enable a number of our objectives.

CASE STUDY: CHILDREN AND YOUNG PEOPLE

Paris: OASIS Schoolyards: battling heat and building resilience

The densest capital in Europe, Paris has only 14.5m² of green space per inhabitant. This increases both the urban heat island effect and the risk of storm water flooding. With space at a premium the city had to consider existing assets it could leverage to tackle its resilience challenges of heat waves, flooding, declining social cohesion, and limited green space.

In 2017, the Paris Resilience Strategy envisioned the renovation of the city's network of 761 schools into green islands or "oases" of cooler temperatures and community solidarity. In 2018, Project OASIS (Openness, Adaptation, Sensitisation, Innovation and Social Ties) brought together twelve city departments to begin a pilot with three schools participating. After extensive engagement with pupils, parents and the education community, renovation work began which included replacing asphalt with porous material, improving storm water drainage, increasing green space, modernizing water management, installing cooling fountains and water sprayers and creating natural and artificial shade structures. The project gained European recognition winning the 2019 Urban Innovation Actions award and a further €5m of EU-co funding.

Paris aims to scale this concept to approximately 700 schools by 2050. The Oases are expected to decrease average surface temperatures by 10%, reduce daytime air temperatures up to 3°C and increase water absorption capacity from 4 to 16mm. These new breathing spaces at the heart of neighbourhoods, designed by users, will improve the living environment, cope with the climate emergency, and reinforce social cohesion.

CONNECTED, NET ZERO-EMISSIONS ECONOMY

Resilient cities are well connected cities. Our vision of Belfast is as an inter-connected city, with secure, resilient infrastructure that meets its economic, social and environmental goals. A city that values sustainable forms of transport.

Connected cities have well-developed networks of people, communities, industries and institutions all working collaboratively towards common goals. Investment in resilient infrastructure is critical to ensuring and enabling inclusive growth - connecting people and communities with markets, and with affordable easy access to high quality jobs and services. Resilient infrastructure is essential for place-making, good relations and building healthy and sustainable cities. Industrial strategy requires reliable, accessible and competitively-priced infrastructure to attract foreign direct investment and to create jobs.

"It has never been more important for a city-region to be connected and have high levels of connectivity. Investment in infrastructure must facilitate and enable the growth of those businesses and sectors which have the potential to close the productivity gap."

Belfast has made huge strides since the Belfast/ Good Friday agreement towards being a connected city. However, much more progress is required to build 'one city', where our connections reduce our vulnerabilities and strengthen our capacity to withstand risks. The potential to be gained from an 'infrastructure revolution' for the city was highlighted in the Belfast Region Infrastructure Investment Framework - commissioned by the Belfast Region City Deal partners as part of their work to present a case to the UK Treasury for investment in the City Region. The Framework recognised the economic potential to be gained from a step change in investment in key infrastructure classes to boost growth in the region, and in turn enhance economic resilience.

This requires a shift in mindset - so that infrastructure is understood as vital to our economic and social interests, and responsibility for building, maintaining and investing in infrastructure goes beyond central government to a range of partners across the city.

It also requires a transformation in how we move around our city. Car dependency is undermining our resilience- by requiring more and more hard infrastructure that builds our exposure to climate risks rather than reducing them. Belfast must make a strategic shift away from the car as the predominant mode of transport, and this will in turn boost our climate resilience, and make our city a healthier, cleaner more enjoyable Belfast.

"Strategic city-wide focus on connectivity has the potential to boost Belfast's resilience - its capacity to withstand shocks and adapt to future risks."

The Good Relations Strategy for the city makes similar and important commitments on the need for a genuinely connected city, '...The way we have done things in the past needs to adapt to help us reach the ambitions we have set ourselves in the Belfast Agenda. We need social innovation; changing the way we plan, deliver and consume services and how and where we access them, how we travel within the city, how we educate our young people, how we view and use local spaces, and how we interact with one another across the city. These are all critical to achieving these ambitions.'

This strategy seeks to complement and underpin delivery of the Good Relations Strategy. The following recommendations are aimed at supporting the strategy in practice.

19 Sustainable drainage

Ensuring sustainable drainage is critical to any city's climate resilience. Led by Department of Infrastructure and working with delivery partners across Belfast, the draft Sustainable Drainage Infrastructure Plan is a critical programme of work, to be delivered in this decade and to ensure Belfast has a network of sustainable drainage systems to meet its existing and future growth.

20 A Zero Emissions city bus fleet by 2030

The transition to zero emissions public transport is a priority for the city. Translink, the city's main public transport provider, has an ambitious target to decarbonise its entire Belfast bus fleet by 2030. In addition, Translink plans to target a 50% reduction in GHG emissions, per passenger km, by 2030. Working in partnership with DFI and a range of regional partners, Translink is exploring opportunities to decarbonise rapidly through use of zero and low emissions vehicles and renewable energy.

Translink will procure and place into service 103 zero emission double deck buses consisting of both Hydrogen Fuel Cell and Battery Electric vehicles by the end of 2022. This programme will deliver clean air, environmentally friendly public transport ultimately being powered by sustainably produced hydrogen and electricity.

21 Delivering Belfast's Net Zero Carbon Roadmap: Buildings

Belfast's 'Mini Stern' - the Net Zero Carbon Roadmap for the city identifies buildings and transport as key emitters of carbon. Targetted intervention in housing, to meet the targets set out in the roadmap is necessary. Housing organisations in the city will explore financial options required to meet the targets by 2030 and 2050 respectively, and set interim milestones to report on progress on a five yearly basis.

22 A Bolder Vision for Belfast

A Bolder Vision for Belfast was collaboratively developed by Belfast City Council, Department for Communities and Department for Infrastructure and provides the blueprint for creating a more attractive, accessible, safe and vibrant city centre that will improve economic, societal, health and environmental wellbeing for all. Underpinned by four Visioning Principles it delivers an ambitious and challenging framework for 13 'What Ifs?', transformational projects identified through stakeholder engagement, data and analysis. It is a high-level Vision, requiring change among all stakeholders and citizens, and is intended to inspire potential solutions to shape a dynamic, sustainable and connected 21st century city.

23 Electric vehicle infrastructure

By 2030, in parallel with the city's ambitions to decarbonise the city's bus fleet, Belfast will have delivered a network of electric vehicles to support transition.

24 Investment in existing NIHE stock

Investment solutions to improve NIHE stock will be critical to the city's resilience. It is important that these solutions are part of a wider city-wide approach to decarbonisation and retrofit of existing stock, as is taking place in other cities, with similar resilience challenges.

25 Developing a Hydrogen Eco System

To accelerate the city's transition to a net zero carbon economy, city partners across energy, waste, housing, water and transport will develop a network of hydrogen powered infrastructure in this decade. This will include hydrogen for transport, for logistics and mobility and for buildings.

26 Belfast Destination Hub - A Low Carbon Exemplar for the City

The Destination Hub will be a landmark signature experience in the heart of our city centre that speaks to the essence of this vibrant place. Supported by the Belfast Region City Deal, this major cultural attraction will invite visitors to explore the many stories of the city and its people through an immersive, multi-gallery experience. The Hub will be a cultural beacon for the city, an anchor for the wider Belfast experience and an area of orientation for visitors into Northern Ireland. Importantly, its design will be a bold demonstrator of intent on Belfast's ambitions to be a net zero emissions, climate-resilient city.

27 Sustainable Tourism

Belfast has joined the GDS (Global Destinations Sustainability) Movement, the world's leading benchmarking and performance improvement programme for tourism destinations.

A partnership between Visit Belfast, and Belfast City Council, the city will take part in the GDS Index for the first time in 2020 in order to inform and accelerate sustainable tourism development and bring a co-ordinated focus to the sustainable tourism agenda across the city region.

This is the beginning of Belfast's commitment to build back better; informing the city's vision for sustainable tourism and the future 10 year action plan for tourism in the city region. The end goal is for Belfast become a more regenerative, flourishing and sustainable place to visit, meet and thrive.

28 Training and skills for an inclusive low-carbon economy

Working with its education partners, Belfast City Council will explore the development of a major programme of training and skills for a generation of professionals to lead our transition to an inclusive low-carbon economy. Inspired by the Canadian Academy for Sustainable Innovation, we will aim to set a target to provide thousands of professionals with the skills, knowledge, and experience to manage our move to a sustainable future by 2050.

29 Innovation and Inclusive Growth Commission

The city's Innovation and Inclusive Growth Commission is a collaboration between Belfast City Council, Belfast Harbour, Ulster University and Queen's University. The Commission was established to develop an integrated, inclusive and long-term growth plan for the city. Its recommendations span a decade long-focus on how to build a job-led transition to an inclusive net zero emissions economy.

30 Fuel Poverty

As we transition to a low carbon economy, we are aiming to make the city more energy efficient and energy self-sufficient. We should therefore agree the eradication of fuel poverty as a city-wide ambition.

CASE STUDY: CONNECTED, NET ZERO-EMISSIONS ECONOMY

Melbourne: Melbourne Urban Forest: bringing a city together to enhance its natural assets

With a rapidly growing population anticipated to reach 8million by 2051, metropolitan Melbourne's urban footprint is both expanding outward and becoming denser shrinking the city's green space, intensifying the urban heat island and contributing to flooding and run off during storms.

Resilient Melbourne in partnership with The Nature Conservancy developed a comprehensive urban forestry strategy: Living Melbourne: Our Metropolitan Urban Forest which seeks to ameliorate the shocks and stresses associated with extreme heat, fire and flooding. With the help of private sector engagement to map canopy cover in the city, the Living Melbourne Strategy set a goal of increasing all sub-regional canopy cover levels by 20-30% by 2050. With this goal set, the Resilient Melbourne team along with Melbourne's 32 councils developed a cohesive roadmap for improving biodiversity and urban forest cover.

Implementation of the urban forest strategy, estimated to cost AUS$570M, is expected to bring economic benefits currently valued at AUS$4.95 billion per year, a figure expected to rise as the canopy cover increases.

Nature is an immensely valuable asset for driving urban resilience. Exposure to nature reduces stress and the incidence of mental illness while also strengthening community bonds by providing spaces to congregate and enjoy physical activities thus also addressing public health and social inequality.

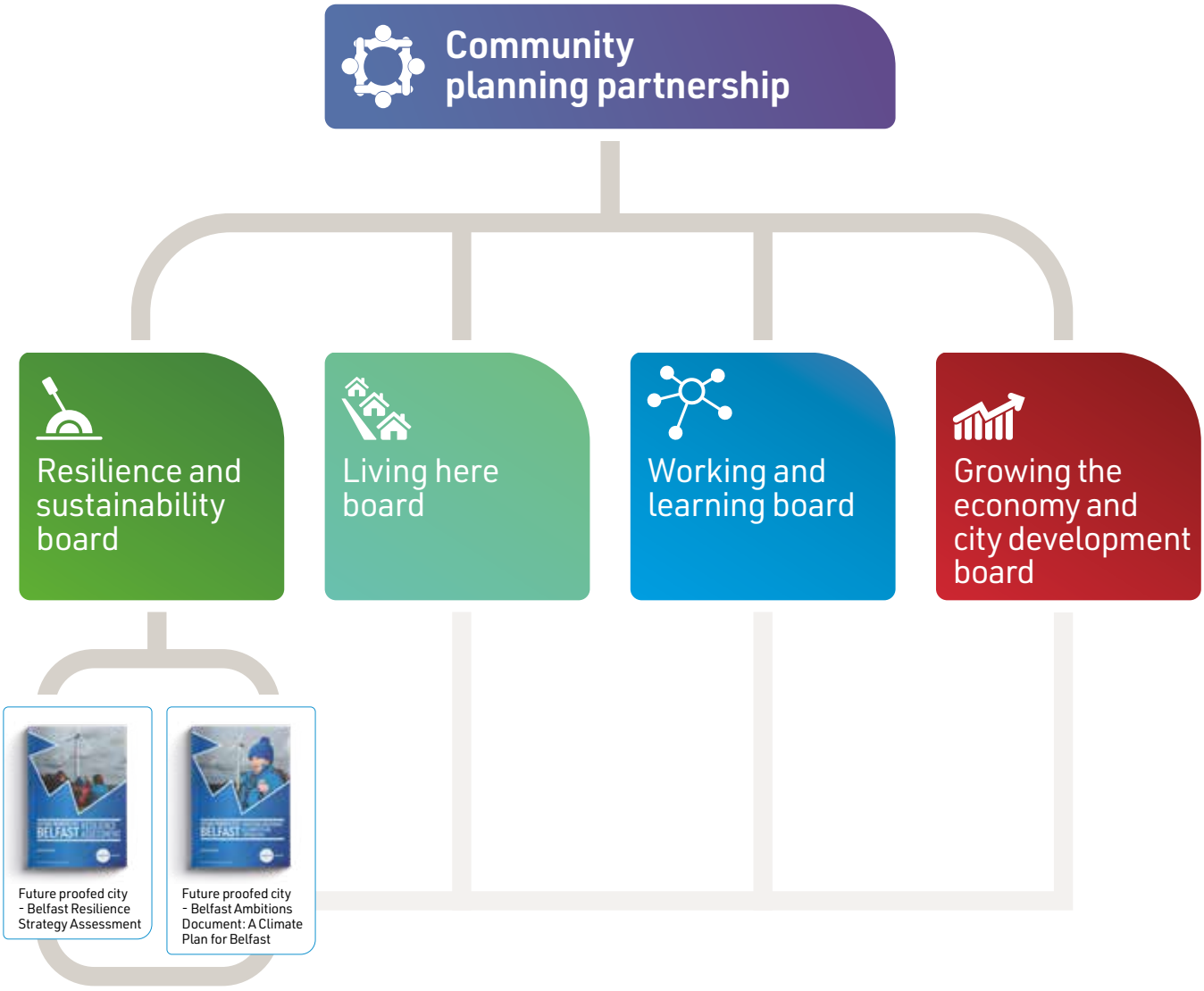
NEXT STEPS

NEXT STEPS

Delivery of our ambitions will be overseen by the Resilience and Sustainability Board, and other Community Planning Partnership Boards, and in doing so will develop relevant delivery and resource plans.

Individual city partners will take responsibility for delivery of key aspects of the strategy's ambitions.

To make contact with the team at Belfast City Council, email resilient@belfastcity.gov.uk



RESILIENCE AND SUSTAINABILITY BOARD MEMBERS

action mental health

Belfast City Council

Belfast Harbour

belfast met

Department for Infrastructure
An Roinn Bonneagair
www.infrastructure-ni.gov.uk

Department for the Economy
www.economy-ni.gov.uk

Department of Finance
An Roinn Airgeadais
www.finance-ni.gov.uk

EAST SIDE PARTNERSHIP
INSPIRING BELFAST

GREATER SHANKILL PARTNERSHIP

Housing Executive

HSC Health and Social Care

include YOUTH

Invest Northern Ireland

LINEN QUARTER BID

CIVIL CONTINGENCIES RESILIENCE

northern ireland water
Delivering what matters

nicva

Translink

Ulster University

Utility Regulator
ELECTRICITY GAS WATER

visitBelfast

WEST BELFAST PARTNERSHIP
PÁIRTÍOCHT

As part of our commitment to promoting equality of opportunity and good relations, we want to ensure that everyone is able to access the documents we produce. This document is available in different languages and formats and we can provide others on request, please contact: Richard McLernon, Project Coordinator, Commissioner for Resilience on 028 9050 2091.

BCC 1101

With thanks to

RESILIENT CITIES NETWORK

ARUP

URBAN SCALE INTERVENTIONS USI

Belfast City Council
City Hall
Donegall Square South
Belfast
BT1 5GS

www.belfastcity.gov.uk/resilientbelfast
resilient@belfastcity.gov.uk
028 9050 2091
@belfastcc
@belfastcitycouncil
Belfast City Council

Belfast City Council

FUTURE PROOFED CITY BELFAST RESILIENCE ASSESSMENT

December 2020

RESILIENT BELFAST

www.belfastcity.gov.uk/resilience

CITY FACTS: BELFAST

BELFAST POPULATION

343,542
2019 MID-YEAR ESTIMATE

33% AGED 25 OR UNDER

BELFAST ACCOUNTS FOR **18%** OF THE POPULATION AND ALMOST **30%** OF ALL JOBS IN NI

103 RESIDENTIAL UNITS COMPLETED IN CITY 2019/20

£575 FULLTIME MEDIAN GROSS WEEKLY PAY 2019

44% HOUSEHOLD WASTE RECYCLED AND COMPOSTED

11,500 STREET TREES

77.3% OF THE POPULATION LIVE WITHIN WALKING DISTANCE OF A PARK OR PLAY AREA

9.2°C AVERAGE ANNUAL TEMPERATURE

68% OF HOUSEHOLDS HAVE ACCESS TO ONE OR MORE CARS

BEFORE COVID-19...

53% OF ALL JOURNEYS TAKEN BY CAR

29% OF ALL JOURNEYS TAKEN BY FOOT

2% JOURNEYS PER PERSON BY BIKE

18.2% OF POPULATION AGED 16-64 HAVE NO QUALIFICATIONS

35.6% OF THE WORKING AGE POPULATION IS EDUCATED TO NVQ LEVEL 4 AND ABOVE

80% OF BUSINESSES ARE MICRO (0-9 EMPLOYEES)

21% OF THOSE CLAIMING UNEMPLOYMENT BENEFITS ARE AGED 18-24

DURING **COVID-19** **3,737 POSITIVE CASES PER 100,000 OF POPULATION** IN BELFAST AS OF 12 DECEMBER 2020 (HIGHEST IN NI)

270 DEATHS IN BELFAST

FUTURE PROOFED CITY
BELFAST
RESILIENCE ASSESSMENT

December 2020

RESILIENT BELFAST


Belfast is a flood prone city and sea levels are rising so the potential for flooding and extreme weather events is growing. Being a resilient city means planning and developing for these risks.

FOREWORD FROM THE COMMISSIONER FOR RESILIENCE

Finalising the first Resilience Strategy for Belfast, while the city endures the effects of a global pandemic, is a poignant reminder of why cities need to prepare for risk, no matter how unlikely they appear to be. COVID-19 has taught us many things about how cities respond to crises, of the value of community networks, and the importance of good connectivity.

Put simply, the pandemic has exposed our weaknesses. Our lives have changed immeasurably as a result of a global shock, but the impact will be felt differently nationally, and locally, and those impacts will be determined by the scale and nature of existing vulnerabilities. Put simply, the pandemic has exposed our weaknesses. We now face the challenge and opportunity to put resilience at the heart of our re-build.

The draft Resilience Strategy, published in January 2020, presented a series of potential shocks and stresses for the city of Belfast. It is not an exhaustive list. Each one by itself represents a risk to the city. However, it is the relationship between these risks, and the scenarios that may emerge if several occur at once, that presents the greatest challenge for Belfast. I made several conclusions about Belfast's exposure to risks. In particular, the potential impacts of climate change on the city. I highlighted the city's lack of preparedness and the lack of a coherent city-wide approach to climate change. I suggested the identification and development of 'multiple problem solvers' - levers which can respond to and resolve several risks at once.

The arrival of the pandemic resulted in an extension of the public consultation on the strategy. The passage of time has enabled us to start work on many of the priorities identified in the draft document. We have therefore, made excellent progress this year in developing a series of measures on climate adaptation, climate mitigation and levers to support a green economy. We have established two important city-wide structures to take this work forward; a Resilience and Sustainability Board to drive delivery of this strategy and the Belfast Climate Commission, to act as a think-tank and advisor for the city's climate action. I am extremely grateful to my co-Chairs and to the members of both boards for their commitment and dedication during such a difficult year. We have managed to accelerate our work in this area, and as a result our final Resilience Strategy looks markedly different from the draft- because so many programmes and priorities have commenced and begun to deliver outcomes for the people of Belfast.

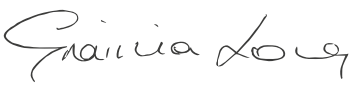
I am also very grateful to the Resilient Cities Network for their generous support to Belfast through this process; to our strategic partner ARUP for their advice throughout and to Urban Scale Interventions (USI) for coordinating our conversations at community level.

> "Belfast is emitting 1.5 million tonnes of carbon a year. At this rate, we will have used up our carbon by 2030."
>
> Belfast Mini Stern

This strategy has two distinct parts: (1) a Resilience Assessment, an analysis of the strategic risks to Belfast, taking account of the views of city-wide stakeholders and (2) an Ambitions Document, setting out the vision and priorities being delivered by the Resilience and Sustainability Board. I am delighted that we now have a strategy and a set of city partners now working with a singular focus on the transition to a net zero-emissions economy.

In a relatively short period of time, the city has moved from lack of preparedness for climate change to one of proactivity, partnership working and ambition. The challenges set out in the draft strategy have been embraced by city-partners. It is to their credit that Belfast is now better prepared for the future, and over time, its people will increasingly be better protected. This is the essence of resilience work.

This final strategy has been amended and improved based on the contribution of residents from across Belfast. Communities have demonstrated their interest in, and understanding of the importance of a long-term focus on risks, and have shown their commitment to projects and programmes that will future-proof their city. I have personally benefited from listening to people from across Belfast, and have no doubt that the ambitions in this document are much more likely to succeed because of them.



Grainia Long
Commissioner for Resilience
December 2020

FOREWORD FROM THE CHAIR OF STRATEGIC POLICY AND RESOURCES COMMITTEE

Welcome to Belfast's draft Resilience Strategy. For the first time, partner organisations across the city have worked together to identify the strategic risks that we face, today and into the future. Furthermore, we have collectively agreed an ambitious goal **to transition to an inclusive, zero- emissions economy in a generation.** Achieving this will require urgent action, and I am delighted that our city partners have committed to thirty programmes, to be delivered collaboratively to future proof our city, and make us climate resilient.

There has rarely been a more important time for Belfast to build its resilience. A major public health crisis, and a combination of economic pressures, climate related events, and social change are taking globally and impacting locally. To improve our readiness and ultimately ensure our recovery, we must have a sophisticated understanding of the risks we face.

The strategy has been informed by more than a thousand conversations, and many hours of data crunching- we are grateful to everyone who has contributed.

Only by working together across the city- communities, schools, nursing homes, businesses and agencies- can we really be ready to face complex challenges, from pandemics to economic shocks and climate change. I am grateful to members of the city's Resilience and Sustainability Board for the leadership they have shown in developing this strategy, and I look forward to seeing the positive effects arising from delivery.

Councillor Christina Black
Chair
Strategic Policy and
Resources Committee

Belfast City Council

CONTENTS

EXECUTIVE SUMMARY

- Urban resilience is the capacity of cities to survive, adapt, and develop no matter what kinds of chronic stresses and acute shocks they experience.
- The Belfast Agenda, the city's community plan, included a commitment to take a targetted approach to issues which pose the greatest risk to the city, its economy and its people.
- In doing so, Belfast has been an active member of the Resilient Cities Network, working globally to reduce vulnerabilities, and making cities better prepared for the future.
- This strategy delivers on the Belfast Agenda commitment. It includes an overview of the major risks facing the city. The 'Resilience Assessment' outlines the shocks and stresses that could make the city more vulnerable and could weaken our capacity to resist and to recover from future challenges.
- It is the intention of the Resilience and Sustainability Board that the Resilience Assessment be reviewed and refreshed every two years to ensure a proactive approach to the management of strategic risks.
- The second half of the document outlines our ambitions: one goal, three 'multiple problem solvers', and 30 programmes for delivery.
- A genuine collaboration between city partners and residents, this strategy will drive progress to deliver the city's goal to transition to an inclusive, zero-emissions, climate-resilient economy, in a generation. It commits Belfast to a step-change in this decade, reflecting the scale of climate breakdown and its implications for Belfast.

OUR GOAL

To transition to an inclusive, net zero-emissions, climate-resilient economy in a generation.

SHOCKS


Infrastructure capacity


Public health


Cyber resilience


Condition of existing housing stock


Flooding and extreme weather events


UK Exit

STRESSES


Economic recovery capacity


Climate change


Mental ill-health


Poverty and inequality


Housing supply in the city


Use of prescription drugs


Population change


Segregation and division


Governance and financing of risk


Carbon intensive systems

We have identified three 'multiple problem solvers' - where we tackle several shocks or stresses at once. A strategic focus on each of these areas will build the city's resilience, over time. They are:

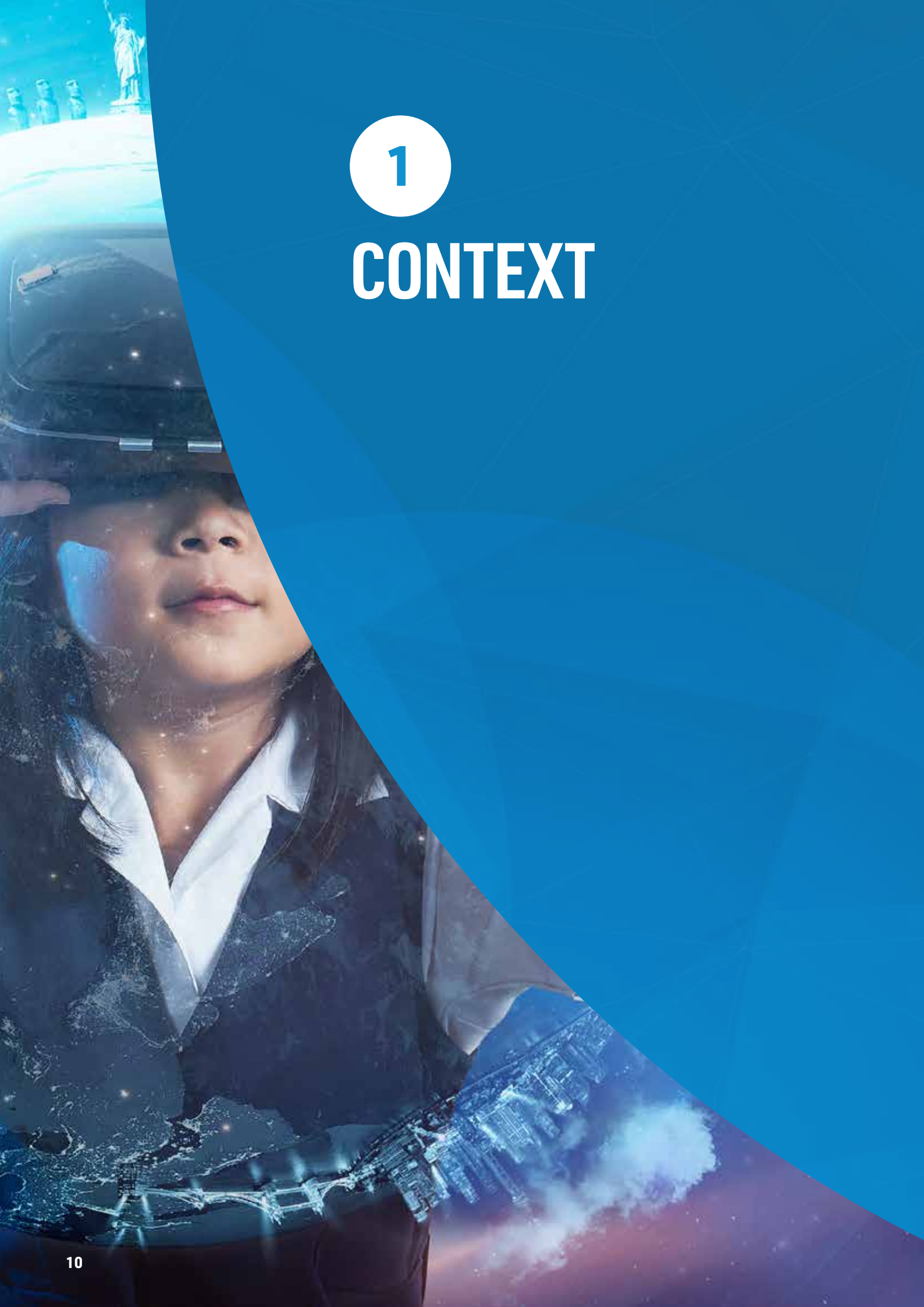
AREAS OF FOCUS


CLIMATE ADAPTATION AND MITIGATION


PARTICIPATION OF CHILDREN AND YOUNG PEOPLE


CONNECTED, NET ZERO-EMISSIONS ECONOMY

The strategy contains 30 transformational programmes, agreed by city partners, to prepare the city for this century. This includes an important focus on how we fund and manage risk.



1 CONTEXT

DELIVERING THE BELFAST AGENDA

The Belfast Agenda vision for 2035

"Belfast will be a city re-imagined and resurgent. A great place to live and work for everyone. Beautiful, well connected and culturally vibrant, it will be a sustainable city shared and loved by its citizens, free from the legacy of conflict. A compassionate city offering opportunities for everyone. A confident and successful city energising a dynamic and prosperous city region. A magnet for talent and business and admired around the world. A city people dream to visit."

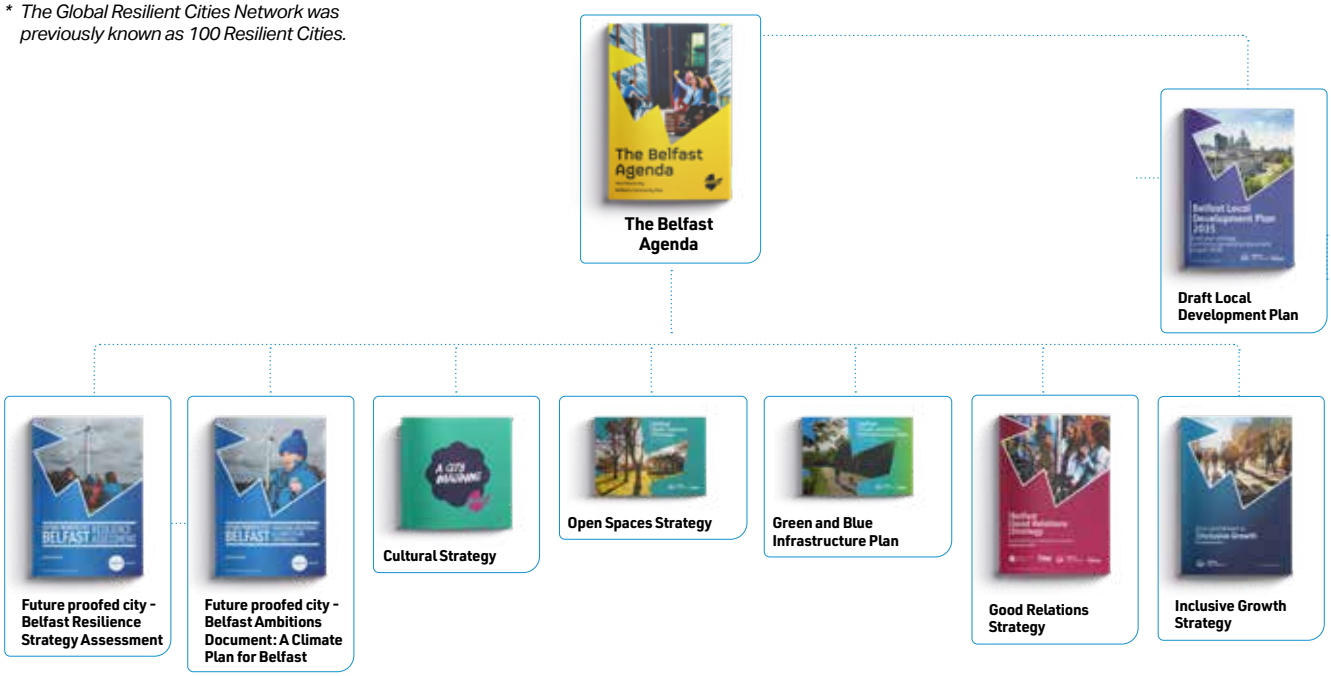
The Belfast Agenda commits the city to the appointment of a Commissioner for Resilience to work with partners to develop a strategy to take a targeted approach to addressing those issues which pose the greatest risk to the city, its economy and its people.

Since 2018, Belfast has been a member of 100 Resilient Cities, funded by the Rockefeller Foundation. GRCN* is

global network of cities, all focused on identifying and reducing urban threats - either immediate shocks or systemic vulnerabilities. It comprises Belfast's biggest global network to date. Since the establishment of the 'Resilient Belfast' team, Belfast is working alongside cities like Barcelona, Sydney, Cape Town and San Francisco to solve urban problems, and strengthen the fabric of the city. This work has culminated in the production of this Resilience Strategy, which includes a range of commitments to de-risk the city, making us more adaptable, prepared for the unpredictable and increasingly our capacity to thrive. This Strategy will help the city to mitigate risks to deliver the Belfast Agenda.

This Resilience Strategy is one of several documents that aim to deliver the Belfast Agenda and its core objective of inclusive growth.

* *The Global Resilient Cities Network was previously known as 100 Resilient Cities.*



1

WHAT IS URBAN RESILIENCE?

Urban resilience is the capacity of cities to survive, adapt, and develop no matter what kinds of chronic stresses and acute shocks they experience.

Being a resilient city does not mean the city is without risk - urban resilience refers to cities that are exceptional at predicting, managing and responding to risk. Resilient cities are highly adaptive.

Working alongside one hundred cities globally, Belfast has been learning the benefits of a focus on preparing for immediate and longer term risks.

> "Belfast's capacity to withstand and embrace disruption and change in the coming decades is critical to its economic, social and environmental future."

Our vision in the Belfast Agenda could be undermined, if we do not learn to adapt to and cope with shocks, such as floods or cyber attacks. COVID-19 has highlighted the city's existing vulnerabilities, and the impact of the pandemic puts the achievement of our Belfast Agenda priorities at risk, unless we take coordinated action, as a city. Furthermore, some stresses such as climate change can be 'risk multipliers', exacerbating existing weaknesses.

Belfast's economic resilience is a good case in point. The capacity of a city to respond to economic shocks is a strong indicator of its resilience.

> "Building Belfast's economic resilience - its ability to adapt to and cope with economic shocks - is essential."

> Resilience thinking is not a luxury but a necessity for cities. It is about putting in place holistic and integrated measures to enable cities to adapt, survive, and thrive regardless of the stresses or shocks they face.
>
> Singapore Resilience Strategy

Belfast's capacity to respond to the recession of 2008-10 has been weak - demonstrated by its low levels of productivity since 2007 and when compared with other cities, it has shown weak levels of 'good growth' since the financial crash.

Furthermore, the impact of economic growth has traditionally been unevenly spread throughout the city, prompting a city-wide focus on 'inclusive growth' in the Belfast Agenda. Building Belfast's economic resilience - its ability to adapt to and cope with economic shocks - is essential.

This may mean building new forms of capacity to take on different types of pressures, to withstand them and recover from them.

Whether impacted by an adverse weather event or an economic recession, the following systems all determine how a city bounces back. However, evidence would suggest that the number and diversity of local community and voluntary groups in the city, and their inter-connectedness, has been a highly valuable social asset in the initial response to COVID-19 and has arguably strengthened the city's capacity to cope with the effects of the pandemic. This resilience strategy emphasises the city's assets as well as its vulnerabilities, and evidence in relation to both has informed the document throughout.

The seven qualities of a resilient city

Reflective
Using past experiences to inform future decisions

Resourceful
Recognising alternative ways to use resources

Inclusive
Prioritise broad consultation to create a sense of shared ownership in decision making

Integrated
Bring together a range of distinct systems and institutions

Robust
Well-conceived, constructed and managed systems

Redundant
Spare capacity purposefully created to accommodate disruption

Flexible
Willingness, ability to adopt alternative strategies in response to changing circumstances

CHARACTERISTICS OF A RESILIENT BELFAST

- We will be **risk aware** - with a strong understanding of exposures that (1) make us vulnerable (2) could knock us off course
- We will ensure there is **capacity 'in the system'** to respond to shocks
- We will **de-risk investment** by improving our management of risks at a city level
- We will have **collective agreement at a policy level** on the 'top risks' and coherence around a plan!
- We will **integrate networks** so we are better able to withstand shocks
- We will include resilience indicators in how we **measure the performance of our city**
- We will demonstrate **strong resistance to shock** - often through resilient infrastructure - i.e. integrated into all capital projects
- We will **demonstrate improved learning** from shocks
- We will develop **multiple problem solvers** - approaches that solve several problems at once

1

RESILIENCE CHALLENGES IN THIS DECADE

2017/18

Major storms

Ex-Hurricane Ophelia in 2017, Storms Ali and Calum in 2018

There were a range of storms bringing high winds in 2017 and 2018 and causing electricity outages and damage to infrastructure. Schools, businesses and public services were affected.

2020

COVID-19

The global pandemic struck the people of Belfast in the Spring of 2020. As of 14 November 2020, 223 people had lost their lives due to COVID-19.

2018

Fire at Bank Buildings

On 28 August a fire destroyed Bank Buildings, a listed building in the heart of Belfast city centre and its retail district. 14 businesses within the cordon were unable to reopen for over four months. Pedestrian and vehicle access across the city centre was affected causing a significant drop in footfall in the area.

2014
Coastal flooding

The threat of tidal inundation to Belfast city centre and over 4000 homes across the city led to the deployment of 45,000 sandbags and the pre-planned closure of basements and businesses in the Harbour area. Millions of pounds of damage was caused to infrastructure around the coastline of NI.

2012
Flooding

Flooding occurs on an annual basis affecting properties and infrastructure. There was significant flooding in 2012, 2009, 2008 and 2005 with thousands of homes being internally flooded.

2012/13
Flag protests and civil unrest

Following a vote to change the number of days the Union Flag is flown at Belfast City Hall, there followed a period of almost daily protests. There were resulting impacts for the performance of the local economy.

2010/11
The big freeze

Five weeks of extremely low temperatures led to widespread impacts on infrastructure including homes, schools and businesses. Frozen pipes cracked during the thaw causing so many leaks that mains water supplies were significantly depleted. 40,000 premises lost water supplies and over 60,000 premises became subject to rotational supplies.

1

METHODOLOGY

A well-established methodology - adopted by 100 cities globally - was used to develop this strategy, and build the city's resilience capacity.

The City Resilience Framework (CRF) was developed by our strategic partner ARUP and helps identify the complex and interdependent issues that contribute to a resilient city. The CRF is used by all partners in the 100RC network and facilitates cooperation between cities. Our relationship with ARUP has led to the development of a city risk and asset audit, a climate change risk assessment and a study that will help us to develop our strategy for child friendly neighbourhoods.

A number of steps in working towards our goals and vision were put in place. Each step carefully considered and carried out as we:

Mapped our city's vulnerability and risk against potential actions.

↓

Engaged with partners citywide in Belfast to gather evidence and formulate possible solutions.

↓

Commissioned a city risk and asset audit by ARUP to quantify and identify shocks and stresses.

↓

Assessed and analysed multiple data sources to inform decisions, test assumptions and steer our initial conclusions. This also involved commissioning our own studies.

↓

Informed our thinking by requesting from ARUP a Climate Change Risk Assessment and a study on developing our strategy for child friendly neighbourhoods.

↓

Engaged across our city for over three months on our strategic areas of focus to engage and attract feedback.

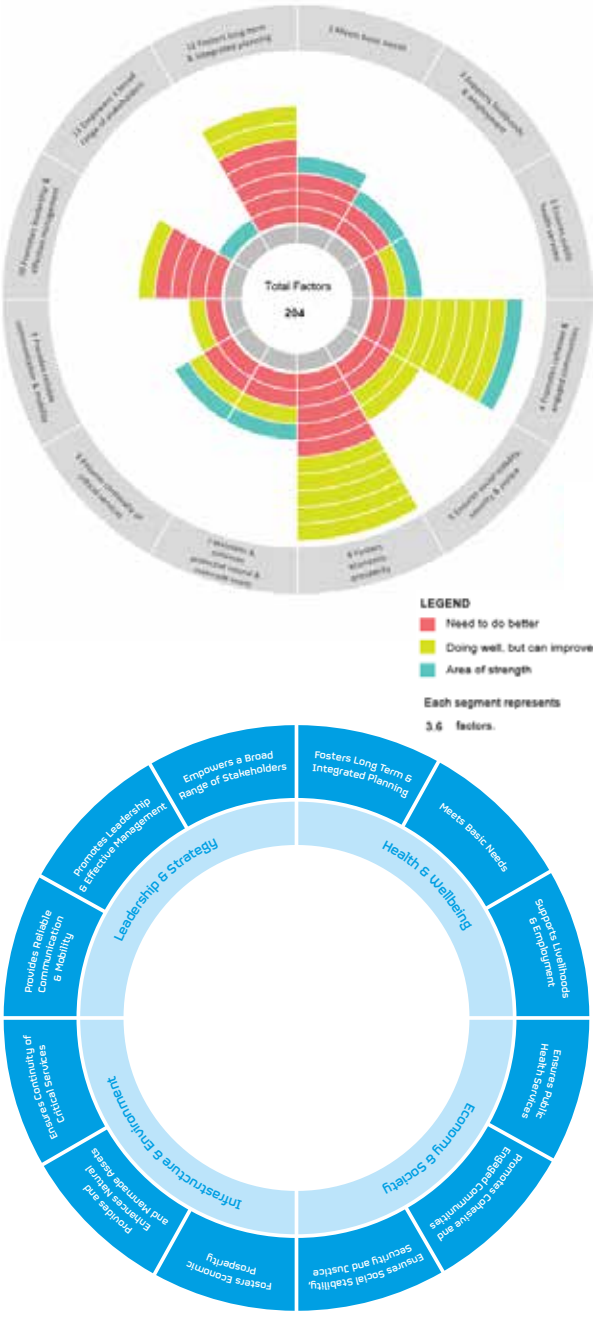
↓

Working in partnership with Urban Scale interventions we engaged with more than 1,000 people across the city. This included public area based events, focused workshops, on street engagement through the tea kiosks in the city centre and online thematic workshops with youth and older people. The online public consultation also created 62 responses and we received 12 written submissions.

With these seven steps, we have embarked on the next stage of the journey towards a resilient Belfast.

STEP 1

City Resilience Framework identified areas of city resilience



*Enlarged version available on pg86

STEP 2

Citywide engagement

- 18 workshops involving 547 people
- 35 focus groups involving 480 people
- 140 people interviewed on a one-to-one basis

STEP 3

Review of city assets and risks

- City assets
- Perceptions
- City risks
- Strengths

STEP 4

Data analysis

- **Spaces to play for children**
- **Population change**
- **Economic** Vulnerabilities, cyber, exclusion, inequalities, automation of industry, business start-ups
- **Poverty** Children and young people
- **Connectivity** Economic corridor, digital, physical
- **Transport** Cheaper, cleaner, integrated, greener
- **Housing**
- **Climate change** Extreme weather and air quality
- **Segregation** Housing, education system, division
- **Civic pride** One city,city story
- **Cyber threat**
- **Health** Dependence on prescription drugs, mental health, nutrition, obesity
- **Risk of returning to violence**
- **Prevalence of cars**
- **Infrastructure** Investment and capacity
- **City centre** Retail, housing, dereliction
- **UK Exit** Impact on Belfast
- **Financing the city** City revenue
- **Politics** Leadership, decision making structures
- **Fossil fuel dependency**

STEP 5

Agreed our resilience goal

Transition Belfast to an inclusive, net zero-emissions, climate resilient economy in a generation.

STEP 6

Identified multiple problem solvers

These shocks and stresses make the city more vulnerable and could weaken our capacity to resist and recover from future challenges.

- Climate adaptation and mitigation'
- Participation of children and young people
- Connected, net zero-emissions economy

STEP 7

Citywide consultation on a draft strategy

Direct engagement with 1,223 people through our consultation partnership with Urban Scale Interventions and receipt of more than 80 written responses.

1

CASE STUDY IN URBAN RESILIENCE

Fire at Bank Buildings, August 2018

Belfast experienced an acute shock in 2018 when a culturally historic building, known as Bank Buildings which housed Primark, a global retail chain, was severely damaged by a fire that started on 28 August 2018 and continued to burn for three days. Located right in the heart of the city centre on a major junction, the fire tested multiple aspects of the city's resilience.

One hundred firefighters successfully prevented the fire from spreading to nearby businesses, shops and restaurants, and no one was killed or injured. However, a significant proportion of the building's internal structure was burnt away, either collapsed or was severely damaged with the external facades subject to further damage. In the immediate weeks following the fire, the building's physical fabric remained very vulnerable and posed a threat to public health and safety.

On engineering advice, a safety cordon was established to protect the public. While the cordon closed 22 business in close proximity, the impact was felt much further across the city centre. The cordon effectively created four cul-de-sacs in the heart of the central retail district in which footfall significantly reduced. Anecdotal evidence from local traders reported decreases in sales levels between 20% and 70% amongst the hardest hit areas. There was considerable concern that the continuation of the situation would lead to fundamental long-term changes in consumer habits within the city centre.

Pedestrians, buses and vehicles had to be rerouted in response to the cordon. This significantly added to the impact on footfall, and to pressures already being felt by the retail sector during a challenging year. The cordon acted as a barrier and restricted pedestrian and vehicular access through Castle Place junction, and as a result pedestrians were required to undertake significant diversions using alternative, longer routes to navigate the city centre. In addition, buses were unable to penetrate into the centre of the city and were subject to significant delays and revised timetabling.

The building was a Category B1 Listed Building located within the city centre conservation area. Immense in size, it was within metres of other buildings close by. Major challenges existed for the owner to assess the damage to the building and make decisions regarding the building's future. In late October, Primark successfully applied to Belfast City Council for listed building consent to take down, record and assess for restoration purposes the uppermost parts of the building. By the following April, a series of ballast-filled shipping containers had been erected around the building to enable the commencement of a long-term restoration project.

For Belfast City Council, the immediate primary concern from the beginning was the safety of people in the city, and to reduce as much as possible the impact on businesses and trade. It established a City Recovery Group made up of partners across the city to coordinate the city's recovery efforts. It held clinics with businesses directly affected, and held ongoing conversations with businesses through the Business Improvement Districts (BIDs) in the city. A #YourBelfast media campaign in the immediate weeks following the fire aimed to remind people that Belfast was open for business.

A 'Rewards App' was developed to encourage people to spend in the local area and a 'yellow dot' trail guided pedestrians around the cordon to sustain footfall in the city. A major revitalization programme was undertaken to 'light up' the city at Christmas via a series of installations to encourage people to spend time in the city. A combination of cultural events and playful installations, dressing up city streets impacted by pedestrianisation worked in combination to give the city centre an energized feel in the busy retail period.

In the New Year, the ongoing pedestrianisation of the area was taken as an opportunity to provide a pop-up play park for children, with seating areas, planters and art to help make the area attractive.

Conclusion

A fire in a building of its size and central proximity amounted to a major shock for the city. It posed significant challenges to the city's resilience. It tested the city's economic resilience and emphasised the importance of strong and supportive citywide networks. It prompted a debate on the role of heritage in the city. Poignantly, the sight of a burnt-out building in the city centre reminded many people of a time when Belfast experienced regular security alerts and fires. It highlighted the city's exposure to retail risks, and reminded decision makers in the city of the importance of an 'experience economy' and how critical it is that we build a vibrant city centre where people work, live and play. Perhaps most tellingly of all, the sight of children playing in a pop-up park next to the Bank Buildings appeared to inspire the public of the importance of play in the city. The park's removal, following the reduction of the cordon has prompted important debate about the importance of play in our city.

2

SHOCKS AND STRESSES FOR BELFAST: 2020

This strategy does not attempt to comprise a final comprehensive list of all the risks that Belfast faces. Like other global cities, it represents the starting point to build our resilience and will be updated to reflect new challenges and opportunities.

What is a shock?

A shock is a sudden, sharp event that can immediately disrupt a city.

What is a stress?

A stress is a slowly moving phenomenon that weakens the fabric of a city.

SHOCKS

STRESSES

2

INFRASTRUCTURE CAPACITY

The issue of the city's infrastructure emerged as a major theme in the workshops, focus groups and data analysis undertaken to develop this strategy. Existing infrastructure has been adversely impacted by a period of underinvestment, which is having a negative impact on the city's economic and climate resilience.

In October 2020, an independent Ministerial Advisory Panel on Infrastructure produced a report which summarised the views of over 100 individuals and organisations on current infrastructure planning and delivery in Northern Ireland. The conclusions strongly mirror those expressed in the development of this document:

- Strategic infrastructure projects frequently suffer time delay and cost overruns.
- Over-reliance on the Barnett funding allocation to fund our public infrastructure is stifling growth and innovation.
- Crucial parts of our infrastructure are at a critical point and there is clear evidence that this is having a negative impact on other major investment decisions.
- We struggle to see beyond our political and financial timeframes which, by their nature, are too short term for effective infrastructure planning.
- Our neighbours on these islands have ambitious infrastructure plans for the next 20-30 years.
- Lack of longer-term planning and appropriate market management often results in legal challenges which cause major delays.
- The population of NI is projected to increase by 8% by 2041, with the 65+ age brackets increasing to 25% of the population. There is little evidence that we are planning sufficiently for this demographic change. (Northern Ireland Statistics and Research Agency, NISRA).
- The current system operates in silos with limited co-operation between central and local government, and with the private sector.
- There is a general failure to identify potential synergies to collaborate or secure economies of scale by working more closely together within NI, or with other bodies outside NI facing up to these very same challenges.
- We are lagging behind in terms of our environmental performance, and urgently need a step change to address climate change and meet our ambitions in respect of the wider UK 2050 net zero targets.
- There is a regional imbalance and urban-rural divide in terms of infrastructure provision. This needs to be addressed to ensure inclusive growth and to improve the quality of life and wellbeing for everyone in NI .
- External factors such as COVID-19, Climate Change and Brexit are dramatically impacting the economic landscape of NI (and will continue to do so for years to come); we must ensure we are nimble, able to capitalise on the growth opportunities that will arise

To inform the development of this strategy, our strategic partner ARUP undertook a high level assessment of the city's assets.

The study identified key areas for intervention to improve infrastructure provision within the local authority area, and these findings were borne out in our consultation and engagement sessions with stakeholders:

- The importance of enhanced connectivity across the River Lagan through a series of bridges.
- The need for extended public transport network, particularly through BRT Phase 2 and improved walking and cycling networks.
- Significant pressure on drainage and wastewater infrastructure' in the city and implications for the city's economy.
- Targeted enhanced digital connectivity, particularly in locations of target growth sector investments.

Separately, Belfast City Council commissioned the Belfast Infrastructure Study to identify the range of infrastructure challenges in the city. The outcome of the study will continue to inform this strategy, both in terms of future versions and implementation.

This strategy has also been informed by a number of relevant reports from the National Infrastructure Commission which advises the UK government; and reports from the UK Committee on Climate Change, on the risks associated with a range of climate scenarios for NI infrastructure.

It should also be noted that the 'New Decade New Approach' document recognises several infrastructure classes requiring intervention, and commits to prioritised investment. The Ministerial Advisory Panel on Infrastructure recommended to the Minister the establishment of an independent Infrastructure Commission for Northern Ireland. Properly established and resourced, such a Commission would resolve many of the issues associated with infrastructure planning and delivery in the city, and across the region.


H & W
GLIDER
3225

2

Drainage Infrastructure Capacity

A fit for purpose wastewater and drainage system is a critical asset to any city. It mitigates the effects of flooding, enables climate resilience and contributes to public health and the economy.

Connection to drainage and wastewater infrastructure is a condition of planning consent for development and therefore underpins sustainable economic development in every city. Furthermore, the capacity of a city's drainage system has a direct impact on prevalence of flooding. Put simply, a fit-for-purpose drainage and wastewater system with sustainable levels of investment is critical for a city's economic, social and climate resilience.

Significant investment has been necessary for several years to improve the drainage and wastewater assets that serve Belfast. In 2015, the Living with Water Programme Board was initiated to develop a Strategic Drainage Infrastructure Plan for Belfast. This aims to provide integrated sustainable solutions which will alleviate the risk of flooding, enhance the living environment and sustain economic growth. The board, which operates as a collaboration between organisations, has been working to set out:

- The scale of flood risk to Belfast.
- The deterioration of Belfast Lough's water quality due to pollution from diffused sources, including agriculture, and from sewerage system overflows and wastewater treatment works discharges.
- The scale of investment needed.
- The potential wider benefits of the proposed approach to investment planning.

Belfast's wastewater treatment system faces a number of significant issues, which could impact on the city's resilience - in particular its ability to adapt to, and mitigate climate change. Capacity risks can also impact on economic resilience, given the relationship between infrastructure and the health of the economy.

Northern Ireland Water publishes information on wastewater systems which are operating at or near capacity. Its August 2019 online report stated that Belfast wastewater treatment works is predicted to reach capacity in 2021. Furthermore, it reported that 'In addition to the wastewater treatment works, wastewater network capacity issues are emerging due to sewer network modelling activities being undertaken at Belfast (Glenmachan sub catchment), Kinnegar (Sydenham sub catchment), Newtownbreda, Whitehouse, Dunmurry. As a result of this, new connections are being declined in parts of the catchment.' The issue was further emphasised by the Chair of Northern Ireland Water in the company's 2018/19 Annual Report which referred to the potential adverse impact of underfunding for economic development across NI.

The 'New Decade, New Approach' document also recognises that wastewater infrastructure is at or nearing capacity in many places in NI.

The capacity issues identified above represent a substantial risk to the city's resilience. Out of sewer flooding, inadequate capacity of the existing system and treatment works with inadequate storm storage capacity all present challenges to the operation of the city and could inhibit the scale and nature of future development, at a time when housebuilding at scale is required. These risks are heightened over time as the system continues to deteriorate and as our climate changes.

On 11 November 2020, 'Living With Water in Belfast' was published for consultation, a 12 year, £1.4 billion investment plan for drainage and wastewater management in Greater Belfast. Implementation of the plan in the coming years would significantly alleviate a key resilience challenge for the city.

How a resilient city values water

Belfast currently has ready access to a plentiful supply of drinking water. However, all cities building their climate resilience should be aware of the potential for water shortages. The Climate Change Risk Assessment for Northern Ireland has identified the potential risks to humans and to agriculture and wildlife from drought. These factors, combined with the lack of capacity in our wastewater treatment system, suggests a strong case for a city-wide focus on valuing our water supply and on water conservation.

Sustainable Drainage Systems (SuDS)

Infrastructure integrated into urban places which provide a drainage function, are widely recognised as playing a crucial role in ensuring water resilience at a city-level. The Belfast Green and Blue Infrastructure Strategy is a helpful document in setting out guidance for city partners to drive a proactive approach to SuDS. At the time of writing, the Department for Infrastructure is finalising a substantial set of proposals for sustainable drainage across the city. Investment in sustainable drainage of this kind, over this decade, is essential to meeting the city's climate ambitions and boosting its resilience.

Conclusion

Belfast is one of hundreds of cities globally that face the competing challenges of driving sustainable economic development and population growth, delivering city centre densification while preparing for a changing climate and rapid decarbonisation. The UK National Infrastructure Commission has rightly recognised these significant challenges, as have global institutions such as the World Bank and the World Economic Forum. Infrastructure is increasingly understood as a key growth driver in cities. This can sometimes result in perceived tensions between infrastructure planning and economic growth strategy. It should not be the case. Competitive, resilient cities have shown that sustainable and inclusive economic growth is possible when infrastructure planning enables growth. Lack of infrastructure capacity should not hinder or dictate economic strategy - to do so would expose a city to a range of risks, and ultimately weaken its resilience. On this basis, investment in Belfast's infrastructure capacity will be a major determinant of the city's resilience, and its capacity to transition to a low carbon economy. This will require reconsideration of how infrastructure is funded in the future. It is almost certain to necessitate new funding models to better plan for growth capacity and climate resilience in the coming years.

2

CONDITION OF EXISTING HOUSING STOCK

Conditions in existing NIHE social housing

The Northern Ireland Housing Executive (NIHE) is the strategic housing authority for NI and its housing stock in Belfast numbers almost 26,000 units. Investment in, and maintenance of existing stock is a core priority for any landlord, however it has wider impacts for the city. A well maintained social housing stock ensures the long-term health and wellbeing of its population. It enhances social capital and if well planned, can have a significant positive impact on reduction of carbon emissions in a city.

> "Well maintained social housing stock ensures the long-term health and wellbeing of its population."

Northern Ireland Housing Executive stock in Belfast has traditionally benefited from significant ongoing investment, and therefore until relatively recently has been able to maintain its stock condition. However, a number of studies have recently shown that the condition of NIHE stock has deteriorated, arguably to a point where it represents a risk to the wider city.

In 2014, the then Department for Social Development and the NIHE jointly commissioned Savills to undertake an Asset Commission to understand the scale and nature of investment required in the NIHE stock. Savills carried out a comprehensive exercise to assess the current and future repairs and maintenance liabilities of NIHE's properties and related assets. Savills found:

- The stock has deteriorated during the last 5 years… projections of costs moving forward have therefore increased and will continue to do so without sufficient investment.
- Just under 44% of the stock (37,974 units) is in asset groups with an average net present value ("NPV") per unit which is negative [i.e. the rental income collected from these properties is not sufficient to maintain the properties and service residents over the next 30 years]'.
- The total cost at today's prices [of the investment required in the NIHE stock] is £6.7bn.
- There is significant investment [circa £1.5bn] required during the next 5 years. In addition to the financial challenge this presents, there is also a significant practical challenge in terms of the capacity of the market to deliver such a large programme…a 3 year lead in time is likely to be required before the levels of investment identified can be delivered on the ground and current investment programmes are concluded'. This "delay" will result in an increase in liability [from £1.5bn] in the 5 years that follow…'.

Worryingly, the 2014 report predicted that 'The situation has worsened since 2009, and is likely to worsen again in the next five years in the absence of increased investment (made at the right time in the right place) combined with the application of modern asset management principles.'

Six years on, it appears that these warnings were prescient - the step change required to improve stock conditions has not occurred, so much so that the NIHE has publicly acknowledged that it may have to de-invest in homes. This would amount to a significant and adverse challenge to the city of Belfast, which requires a continual and ongoing supply of good quality social housing to meet its social and economic needs. Furthermore, the current condition of NIHE properties could make decarbonisation a much more significant challenge for the city.

A recent statement by the Minister for Communities acknowledged the scale of investment needed, and that two years have passed since the previous analysis of the scale of the investment challenge.

In her words, 'the current situation is most certainly worse and the scale of the investment even greater. New investment requirements have materialised since 2018: the consequence of the Grenfell Tower disaster and the ambition to reach a position of carbon neutralisation in our homes by 2050.' In response, the Minister has announced her intention to change the status of the NIHE to enable it to borrow to fund investment, and with proposals to come forward in 2021/22.

Housing conditions and health outcomes

Housing conditions have a profound impact on health outcomes. Belfast's aging population, the condition of its housing stock- across all tenures, and projected patterns of extreme weather (warmer summers and colder, wetter winters) present key health challenges across the city. Older people and those with chronic health conditions are more at risk from cold weather and tend to live in greater fuel poverty. A sustained, collaborative and targeted approach is necessary.

The Health and Social Care Board is leading the Belfast Warm and Well Initiative, bringing together partners to take an evidence based approach to prevention, risk identification, data sharing, service coordination training. However, a strategic approach to improving energy efficiency and housing conditions, e.g. ensuring high standards of ventilation and insulation across all tenures in the city is also necessary in this decade, to avoid exacerbating existing health conditions and prevent avoidable deaths each year.

Housing conditions in the private sector

Poor housing conditions, and in particular energy inefficient housing, exist across all tenures and can fundamentally impact health and wellbeing of residents, as well as wider society goals. Importantly, the UK Climate Change Committee has referred to UK homes as 'not fit for the future' given their levels of energy inefficiency. Health research has proven the negative impact that poor housing conditions can have on health- particularly for those with underlying conditions. Belfast's housing stock - particularly in the private rented sector- requires retrofit and modernisation to eradicate fuel poverty and meet the city's climate ambitions. Future legislative change is required to set a target on energy efficiency of our buildings, and implementation 'Belfast's Net Zero Carbon Roadmap' will be a critical driver towards these ambitions. The Northern Ireland Executive's future economic strategy – which will require a jobs-led approach to growth will be a critical lever. Belfast's Innovation and Inclusive Growth Commission has produced a 'thinkpiece' recommending investment, at scale, in community based retrofit programmes, to improve the energy efficiency of homes, reduce fuel poverty and sustain local employment. This strategy has continually stressed the integration of climate and economic strategy to meet the city's Belfast Agenda priorities- retrofitting of homes is an excellent opportunity to achieve several outcomes at once.

Conclusion

The Northern Ireland Housing Executive has commented publicly on the risks associated with its investment requirements- and the need for £3bn of investment across its entire stock in the next five years. The consequences of not meeting these requirements could include de-investment in homes. The implications of de-investment in social housing at a time of existing housing stress, income deprivation and climate related challenges represent a significant and urgent risk to the city.

2

PUBLIC HEALTH

Belfast's experience of the COVID-19 pandemic, which first affected the city's residents during the public consultation on the strategy, has given a unique insight into the city's systemic vulnerabilities. While pandemics were not previously identified as a likely shock to the city, community planning partners had noted global research (World Economic Forum, 2019) which found that environmental degradation across the world makes viral pandemics more likely in future.

At the time of writing, there remains a substantial public health risk, and therefore we are far from understanding the long-term social, economic and environmental impacts of COVID-19 for Belfast.

Nevertheless, the pandemic has reminded cities such as Belfast of two important principles; firstly, that good health is a central element of a city's resilience to shocks and stresses of all kinds, and secondly, that cities must take a number of steps to be resilient to public health crises. We have taken account of both of these lessons, and improved the strategy on this basis.

Evidence from Belfast suggests a number of key characteristics that are important to note, when considering the health of the population, and its resilience to shocks and stresses:

Health inequalities remain a significant concern

The Department of Health's 'Health Inequalities Annual Report 2020' highlighted that Belfast's health outcomes were worse than the NI average in 32 out of 41 outcomes measured; most notably in relation to male life expectancy, drug related mortality and alcohol specific mortality.

- Male life expectancy in Belfast's most deprived areas is 71.7 years; 4.6 years less than the Belfast average (76.3 years). Female life expectancy is 3.6 years less than the average (81.1 years).
- Inequality gaps for suicide remain persistently high with the rate in the most deprived areas of Belfast around two-thirds higher than the Belfast average.
- However, the 2020 report identified a narrowing of inequality gaps in 15 of the 40 outcomes assessed.

Demographic change must be a key feature of health planning for the city

- Belfast was the first Age Friendly City in Northern Ireland and has a reputation as a leader in healthy ageing beyond the UK. This strongly contributes to the resilience of the city. Active Ageing with employment for older groups and opportunities for physical activity and reduced social isolation supported by inclusive transport infrastructure, walkability, green areas will help make an ageing population a positive asset for the city rather than a challenge to its resources. The number of people with dementia will also increase significantly and the work being led by community organisations to develop Dementia Friendly Neighbourhoods will contribute significantly to its resilience by ensuring that those with dementia and their carers have ready access to all the social assets within their communities who understand their needs.
- As set out in the section on 'population change', Belfast's population is ageing. The number aged over 65 will increase by one third with over 20,000 more people in this age group by 2041 (NISRA). People aged 45 now will be over 65 in 2041 requiring a focus on their health as well as those who are older now.

The relationship between housing, transport and infrastructure policy and health outcomes is critical to the city's resilience

- The resilience of the city, as demonstrated during the pandemic, depends on having resilient local neighbourhoods where leadership has been evident. Evidence is also emerging globally of the importance of integration of housing, transport and infrastructure services to build greater resilience into the design of resilient neighbourhoods. Such neighbourhoods should be well-connected with walkable or cycle-friendly routes throughout, with a mix of inter-generational, cross-tenure housing, with a layout offering shared space to create a sense of safety and belonging as well as good relations and social inclusiveness. Lessons should be learned from cities such as Melbourne with its '15 minute neighbourhoods' and Paris and its 15 minute city.
- The Strategy recognises mental health as a systemic stressor in the city which can be amplified if crises are not well-managed. The pandemic is likely to see a sharp rise in mild to moderate conditions arising from social isolation and loneliness as well as economic recession. Isolation and loneliness is recognised as a significant public health issue, affecting as many as 1 in 10 adults. The creation of socially inclusive neighbourhoods through support for social assets and creative physical planning, building on the upsurge of interest in volunteering in response to the pandemic could reduce demand for more specialist services.

Conclusion

Belfast's future resilience to shocks and stresses will depend on the underlying health of its people. This therefore requires a singular focus on ensuring the population is as active and healthy as possible. Opportunities should be proactively considered, through the Community Planning Partnership structures to ensure that housing, health and infrastructure delivery can contribute to, and demonstrate positive health outcomes at a local level.

"The strategy will put the city in a much better position to meet critical threats to the health of our citizens and protect the most vulnerable."

Iain Deboys,
Assistant Director for Contracting and ECRs
and Commissioning Lead, Health and Social Care Board, Belfast

2

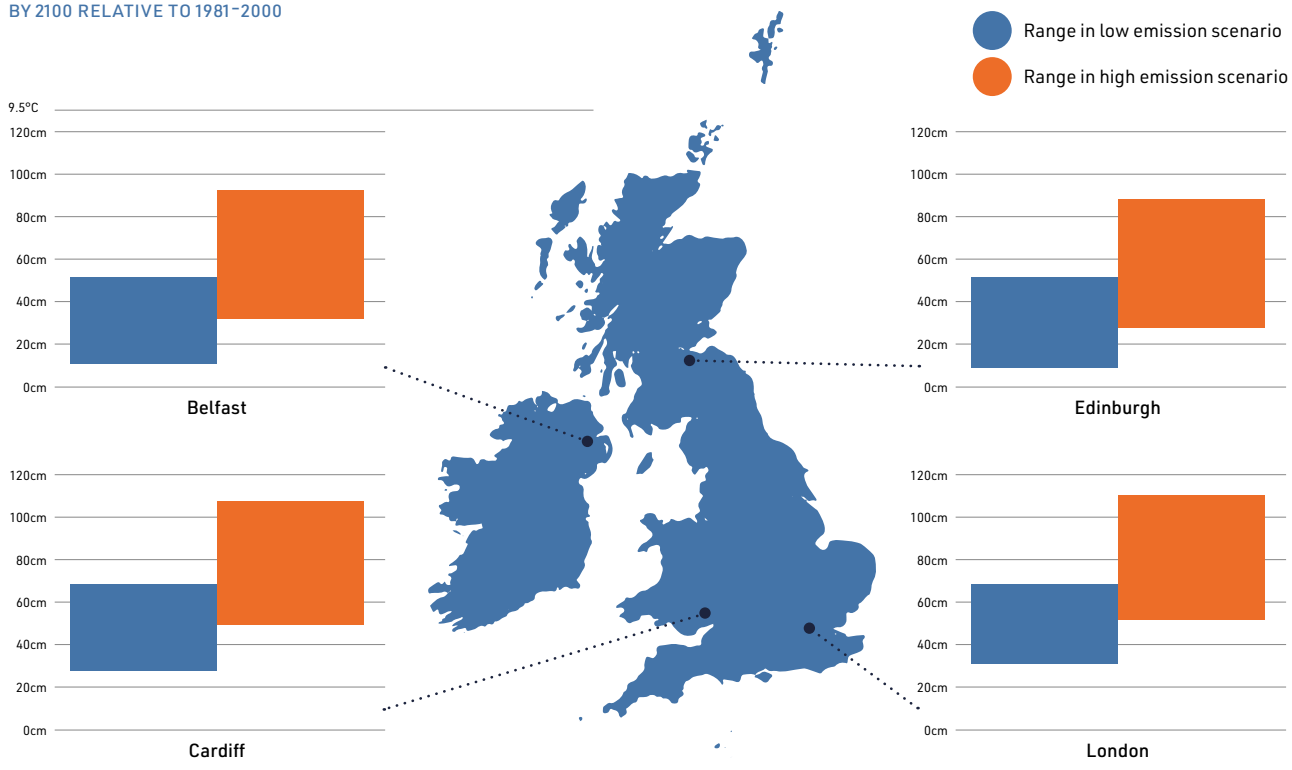
FLOODING AND EXTREME WEATHER EVENTS

To be a resilient city, Belfast must be able to withstand the impact of flooding and extreme weather events.

The effect of climate change will be profound and with ongoing risk management and risk assessment, Belfast will be resilient in understanding potential impacts, infrastructure preparedness and economic consequences.

Sea level rise

BY 2100 RELATIVE TO 1981-2000



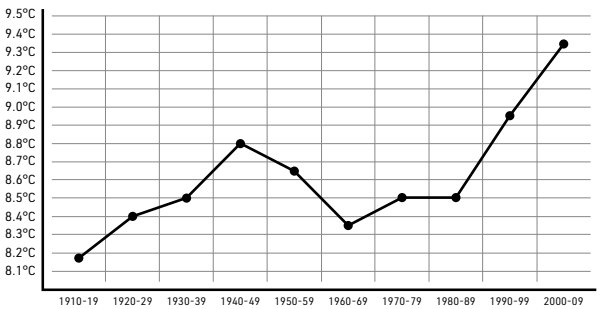
Source: UK Met Office

Changes to our weather

Climate change is causing many extreme weather events to become more intense and frequent, such as heat waves, droughts, and floods. In the summer of 2020 wildfires caused fire fighters to be called to numerous incidences that impacted residents of north Belfast. The image below shows the trend in temperatures in NI since 1910.

Cities are already responding to the financial impact of extreme weather events. The Glasgow City Region has estimated that the cost of four typical weather events between 2012 and 2017 cost the city region £44.5m.

NI mean temperatures



Flood risk in Belfast

Belfast is located within the River Lagan catchment and at the mouth of Belfast Lough. It is a city with very close proximity to water, and where water resilience is critical to the operation of the city. Belfast makes up a large proportion of the geographical area estimated to be at "Significant risk of flooding in NI."

The Northern Ireland Flood Risk Assessment (2018) is a critical source, and identifies Belfast as one of twelve Areas of Potential Significant Flood Risk (APSFR) in Northern Ireland.

Several tributary rivers flow from the hills surrounding Belfast, into the city to the River Lagan and Belfast Lough, all of which have the potential to flood during periods of heavy prolonged rainfall.

Belfast is therefore at risk of flooding from a number of sources including tidal (the sea), fluvial (rivers) and surface water (pluvial) unable to drain away quickly into the combined storm and combined sewerage network, much of which was built in the late 19th and early 20th century.

The fact that Belfast has a mainly combined sewer network means there is additional pressure on the system every time the city experiences heavy downfalls. As the city grows, additional pressure on the capacity of the network could increase the risk of flooding.

Belfast has a history of flood events and major damages are caused by both fluvial and pluvial events. The five highest tidal surges have been recorded since 1994, most recently in early January 2014.

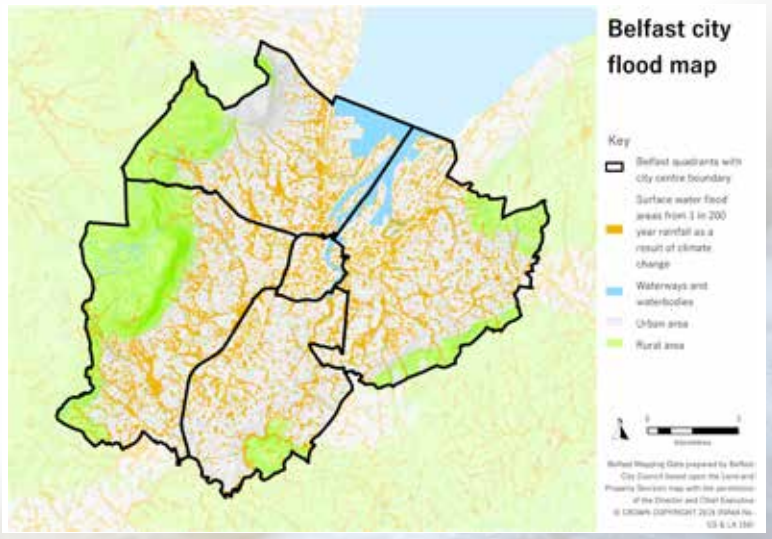
"The economic consequences of flooding for the city are well-known. "

"The NI Flood Risk Assessment (2018) predicts that the city is the most economically impacted of all areas of risk in Northern Ireland with Aggregated Annual Average Damages (AAADs) of approximately £16m."

Coastal and pluvial flood risks are both sensitive to climate change. The impact of climate change causing sea level rise will increase the number of properties at risk of tidal flooding in the city to over 3,400 (2,640 Residential and 770 Commercial) by 2065 and over 7,900 (6,050 Residential and 1,860 Commercial) by 2115.

The Belfast Tidal Flood Alleviation Scheme is a landmark project that will provide a long term approach to tidal flood risk management for Belfast. Much of the city centre is between 1m to 2m below extreme tide levels, so a weather event of magnitude would cause serious disruption to the local economy, the transport network, and the social fabric of the city.

To understand the risks associated with climate change, ARUP undertook a high-level risk assessment of existing city infrastructure. The study looked to three points in the future (2040, 2060 and 2080) for four key climate hazards: sea level rise, extreme heat, drought and extreme cold. The two key hazards with the biggest projected impact for Belfast are (1) sea level rise and flooding and (2) extreme heat. ARUP found that many assets in the city are already at risk of flooding which is projected to be exacerbated by sea level rise and an increase in winter rainfall. The planned new flood defences will provide some protection but residual risk is projected to remain.



Conclusion

The forthcoming tidal flood alleviation scheme provides a mitigation against worsening flood levels in the future, therefore it is expected to provide some improvement to the city's overall climate resilience. However, there remains significant work ahead to ensure the city's existing infrastructure is climate resilient. Sea level rises and flood risk, coupled with extreme heat will have significant implications for the city's infrastructure, as with many other cities. Evidence from cities globally has demonstrated the negative impact this can have on the local economy, the transport network and the social fabric of a city. Belfast must therefore carefully plan the future of its infrastructure to ensure climate resilience is prioritised.

2

CYBER RESILIENCE

A resilient city is reliant on its digital infrastructure, data and associated cyber security. As cities increase their digital dependency, their exposure to attack grows. A resilient Belfast will be able to deliver its essential services in the event of any breach.

As Belfast grows, and becomes increasingly reliant on a digital eco-system to achieve its ambitions, its ability to mitigate and manage data and cyber security risks will be essential. Experience from other cities with a sophisticated data infrastructure shows that as cities increase their digital dependency, their exposure to attacks also grows (McKinsey, 2018). A Smart Belfast must therefore be a secure and resilient Belfast. Being a cyber-resilient city means more than just being secure- it means being capable of delivering essential services in the event of a breach.

A security breach has the potential to disrupt the city; however, cyber-crime has increasingly affected communities and individual households too. Cyber-crime knows no borders and while authorities have experienced increasing levels of sophistication in mode of attack in recent years, low-level basic opportunistic attacks remain prevalent.

> " Being a cyber-resilient city means more than just being secure - it means being capable of delivering essential services in the event of a breach. "

A significant cyber incident can affect the functions of the city - organisations and the public need to consider the impact which a major incident will have, what measures are needed and how to recover. Cyber security planning should be part of routine risk management and should be embedded in the structures and objectives of every organisation and business.

The National Cyber Security Centre, which is part of GCHQ, is a well-established source of information regarding escalating volumes and types of threat. While this is extremely valuable at a national level, at a city level more work is required to develop more cross-sector plans to future proof our digital environment.

Development of digital infrastructure and connectivity

Secure digital infrastructure is critical to the fabric of any modern city- to support its social and economic goals. In recent years, Belfast has improved its digital connectedness - however it must retain this advantage through (1) a strategic approach to the development of a smart/digital city (2) sustained investment in the growth of its digital infrastructure (3) significant focus on the security and resilience of our digital infrastructure assets.

A number of key reports have recently made a similar case. Matrix, the Northern Ireland Science Industry Panel, formed a sub panel of experts in the Digital ICT sector to look at the opportunities within the sector and produce a capability assessment and foresight study into NI's Digital Information and Communications Technology sector. Its 2016 report made a number of significant recommendations that - while focused at a NI level - remain highly relevant to driving Belfast's economic resilience:

- Develop and deliver a coordinated Digital Strategy to bring together the key stakeholders and initiatives required to transform NI into a fully digitized and Smart society and appoint a Chief Digital Officer to build a digital society.
- Develop a 3-5-10 year Skills Investment Plan for the Digital ICT sector.
- Ensure that NI has an exemplar digital infrastructure within and between urban areas to secure NI as an exemplar smart, connected region.
- Provide an integrated, agile platform, based on open standards which expose appropriate data and service APIs to nurture the development of an innovative ecosystem.
- Ensure that the cyber security sector is supported and developed.

Belfast is well placed to build its cyber resilience, in part due to the development of cyber security expertise in the city. CSIT, the Centre for Secure Information Technologies at Queen's University is recognised for its world class research, and its work to enable new value and venture creation and ensure an entrepreneurial approach in the area of cyber security. It facilitates 'NI Cyber' a cluster of companies based in NI that are developing world-leading cyber security technologies for customers worldwide.

Belfast City Council has prioritised a 'smart cities' approach to digitising and connecting the city, to achieve its economic and social ambitious, and in turn contributing to the city's resilience. Smart Belfast brings together our universities, businesses, local government and citizens to collaborate, innovate and experiment using cutting-edge technologies and data science.

The Matrix report was instrumental in informing the

Belfast Region City Deal Innovation and Digital Pillar, which will deliver a number of its recommendations at a city-region level.

- The Regional Innovators Network (RIN) will create a unified environment in which the districts across the Belfast City Region are able to work together to develop and deliver a response to the regional needs for spaces within which entrepreneurs and SMEs can develop new products and services, and work with the larger businesses in the region.
- The Infrastructure Enabling Fund (IEF) will support the deployment of advanced and resilient connectivity infrastructure across the Belfast region.
- The Smart District and Regional Testbed Network consists of key locations across the Belfast region that will act as hubs for development of advanced digital and physical infrastructure and will foster early adoption of new digital products and services at large scale.
- The Digital Innovation Platform and Partnership (DIPP) is a shared physical and digital environment where academic research community, tech entrepreneurs and industrial partners will come together to address key challenges in business and society through the application of the Internet of Things (IoT) and data science.

Consumer protection on cyber security is also critical to cities, like Belfast, that are becoming increasingly digitally connected. The Department for Culture, Media and Sport has produced helpful guidelines for Consumer IoT security that aim to strengthen the security of consumer smart devices sold in the UK and define the security requirements for the Internet of Things (IoT). These standards will allow configured devices for Smart City initiatives to be better protected.

Belfast's objectives to ensure cyber and digital resilience should be:

- To make Belfast unattractive to cyber criminals - through resilience and recovery.
- To build an eco-system of supported city partners.
- To build a pipeline of skills and education.

Belfast Region City Deal is a 'once in an generation' opportunity to build Belfast's resilience by increasing its digital connectivity.

The Infrastructure Enabling Fund (IEF) will:

- Support the deployment of advanced and resilient connectivity infrastructure across the Belfast Region.
- Catalyse digital innovation towards increased productivity and inclusive economic growth.
- Manage the deployment of advanced wireless and fibre network infrastructure over the lifetime of the City Deal comprising of 4G LTE, Wi-Fi, IoT, optical and 5G technologies.
- Develop next-generation infrastructure to support the provision of a range of connectivity services, and will be critical for businesses within the Belfast region to catalyse their growth by having access to the latest communication technologies.
- Provide high value sectors in the city region with the digital infrastructure needed to test the application of new and emerging digital technology and solutions.

This will provide a significant boost to our economic resilience. Critically, the Digital and Innovation Pillar of the City Deal will be implemented in an integrated way- to ensure that the outputs and outcomes arising from the City Deal are directed and driving inclusive economic growth in the City Region. However, it places even greater emphasis on the importance of secure and resilient infrastructure.

Conclusion

There is no single coordinating body for the identification and management of cyber risk at a city level. While some individual organisations have developed cyber resilience plans to varying degrees of sophistication, this remains ad hoc, and with very little support for small organisations, and little focus on business continuity following a potential cyber or digital attack. Furthermore, there has been no single published account of the potential cost implications of a cyber-security threat to the city.

Protecting the city from cyber threats should be considered the collective responsibility of senior leaders across the city. This strategy advocates closer working relationships across organisations in Belfast- with academia and the private sector - sharing threat information and good practice and collaborating to make it more difficult for cyber threats to succeed.

2

UK EXIT FROM THE EU

On 31 January 2020 the United Kingdom left the European Union and the Withdrawal Agreement concluded with the EU became law. The 'transition period', provided for in the Withdrawal Agreement, comes to an end in December 2020. At the time of writing (October 2020), trade negotiations to establish the UK's future trading relationship with the EU remain ongoing. These negotiations on the UK's trading relationship will have enormous implications for Belfast's economy and for the wider region.

A number of studies have been undertaken to assess the future impact of UK Exit on NI, however there is no published central government assessment of the potential impacts of UK Exit for the city of Belfast or for similar UK cities. Earlier this year, a previously confidential study undertaken by the UK government detailing 142 areas of life in NI that will be impacted by Brexit was published by the House of Commons Exiting the EU Select Committee. The document is instructive in outlining the range of policy and practice areas - beyond trade and customs checks - that would be affected by a managed UK Exit. Furthermore, it highlights the scale and nature of formal and informal cooperation between the two jurisdictions on the island of Ireland, some of which may be impacted by a managed exit, and some adversely impacted by an unmanaged exit (i.e. departure without a deal).

It is extremely likely that unsuccessful trade negotiations between the UK and the EU would represent both a short-term shock to the city of Belfast, and have longer term implications for the operation of the economy.

Conclusion

The UK's decision to leave the EU has long term implications for the city of Belfast. Significant re-framing of our relationship with cities in Europe is required; work to sustain levels of investment in a new trading landscape will also take time; and its funding relationships with key EU bodies requires careful planning into the future. For these reasons, UK Exit from the EU will remain a significant area of focus and of risk management for the city.

2

ECONOMIC RECOVERY CAPACITY

Economic resilience refers to a city's resistance to and recovery from an economic shock. Improving resilience therefore includes a focus on the vulnerabilities that either make an economic shock more likely, or that exacerbate a crisis.

Following the global financial crash (2008-09), policy makers began to pay greater attention to the cost of crisis in a city- sometimes referred to as 'GDP at Risk', which can profoundly damage long-term economic development. The OECD, for example, has developed a set of indicators to help cities help policy makers detect vulnerabilities early on and monitor country-specific risks. Like several other cities, Belfast has made economic resilience a core priority, committing the city in the Belfast Agenda to take a targeted approach to addressing those issues which pose the greatest risk to the city and its economy.

As a city with important economic relationships globally, Belfast is susceptible to global economic trends and headwinds. Our focus on economic resilience seeks to ensure (1) strong resistance - when economic shocks happen, we are prepared and can ensure the shock has a temporary impact; and (2) have with greater capacity to adapt and recover, and to maintain progress towards our inclusive growth ambitions.

Resilience to what?

The World Economic Forum Global Risks Report is a credible and often cited source of information on immediate and longer term risks faced by cities and states globally. Published annually, it allows for tracking of risks over time.

In 2020, its report identified immediate risks emerging globally; a 'synchronised economic slowdown', continued warmer temperatures globally, expected increases in cyberattacks, and growth in protests around the world against systems that exacerbate inequality. The report was published in January 2020, as COVID-19 was confined to a small number of countries and had not yet been declared a 'pandemic'.

Since early 2020, global economic forecasts have worsened, and in the UK economic forecasts suggest a prolonged shock as a result of the pandemic. At the time of writing (October 2020) the Bank of England has warned of an 'unusually uncertain' outlook. HM Treasury comparison of independent forecasts predicts an average GDP drop of 10% for 2020, an average unemployment rate of 7.3% for 2020, and average public sector net borrowing for 20202/21 to sit at £343bn.

An unsettled world, global risks and Belfast

For the first time in the history of the WEF Global Risks Perception Survey, environmental concerns dominate the top long-term risks globally. These risks are set against a worsening macro-economic outlook, which has been emerging for some time, i.e. before the impact of COVID-19. The 2020 report makes a number of observations that are relevant to Belfast; risks to economic stability and social cohesion, climate change and accelerated biodiversity loss, consequences of digital fragmentation, and health systems under pressure.

For Belfast, proactively managing the impact of these global risks locally is challenging, but essential. The impacts for Belfast could be:

- A potential slow-down of growth in investment and Foreign Direct Investment in the city, if property funds look outside of the UK due to uncertainties arising from the impact of UK Exit from the EU.
- Increased costs for businesses and potential major shocks for industry depending on the nature of the UK's future trading relationship with the EU, and particular arrangements for NI.
- Supply chain shocks - in particular costs associated with accessing supplies depending on the nature of the UK withdrawal from the EU.
- Currency volatility and its impact on exports.
- Economic shock arising from COVID-19, followed by a prolonged global slow down could choke off the slow recovery being experienced by the city since the financial crash.
- Slowdown in scale of transition to low carbon technologies thereby reducing potential to take advantage of opportunities to be gained.

As a city with significant exposure to the impact of the UK's exit from the European Union, and with underlying existing economic vulnerabilities, Belfast must prioritise how it builds resistance to economic risks, as quickly as possible.

This strategy and the establishment of an Innovation and Inclusive Growth Commission is aimed at institutionalising an approach to managing long term economic risks thus boosting the city's economic resilience.

Belfast's existing economic resilience

In 2018, the UK Core Cities Network commissioned Cambridge Econometrics to investigate the economic resilience of cities. In preparing this strategy, through our membership of the Core Cities network, we supplemented this study to include an assessment of Belfast's economic resilience, including relative to other core cities. The study concluded that:

> "Belfast requires a series of measures to strengthen its resistance to, and recovery from, economic shocks."

Belfast had lower resistance and lower recovery capacity than the Core City average measured against twelve other UK cities. Its recovery capacity has been particularly low, being rated as the weakest of all the cities except Liverpool. This is despite the data showing that Belfast's resistance is strengthened somewhat by the share of public services in the city's economic output.

This finding underscores that the policy levers required for economic resilience are different to those that focus on economic growth. The high dependency on the public sector as a contributor to the city's economy has a positive impact on the city's resistance to shocks; however, it can also have a negative impact on the city's ability to develop sustainably.

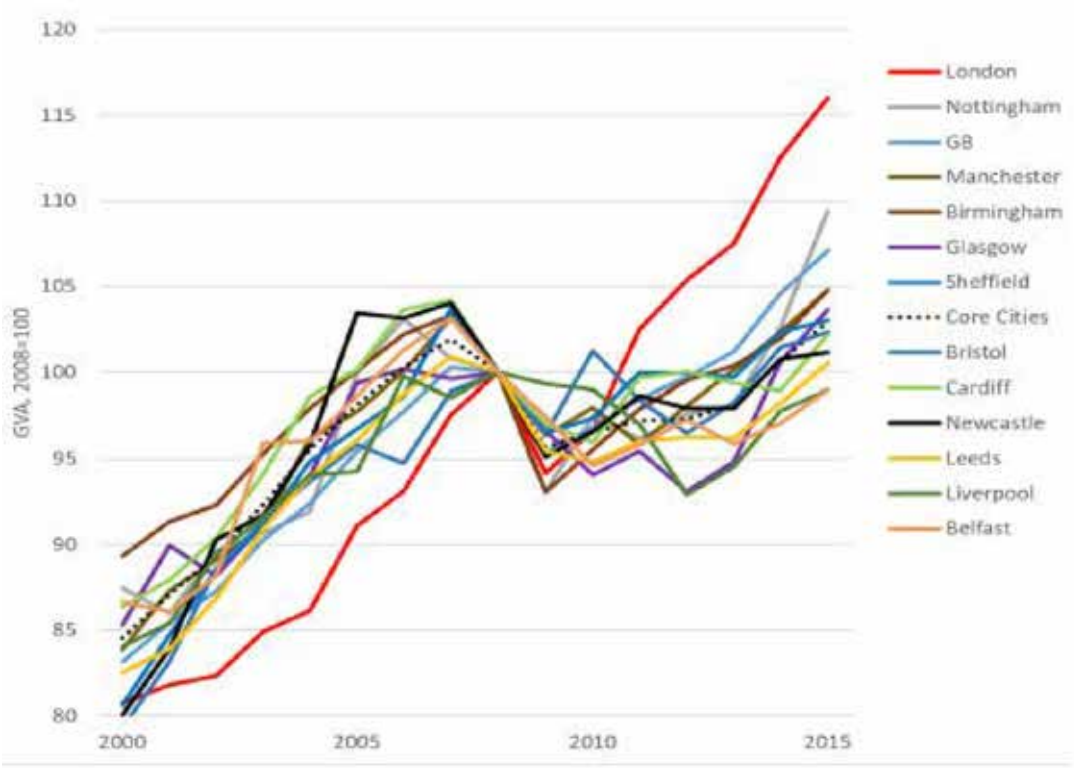
Belfast requires a series of measures to strengthen its resistance and recovery to economic shocks. This is particularly important because the way cities recover from shocks can have permanent impacts on their long term economy. For example, if people who are economically inactive fail to feel the benefits of a return to growth, this can result in a widening of income inequality further reducing resistance to the next shock.

Factors affecting Belfast's economic resilience

Despite its importance, there is no single global standard or set of indicators for measuring economic resilience.

In this section we examine two particular aspects of Belfast's economic resilience - income inequality and competitiveness and recommend the development of a series of indicators to measure the city's economic resilience in the future.

Core cities compare Belfast with the GB average



2

Belfast city's competitiveness

A recent study of the city's competitiveness (Baker Tilly Mooney Moore 2019) identified a number of areas of vulnerability for the city of Belfast, and summarised them in the graphic below. Importantly, the study found that Belfast's decline relative to other cities is due to their resurgence, i.e. other cities' out-performing Belfast.

Theme	Current average ranking	Three year change	Five year change
Productivity	4/12	→	→
Population and demography	9/12	→	↓
Sustainable and inclusive growth	6/12	→	↓
Quality of life	6/12	→	↑
Physical knowledge and infrastructure	5/12	↓	↓

The study concluded the following:

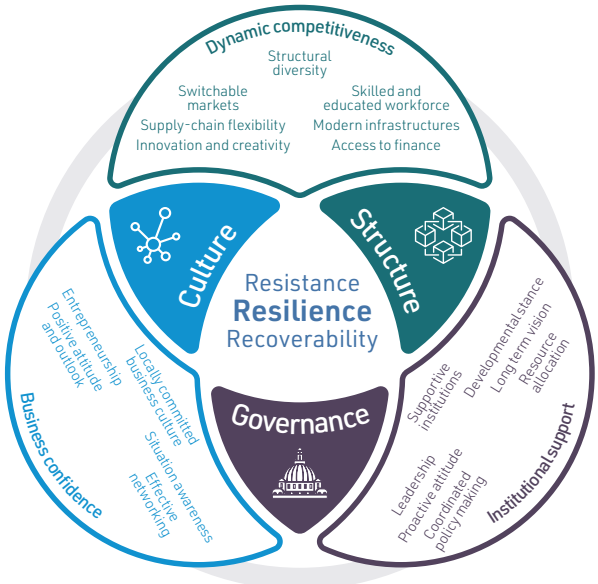
- Belfast's demographic profile is impacting its competitiveness and its ability to achieve its city objectives. Belfast has a smaller labour pool which is growing slower than its competitors. Retaining the city's population and replacing those who leave is a major challenge. These factors may potentially impact the city's attractiveness to investors and is at odds with the performance of other cities.
- Belfast has a significant skills challenge. It has too few highly skilled workers and too many with no qualifications. While the figures are improving, it lags significantly behind other UK and European cities. This is impacting of the city's competitiveness and the prosperity of its citizens, creating inequalities within the Belfast economy and making the achievement of inclusive growth more challenging. While a range of initiatives have been delivered to improve the skills base, significant issues remain and while much of the policy responsibility sits with the NI Executive, initiatives such as the Belfast Region City Deal present an opportunity for the City to play a bigger role, over both the short term and the long term.
- Belfast (and NI as a whole) still has the largest proportion of economically inactive population of all UK cities (and regions). As well as the implications for the individuals affected, it also results in a drag on the local economy's performance and competitiveness. To improve Belfast's competitiveness, this is an area which must be addressed.
- While there is a sense of an emerging entrepreneurial ecosystem, supported by a buoyant knowledge economy and a growing private sector, key indicators still highlight that Belfast lags behind its peers in relation to creating and growing successful businesses. Providing a supportive environment which is conducive to business creation will be key to improving Belfast's competitiveness. This is also a key focus of the Belfast Region City Deal, which presents a significant opportunity to provide further foundations to support enterprise, innovation and entrepreneurship
- Belfast has momentum across a range of indicators, it has also dropped down the rankings across others - namely in broadband provision. There is evidence that other cities are seeking to enhance their competitiveness by investing in policy areas that have made Belfast successful. This poses a threat to Belfast and may take away from Belfast's competitive offer. The city should not rest on its laurels and should seek to build on its strengths to maintain and enhance advantages where they exist.

The Belfast Agenda, the city's community plan, sets out a series of measures aimed at reducing and removing some of Belfast's economic challenges- in particular through a sustained focus on population growth, jobs creation and development. This pro-growth approach is underpinned by a focus on inclusive growth, reducing inequality over time. This mirrors the approach taken by a number of global cities with similar challenges, and assuming the right policy levers are applied, could be transformative for the city of Belfast.

Encouragingly, the potential for greater resilience is intrinsic to the ambitions within the Belfast Agenda. Their realisation could address a number of challenges for the city referenced in this document, such as providing critical mass to maintain or support services and infrastructure.

Building our economic resilience

Building economic resilience for sustainable growth requires an integrated and simultaneous focus on several aspects of the city's economy. The Cambridge Econometrics Study produced the following helpful Venn diagram:



Indicators to measure and strengthen economic resilience

This strategy proposes the agreement of a citywide series of indicators to measure Belfast's economic resistance and recovery capacity. These may include the following:

1. Levels of private and household debt
2. Flexibility of labour market
3. Skills among working age population
4. Ratio of FDI and indigenous investment
5. Public Sector as a contributor to economic output
6. Export Intensity
7. Income and wealth inequality
8. Employment and economic activity
9. Integrated local economic networks
10. Presence of strong economic strategy and leadership
11. Levels of trust
12. Dependence on carbon

2

Building on the city's economic strengths

As set out in the previous pages, Belfast faces a number of challenges associated with its weak recovery capacity. However, its economic resilience has been significantly boosted in the last decade as new growth sectors have emerged, and thrived. These include significant recent growth in the ICT sectors, fintech, life and health sciences, global business services and across emerging sectors such as cyber security, regtech and legal tech. More recently, Belfast has also attracted a significant number of internationally recognised global investors.

Alignment of city partners around a number of growth priorities, has led to the establishment of a number of new city structures. For example, the Belfast Digital Innovation Partnership brings together local government, universities, Belfast Harbour and Catalyst- the city's community of innovators- to harness digital innovation with the objective of achieving a step-change in increasing the city and the region's productivity. The work ensures a strategic focus on commercialising the outputs of the city's research base, weaving digital innovation into every aspect of the city's economy with the goal of creating new and better jobs.

Investment in companies across the city has remained strong throughout the decade. Between 2015/16 and 2019/20 Invest NI, the Economic Development Agency for Northern Ireland, provided £198m of support to businesses based in Belfast (£110m to local companies/ £88m to externally owned companies), securing over £1.144bn of investment and assisting in the promotion of 10,126 jobs.

As a result of this investment and a strategic approach to development of growth sectors, Belfast can now boast of becoming a leading city across a number of key industries. It is currently (2020) Europe's leading FDI destination for new software development*, is ranked as the No 2 'Second Tier' city for Business Friendliness and is one of the top 10 digital economies of the future.

Continuing to improve the city's economic resilience is a critical priority for the city's Innovation and Inclusive Growth Commission, established to develop an economic strategy for Belfast and to ensure continuation of a strategic focus on key growth sectors. The Belfast Region City Deal offers a timely and important lever for the city to invest heavily across those industries to support job creation, skills development and sustainable economic output.

Conclusion

The financial crash and global recession of the previous decade exposed Belfast's weak recovery capacity. This will be further impacted by the economic shock arising from the effects of the COVID-19 pandemic. In many respects, Belfast had only just begun to recover from the previous crash, when COVID-19 hit. To better prepare for future economic cycles, a sustained focus on economic resilience, as part of a wider inclusive growth strategy is required. Many global cities, are now placing a particular emphasis on economic resilience and Belfast can learn from existing global practice. This strategy recommends that we commence this work by (1) identifying and agreeing a series of city-wide indicators to measure economic resilience (2) making it a core aspect of the work of the Innovation and Inclusive Growth Commission.

2

POVERTY AND INEQUALITY

High levels of poverty and income inequality can severely reduce a city's resilience. At a household or individual level, lack of access to additional resources in times of unpredictability means much greater vulnerability in a crisis. Substantial research now exists to show the disproportionately adverse impact of climate related shocks on poorer neighbourhoods, for example, following periods of economic shocks, people without jobs and on fixed low incomes often do not benefit from a return to growth as quickly as wealthier households.

A significant proportion of the population will face financial difficulty. The Office for National Statistics (ONS) said that one in four (25%) adults stated that the coronavirus was affecting their household finances, with 75% reporting reduced income. The survey also indicated that an increasing proportion of households have needed to use savings to cover living costs, with evidence of having to borrow money or use credit causing concern for some households.

Initial analysis indicated that those in the lowest earning income deciles are much more likely to be furloughed or laid off compared to those at the top of the income distribution. Therefore, the least well off are more likely to lose their jobs or suffer from reduced income, thus widening inequality. (UUEPC)

COVID-19 makes it clear that cities are only as resilient as they are inclusive. (World Bank Cities).

Belfast's resistance to and recovery from shocks, and its wider resilience will therefore be determined by the success of its achievements to drive inclusive growth.

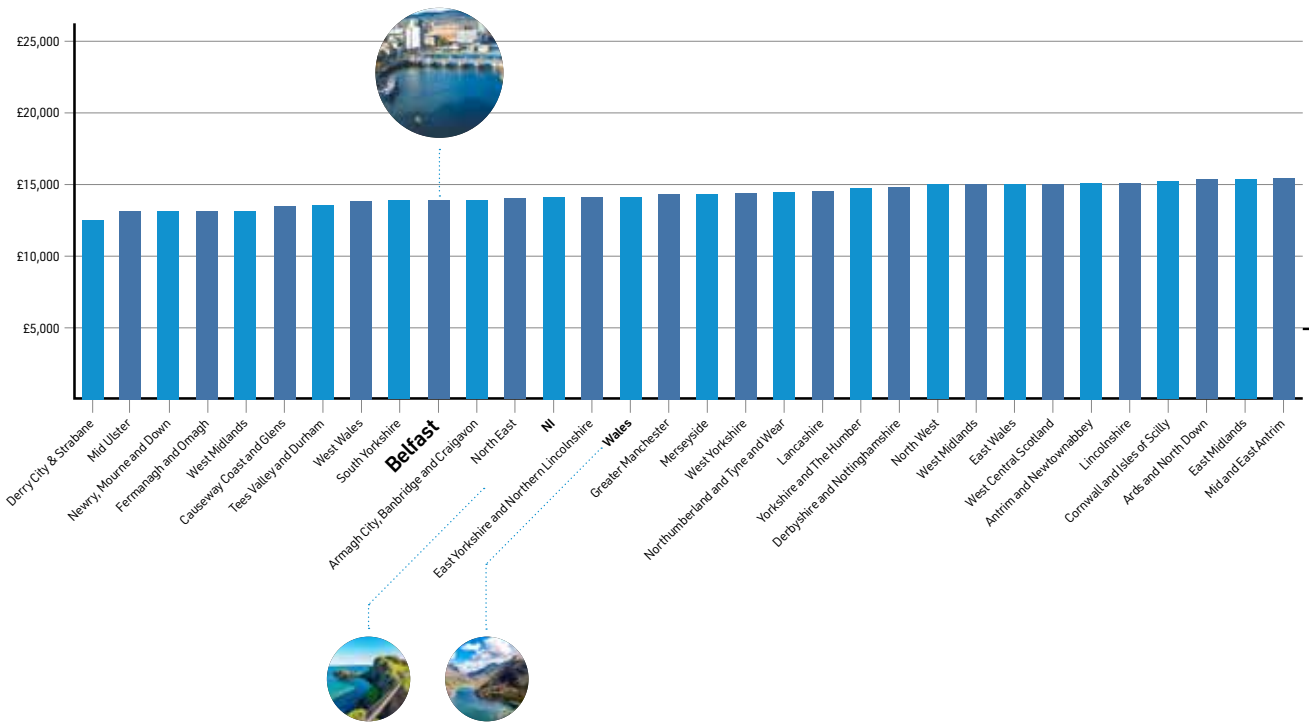
The draft Local Development Plan (LDP) describes the social context in Belfast as 'a tale of two cities'.

> "Belfast is home to some of the most affluent communities in NI, however it is also home to some of the most deprived communities."

There is a need for the LDP to increase equality of opportunity and contribute to the breakdown of the physical and psychological aspects of division.

This assertion is based on a range of data sources- including the Income Deprivation Domain (in The Northern Ireland Deprivation Measures), which identifies the proportion of the population living in households whose equivalised income is below 60% of the NI median. Belfast is split into 174 spatial areas known as Super Output Areas (SOAs). Belfast contains two of the ten most deprived SOAs in NI - and 4 out of the 10 least deprived, in terms of income.

Gross disposable household income



A 2016 NICVA study on income inequality found that 'it is possible to say that Belfast is the most unequal part of NI, as it has a high proportion of people in the bottom of the income distribution (25%) and a high proportion at the top (18%).'

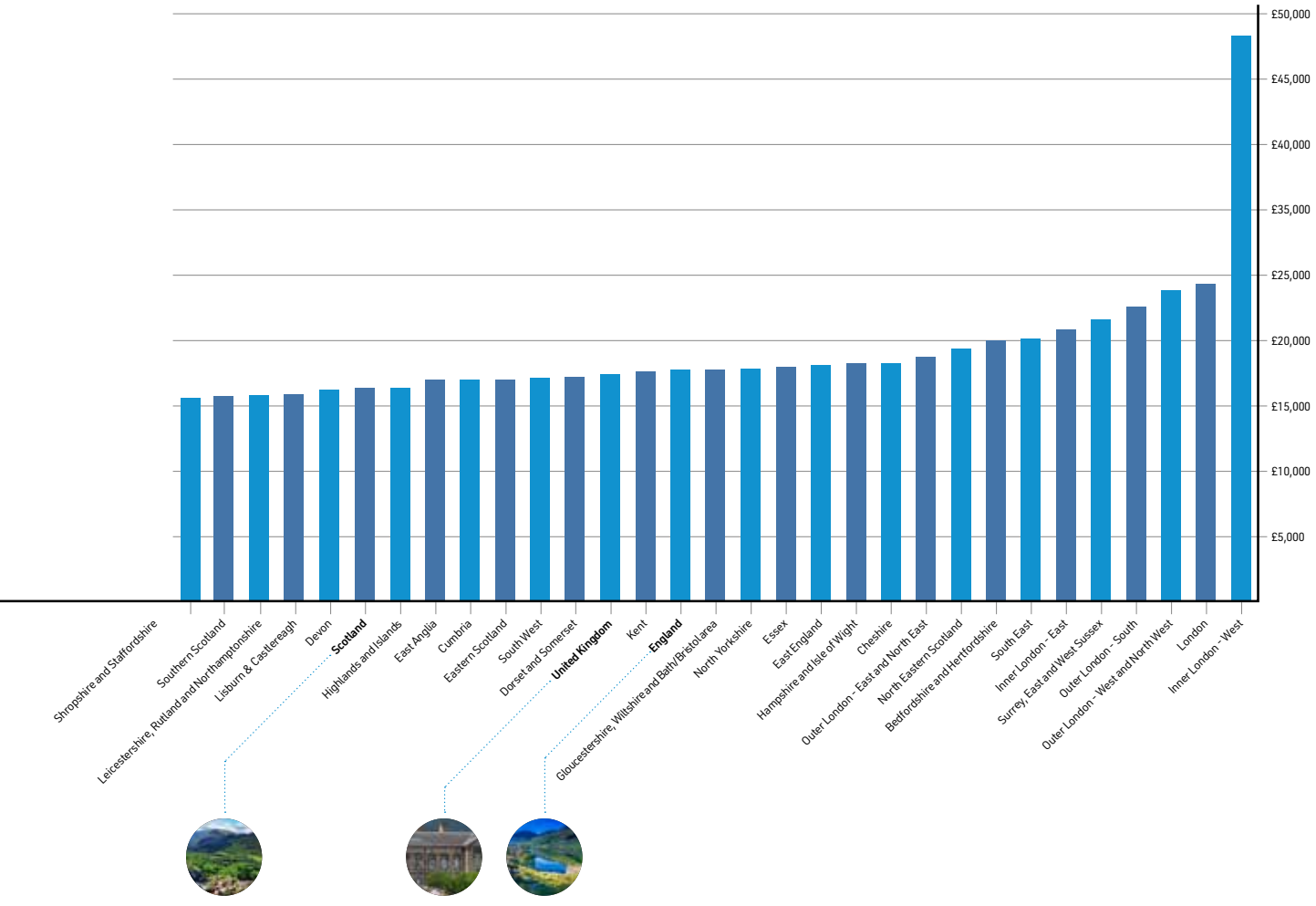
While income and wealth inequality in Belfast is high, the city also compares poorly to others in terms of absolute levels of income. Twenty-one of the top 20% most deprived SOA's in NI are in Belfast. However, 14 of these have remained in the top 20% since 2005. Even more notable is the fact that a number of SOA's moved out of the top 20% in the 2010 measures and then re-entered again in the latest 2017 measures.

While income inequality clearly requires a sustained focus, there is an equally strong argument for a greater understanding of the impact of wealth inequality. Wealth inequality rarely receives as much policy attention as income inequality, yet the gap between public and private capital is a strong driver of divisions in society. It is not clear whether a single city study into wealth inequality has been done in Belfast.

"While overall private wealth has increased in the UK, public wealth has waned and the gap between both has widened."

Data on economic performance confirms the benefits to be gained from reduced wealth and income inequality, and less division generally. Economic activity has close correlations with levels of trust- economies with high levels of trust, have higher levels of trade and activity that adds economic value. There is a case for a focus on community wealth and asset based welfare to find ways to reduce wealth inequalities in the city.

Coupled with political polarization, inequality erodes a country's social fabric in an economically damaging way: as cohesion and trust diminish, economic performance is likely to follow.



2

POPULATION CHANGE

Resilient cities are those with thriving populations - well planned levels of sustainable development, to match cities' long term ambitions. Belfast's economic resilience is therefore dependent on sustainable levels of population growth, particularly among its younger and its working age populations.

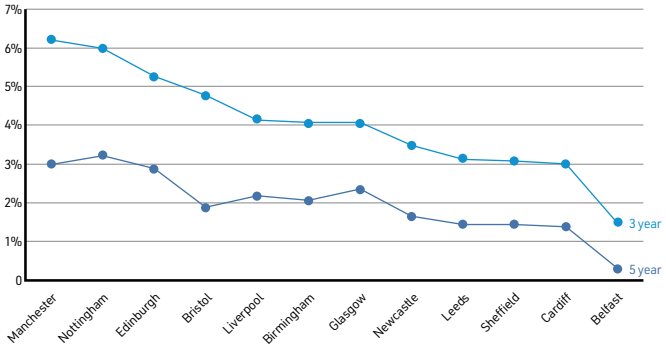
Population projections are important because they give us a perspective on how the future might look, if certain trends continue. However, because they are trend-based, they cannot take account of policy changes which might occur, and the impacts of these interventions. Most cities globally are planned on this basis - population projections are developed centrally based on past trends, however, local planning policies aim to change these trends over time.

This strategy uses population projections because they provide critically important information on how past trends might impact on the future. However, as this section concludes, future policies will determine whether these projections are realised.

In 2019, Belfast had a population of 343,542 (2019 Mid Year Estimate) making it, by this measure, one of the largest cities in the UK overall. It has a lower population than the Scottish capital Edinburgh (518,000) but has a similar population to the Welsh capital Cardiff (364,248), Newcastle (300,196) and Nottingham (331,069) (Office for National Statistics ONS).

As part of Belfast's competitiveness study, the city's projected population growth rates was compared with 12 others. The study found that Belfast had the lowest projected population growth rate for the next three and five years.

Three and five year Population Growth rates



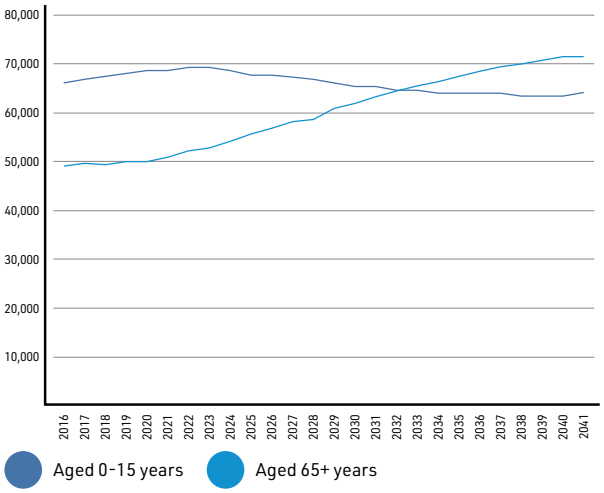
When data on growth in working age population was compared, Belfast has one of the lowest labour pools of the twelve cities. Perhaps most worrying of all, Belfast has seen relatively low growth in its working age population since 2013 (0.8%) and a decline since 2015 (-0.2%) which leaves it ranked lowest of the 12 comparator cities.

An Aging Population

Over the decade mid-2016 to mid-2026, the population of children (i.e. those aged 0 to 15 years) in Belfast is expected to grow by just 2.4%.

Furthermore, over the same decade, the population in Belfast aged over 65 is projected to increase by 15.2%. In 2033, the number of older people aged 65+ in Belfast will surpass the number of children under 15 (NISRA). Each of these trends presents distinct challenges for the city- and for its economic resilience in particular.

Children 0-15 and older people 65+

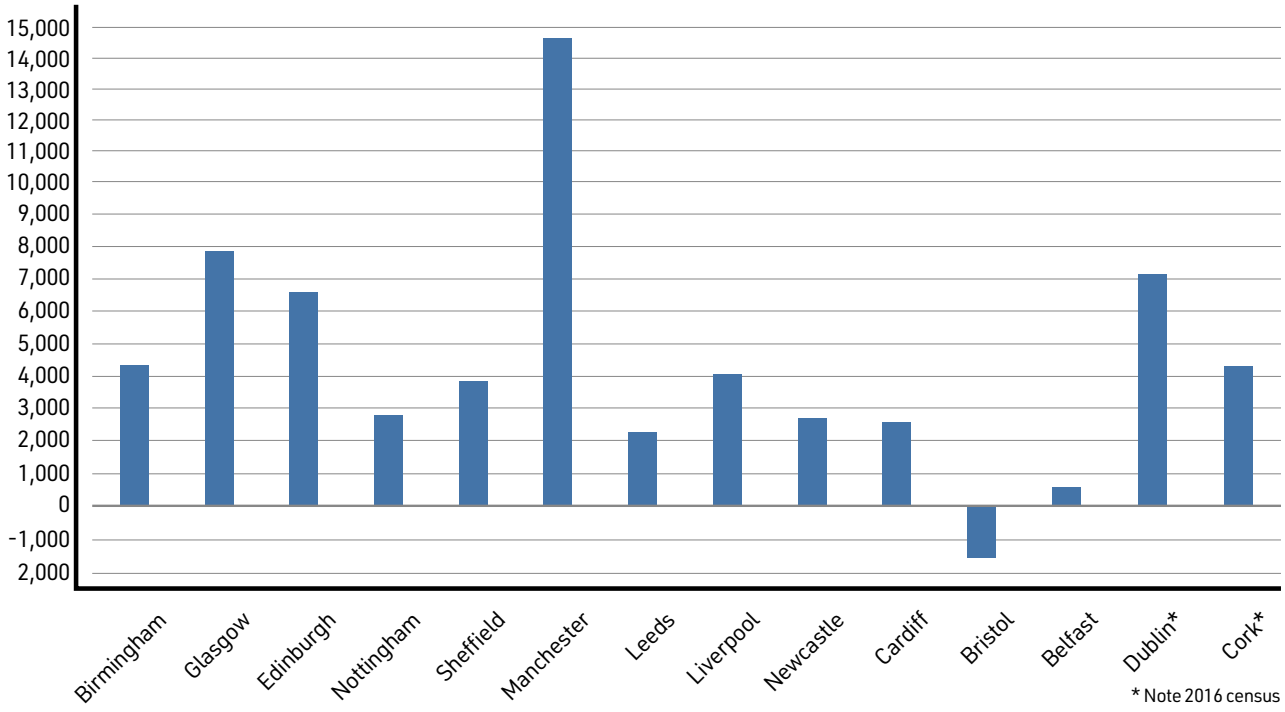


Migration and people leaving our city

Migration flows are a strong indicator of how a city is perceived internationally. Belfast has recently realised negative net migration - i.e. more people leaving than arriving. This is highly unusual. When ranked alongside twelve other UK cities as part of the Competitiveness Study, Belfast was unique in this respect.

Environmental migrants forced to flee their current homes due to rising sea levels, drought and unpredictable weather events around the world is something that may impact UK cities in future years.

Migration, 2019 mid-year estimates



* Note 2016 census

Conclusion

Official population projections for Belfast demonstrate the challenges faced by the city. However, it is important to stress that a focus on projections alone can mask the drivers that led us to the present position. Resilient cities are highly reflective and adaptive - they plan for sustainable development based on a sophisticated understanding of the relationship between economic and social trends, on what has succeeded or failed in the past and what has worked elsewhere.

Growing its population - and in particular the number of young people and working age people is critical to the city's economic resilience. For this reason, the policy goals in the Belfast Agenda - 'to be home to an additional 66,000 people', and underpinned by its draft Local Development Plan are crucial to the city's future economic resilience.

Many other cities globally have demonstrated the capacity of local planning policies to reverse or shift population trends and it is essential that decision makers in Belfast do the same. Given the impact of Belfast for the regional economy, there is a strong case for pursuit of these policies to receive regional priority.

2

CARBON INTENSIVE SYSTEMS: DEPENDENCY ON FOSSIL FUELS

Belfast is a net importer of energy, relying heavily on traditional coal, gas and oil to heat and power homes and buildings in the city and on petrol and diesel for virtually all of its transport needs. A third of the domestic sector relies exclusively on oil for space heating.

This heavy fossil fuel reliance, generating high levels of demand for what is an expensive form of energy, presents a significant challenge to the city's long-term resilience.

> " Balancing security of energy supply for economic growth with a supply of affordable energy so all households can live in healthy warm environments with environmentally sound sources of energy."

Belfast's dependence on energy will increase. The International Energy Agency has previously projected that energy demand in cities globally will increase by 57% by 2030 - energy demand and energy security therefore represent a major challenge for all global cities- including Belfast. This makes the transition to low carbon sources of energy an even greater priority for the city.

The so-called 'energy trilemma' is a well-known phenomenon within cities. It relates to balancing security of energy supply for sustainable economic growth with a supply of affordable energy so all households can live in healthy warm environments with environmentally sound sources of energy in response to a changing climate.

A 2017 Northern Ireland Affairs Committee report on the electricity sector was blunt in its assessment that NI has struggled to achieve this balance. It called for an urgent update of the Strategic Energy Framework - the policy framework on energy, to give certainty to investors, and enable long term policy clarity and planning for energy. It also recommended a permanent advisory body on energy.

Belfast is a net importer of electricity. The security of this supply is considered both on a NI basis and an All Island basis. SONI (the Norther Ireland Transmission System Operator) jointly (with the Republic of Ireland Transmission System Operator, Eirgrid) annually published a Generator Capacity Statement and Annual 10 year Transmission Forecast Statement. These consider the expected electricity demand and the level of generation capacity that will be required in NI and on the whole island over the next ten years. Within this they consider a number of realistic scenarios. Their current statement highlights that current capacity needs are met however some scenarios indicate further capacity is needed for 2026 and beyond. The need for a second North South Interconnector to increase security of supply is also highlighted. Planning approval for the interconnector has now been granted by the Minister for Infrastructure in Northern Ireland enabling this critical project to advance.

Generators are provided with clear information on how they are compensated within the current single electricity market on the island of Ireland. This design includes capacity auctions for generation capacity four years in advance of the need. However generators also require long-term policy clarification from the NI Executive to provide further surety and reduce their risk leading to reduction in costs for consumers going forward.

Belfast is also a net importer of gas. The security of supply for gas is considered on a NI basis by the Gas Market Operator within NI.

Nevertheless, we have a good story to tell when it comes to renewable electricity. From October 2018 to September 2019, 44.9 % of total electricity consumed in Northern Ireland was generated from renewable sources. This exceeded the original target of 40% by 2020. Decarbonisation of the energy system, however, will require a step change in the level of renewable generation if net zero carbon targets are to be met. Demand for electricity may also increase through the electrification of heat and transport. These are dependent on an enabling policy environment, which will not be in place until a new Northern Ireland energy strategy is implemented, expected to be in 2021 or later.

Towards a New Energy Strategy for NI

The Department for the Economy has begun the process of developing a new energy strategy, which it intends 'to decarbonise the Northern Ireland energy sector by 2050 at least cost to the consumer.' Encouragingly the department also recognises that any new strategic direction for energy in Northern Ireland must consider the existing energy mix and how it will be reshaped, as well as considering energy demand reduction. The move to decarbonise our energy systems was given further impetus when the Minister for the Economy announced that 'Clean Energy' is one of four growth sectors for targetted investment in her 'Rebuilding a Stronger Economy' document, published to support economic recovery following the COVID-19 pandemic. Clearly, in a relatively short space of time clean energy has emerged as an area of strategic focus in Northern Ireland, and as the region's capital, Belfast will have a critical role to play

Belfast's big energy bill

The 'Mini Stern' for Belfast, commissioned by the Belfast Climate Commission, and undertaken by Professor Andy Gouldson at Leeds University, found:

- Belfast spent a total of £296m in 2019 on energy across the city. However, Belfast's energy bill is forecast to grow to £466m by 2050.
- If it invested in all of the profitable energy efficiency and low carbon options, total energy bills would be cut by £286m per year in 2050, creating jobs, improving air quality and the liveability of the city.
- Households in the area would save £46m a year from their energy bill.
- Belfast's industry could cut its fuel costs by £9m a year.
- This would mean the area's carbon emissions would fall by 23% over and above what is already expected.

"Cutting the city's carbon footprint makes really sound sense economically and socially as well as environmentally. Belfast could cut its future energy bill in half whilst at the same time reducing fuel poverty, creating jobs, making its homes more comfortable and slashing its carbon emissions. The case for action is so strong that rather than asking why would we do this, people in the city should be asking why wouldn't we."

Andy Gouldson
Professor of Environmental Policy, University of Leeds
Author of Belfast Net Zero Carbon Roadmap (Mini Stern)

Waste and the circular economy

In January 2018, as part of its national climate mitigation and adaptation policy, China banned the import of foreign waste, including almost 9 million tons of plastic scrap, to reduce pollution and strain on its national environmental systems.

This ban exposed poor resilience in the domestic recycling capacity of many states that had traditionally exported to China. Plastic waste built up in the United Kingdom, Canada and several European states. In the first half of 2018 the United States sent 30% of the plastic that would previously have gone to China to landfill. According to the World Economic Forum, 'as the impact of environmental risks increases, it will become increasingly difficult to treat those risks as externalities that can be ignored or shipped out. Domestic and coordinated international action will be needed to internalize and mitigate the impact of human activity on natural systems.'

Successful cities manage the impact of growth sustainably and ensure that it does not limit the quality of life of future generations. Waste management is therefore a key factor in the resilience of the city. Belfast City Council is prioritising the management of urban waste, to create a quality materials product with the aim of supporting jobs via a circular economy.

The council's forthcoming Corporate Plan from 2020 to 2024 will prioritise new waste collection arrangements under the 10 Year Waste Framework Strategy. Through the Resourceful Belfast programme, the council aims to maximise economic potential by creating social enterprises; and will develop a strategy which will ensure waste is managed effectively and investigate the economic potential of the circular economy to increase skills, jobs and inclusive growth.

Risk to health and enjoyment of the city: air quality

The quality of urban air is a critical factor in the quality of life enjoyed by city residents, as well as a key health determinant. The World Health Organisation describes air pollution as 'the largest environmental risk factor for ill health' and estimates that in 2012 around 1 in 8 deaths were attributed to exposure to air pollution , and this is echoed by the UK Clean Air Strategy, published in early 2019 .

Cities that have been successful in enhancing air quality have tended to take a multi-faceted approach:

1. Setting evidence-based targets for reduction in harmful levels of pollutants- often exceeding national level targets
2. Dramatic reduction in fossil fuel dependent road transport and in combustion of fossil fuels- a sustained modal shift in travel and transport
3. Providing clear and easy to access public information on air quality levels, to enable informed decision making by the public on their travel routes
4. Well-resourced public education campaigns to help individuals and organisations understand how they could reduce their contribution to air pollution
5. Excellent partnerships between city government, health policy makers and innovators to identify new solutions to a systemic problem.

Belfast Smart Cities Urban Health Programme

The Urban Healthy Living pilot was funded by UK Space Agency's 'Space for Smarter Government Programme' which adapts satellite-enabled air pollution monitoring to support public health programmes and healthcare delivery in an urban setting.

The project demonstrated the use of a space-enabled technology for traffic related air pollution monitoring and aimed to spur innovative interventions in healthy living and disease prevention. Using a blend of technology, the project produced air pollution models that were visualised on 3D maps, making complex information accessible. UHL also prototyped a routing map that could allow clinical patients to better self-manage their respiratory conditions by selecting the routes and modes of transport that limit their exposure to pollutants.

The project's research led to some important conclusions which are highly relevant for policy makers and city planners; that air pollution hovers long after traffic dissipates, and that weather is a determining factor. Those with COPD and asthma are much more severely affected by air pollution levels, and air pollution is increasingly linked with non-respiratory diseases including diabetes and reduced cognitive function.

Conclusion

Belfast's economy is a high-carbon one- which will impact its resilience in the coming decades, as other cities transition to low-carbon futures. The speed and means of Belfast's energy transition will be critical to its economic future. However a timely and well managed transition has the potential to significantly boost inclusive growth in the city, to create jobs and to reduce fuel poverty.

When work commenced to prepare a resilience strategy in 2018, there were no formal citywide structures or plans in place across Belfast with either a focus on climate mitigation or climate adaptation. Data on the potential implications of climate change is still not held centrally (i.e. at a city wide level).

How prevalent is car use in Belfast?

- Belfast remains a car oriented city with 68% of households having access to at least 1 car.
- 53% of journeys made in Belfast between 2015-17 were car journeys, and just 11% were by public transport. This compares poorly to other similar UK and global cities.
- Relatively few households were close to a train station. 60% said it would take them 44 or more minutes or that it was not feasible to walk.
- Belfast's daytime population increases by 25% to accommodate people who travel to Belfast to work.
- Congestion levels in Belfast place the city in the TomTom Traffic Index Top 25 Global Congested Cities.
- 158,237 vehicles registered in Belfast 2019.
- 1,172 electric vehicle registrations in Belfast in the first quarter of 2020 (less than 1% of all registrations in 2019).

Conclusion

The fact that the car remains the predominant feature of Belfast's transport infrastructure and network is a major risk factor for the city, and increasingly inhibits its resilience. While the city's transport infrastructure is functioning successfully in lots of ways, the prevalence of road infrastructure in the city, the numbers of daily car journeys and their impact on movement in the city and the dependency on fossil fuels for car use present major challenges for the city as it transitions to a low carbon economy. The draft LDP Technical Supplement makes the point succinctly, 'Belfast is a city that has historically been dependent on the private car and the streetscape has evolved to cater to these demands, resulting in road infrastructure that is over sized, over complicated and a barrier to non-motorised accessibility'.

The policy framework for transport at the city level, the Belfast Metropolitan Transport Plan was developed in 2004 for implementation to 2015. While many aspects of the plan remain relevant, there is a strong case, as Belfast sets targets for decarbonisation, to refresh the city's policy ambitions for sustainable transport.

Belfast's future resilience is dependent on its transition to a low carbon economy. This will only be possible with a material shift in the balance of its travel choices away from cars and towards sustainable public transport, walking and cycling as advocated in the approach to future growth in the LDP.

There are welcome signs of progress towards reducing the city's dependency on the car. Changes to mobility following COVID-19 may result in longer-term patterns towards sustainable forms of travel. The appointment of a Walking and Cycling Champion by the Department for Infrastructure presents a welcome opportunity to promote active travel across the city.

Research from cities across Europe, where the dominant mode of transport is walking, cycling or public transport demonstrates the health benefits and the transformational impact modal shift can have on peoples' satisfaction with their city. A step change in sustainable forms of transport would deliver two major city objectives at once- making Belfast a city that attracts and retains young people, and encourage them to live in the city centre. It would significantly increase the city's climate resilience and drive decarbonisation, making Belfast a much more attractive city in which to live.

2

CLIMATE CHANGE

Climate change presents a grave risk to the planet, and as such, its effects on cities will be profound, and many will be permanent. How we design cities, how we live in them and enjoy our city lives will change significantly in the decades to come. Work on this strategy had just commenced in 2018, when the IPCC produced its seminal report which concluded that global warming should not go above 1.5 degrees beyond pre-industrial levels. The report recommended significant acceleration in global efforts to reduce carbon, and was instrumental in shaping the UK government's decision to set a net zero carbon target for the UK by 2050.

In preparing this strategy, climate change was the predominant issue raised by stakeholders in our focus groups and workshops. Children and young people across Belfast raised it as a priority issue for them.

Lack of preparation for climate change emerged as a major feature of discussion in our workshops and focus groups. This was echoed in Northern Ireland Climate Change Risk Assessment, which found:

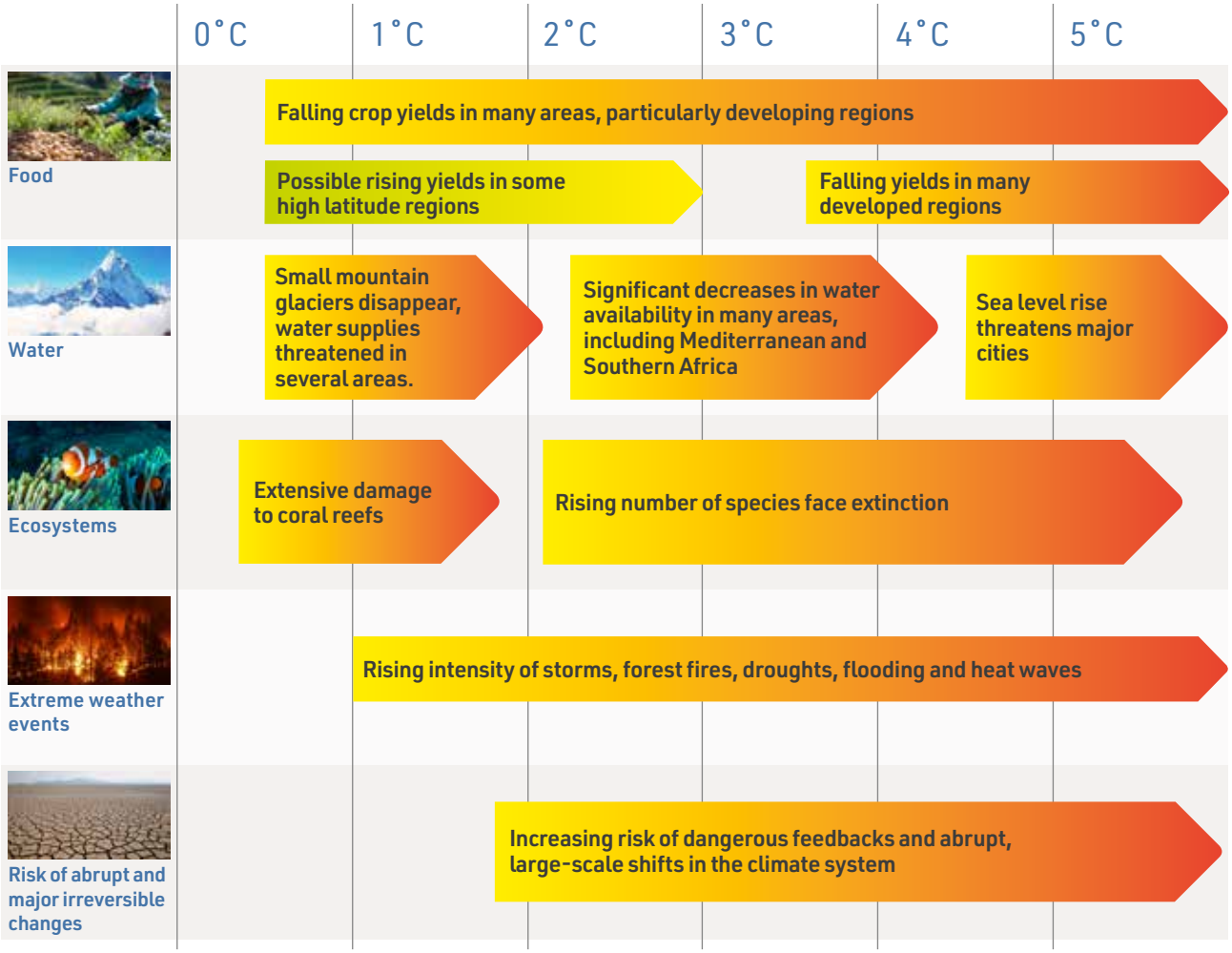
'There is no published account of what has been achieved by efforts in recent years to improve the resilience of infrastructure systems in NI to flood risk.'

Most sectors do not report on the resilience of their assets, networks and services. This is particularly the case with the non-regulated sectors and for local infrastructure, especially minor road networks and highways.

Few sectors systematically describe the disruption that has been caused by flooding, and the actions that have been taken as a result.

Global temperature change

Relative to pre-industrial



Assessing climate risks to Belfast

While no comprehensive city-wide risk assessment has yet to be undertaken, the Climate Change Risk Assessment undertaken at a NI level, is relevant, and we would expect that the risks identified below are likely applicable to Belfast. It found that:

- Climate change poses risks to NI's soils, farming, freshwater resources, natural carbon stores, marine ecosystems, wildlife and habitats. It argued that more action is needed to build resilience to these risks. It also highlighted that more evidence is needed to fully understand other climate change risks that are likely to be important for NI's natural environment, including potential changes in agricultural and forestry productivity and land suitability and impacts on freshwater and marine ecosystems.
- Infrastructure in NI is exposed to a range of climate hazards. Impacts on some assets have the potential to cascade on to others as part of interdependent networks. Flooding poses the greatest long-term risk to infrastructure performance from climate change, but the growing risks from heat, water scarcity and slope instability caused by severe weather could be significant.
- The CCRA Evidence Report suggests that there are potential health benefits from warmer winters in NI, but more action is needed to manage current risks to people from cold temperatures through addressing fuel poverty. There are several risks that might be important for NI but there is not enough evidence to assess to what extent adaptation action is already underway to manage the risks. Such areas include risks to communities from flooding and sea level rise, extreme weather impacts on the healthcare system, risks to building fabric from moisture, risks to culturally valued buildings, and risks to health from overheating buildings, poor air quality and pathogens. For these risks, more research in NI is urgently needed.
- Flooding and extreme weather events which damage assets and disrupt business operations pose the greatest climate change risks to businesses in NI now and in the future. This could be compounded by a lack of adaptive capacity.
- Climate change will impact upon on water security, agricultural production and economic resources around the world. These impacts can in turn exacerbate risks from conflict, migration, and humanitarian crises abroad, with implications for the UK. The main risks arising for the UK from climate change overseas are through impacts on the food system, economic interests abroad, and increased demand for humanitarian aid.
- The high-level climate risk assessment undertaken by ARUP to inform this strategy concluded that Belfast is already suffering as a result of climate hazards- that extreme weather is impacting Belfast's infrastructure and this impact is likely to significantly increase in the future. The vulnerability of existing infrastructure will be exacerbated with changing climate risks and is likely to involve more periods of extreme heat and winter rainfall. It recommended a comprehensive climate risk assessment is undertaken to inform a future Climate Plan for the city.

The importance of science based targets

Assessing climate risks to Belfast comprehensively has been difficult because of lack of available data and analysis. Unsurprisingly therefore, this strategy recommends that considerable work is undertaken swiftly, to understand the scale and nature of climate related risks, to inform how to make Belfast climate resilient. Research is also required to ensure science based targets inform our ambitions for decarbonisation.

Risk assessment is not just important to enable the city to prepare for climate change, it is critical to understanding economic risks. The Glasgow City Region's Risk Assessment identified that the annual economic cost of climate change in Glasgow City Region is estimated to be £400m each year by the 2050s; around 1% of current GVA . Given Belfast's existing level of economic resilience, the city can ill-afford to be unprepared for an equivalent level of GVA at risk.

2

An inclusive approach to climate planning

As the Committee on Climate Change noted, 'Low income households are particularly susceptible to climate change impacts, though they might also benefit the most from the positive implications of climate change.

> "NI has the highest proportion of properties at risk of flooding that are in deprived areas (27%)."
>
> CCRA 2017, NI Summary Report t

For this reason, it is critical that climate adaptation and mitigation targets are genuinely inclusive and aim to ensure the most vulnerable are protected, and that the economic benefits from decarbonisation are felt by those most impacted by fuel poverty. A core aim of any climate mitigation plan must be a significant reduction, or virtual elimination of fuel poverty.

Furthermore, given the level of interest in the issue of climate change by the city's children and young people, it is critical that city-wide climate planning is participative and includes their voices and opinions on the future of their city.

Effective structures already exist across the city to build and sustain community resilience, and effective resourcing of these partnerships will be critical into the future. The Regional Community Resilience Group (RCRG) was formed in 2013 to help local communities prepare for and respond to weather related emergencies. The group which the Department for Infrastructure co-chairs with local government works collaboratively to bring together Multi-Agency Partner Organisations from government, utilities and the voluntary sector to work for and with Communities at risk of severe weather. Belfast City Council is a key partner on this group through their Emergency Planning Team and have played an essential role in engaging with a number of communities in Belfast in recent years helping them to become more resilient to the impacts of severe weather.

A net zero carbon roadmap for Belfast

The Belfast Climate Commission, a partnership between Belfast City Council and Queen's University Belfast is committed to ensuring a science based approach to climate planning across the city. Working with Leeds and Edinburgh, Belfast's first Net Zero Carbon Roadmap has been produced, to identify the sources of Scope 1 and 2 emissions, and to set out cost effective and innovative stretch measures needed to reach net zero carbon by 2050.

The document concludes the following:

- Belfast's share of the global carbon budget- to keep to 1.5 degrees of warming is 16 million tonnes of $C0^2$.
- Belfast is emitting 1.5 million tonnes of carbon a year. At this rate, the city will have used up its carbon budget by 2030.
- Belfast's carbon emissions have declined by 42% since 2000, but this needs to be increased to an 80% reduction by 2030, and a 100% reduction by 2050.
- Targeted measures in transport and housing would make significant progress towards the 2030 target, reducing the city's energy bill by £286m a year, boosting employment in the city. These cost effective measures are set out in detail in the report.
- Innovative stretch options are also outlined, demonstrating the transformation that is required and possible, to achieve net zero emissions by 2050.

> "I am delighted that Belfast has a resilience strategy to address global challenges. I commend Belfast City Council for including the voices of local people throughout the consultation phase and look forward to seeing the positive impact the strategy will have on the lives of people in Belfast."
>
> Michele Bryans,
> EastSide Greenways Manager, EastSide Partnership, Belfast

Developing a climate plan for Belfast

Cities that are climate resilient- ready for the impact of climate change- are those which have developed a comprehensive approach in an integrated and joined-up way. The Community Planning Partnership model for Belfast is the right model through which to build a city-wide collaboration of agencies and organisations to help plan the city's preparedness for climate change and to drive decarbonisation.

The city's Resilience and Sustainability Board is working collaboratively to ensure the following:

- A single adaptation and mitigation plan is developed, using comprehensive risk assessment and science based targets to ensure robust commitments, including targets for arriving at net zero carbon as a city, and agreeing a carbon budget.
- That adaptation strategies are joined up with emergency planning structures in the city, and with NI wide targets and strategies and with city region strategies
- That future strategic developments in the city are informed by climate adaptation and mitigation targets
- That the recommendations from the Committee on Climate Change regarding NI's emissions are heeded; for example, to significantly improve levels of tree planting; to find ways to incentivise transition to low-carbon heating of homes and retrofit of housing stock; more rapid deployment of electric vehicles, tighter conventional vehicles standards, and transport behaviour change.
- Fundamentally, a city-wide climate adaptation and mitigation plan, developed in partnership with the city's statutory community partners and others should result in a comprehensive series of commitments to prepare for climate change and to decarbonise. This should inform and influence decisions on strategic developments in the city. As the Committee on Climate Change notes 'The cost-effective path to decarbonisation in NI requires action across all sectors of the economy and a joined-up approach.'

Conclusion

The effects of climate change on Belfast will be profound. A comprehensive risk assessment is urgently required to better understand the economic, social and environmental risks expected for Belfast at a local level, to enable effective adaptation planning.

Climate change represents the biggest medium term risk to the city of Belfast - to its people and its economy. Given our levels of economic resilience, the scale and nature of spatial division in the city, levels of fuel poverty and deprivation, Belfast's resilience is dependent on how we prepare. A step change is now required across a range of city partners to develop a comprehensive climate adaptation and mitigation plan, which will include science based targets and aim to achieve an inclusive approach to decarbonisation. While the net effects of climate change are not sufficiently understood, it is highly likely that there will be economic upsides to decarbonisation, and therefore this is a once in a generation opportunity to radically reduce fuel poverty and help drive inclusive growth.

2

HOUSING SUPPLY IN THE CITY

Economically resilient cities tend to have vibrant city centres, which act as economic drivers for the rest of the city, while also being a focal point for culture, tourism and connectivity. Climate resilient cities are increasingly investing in greater levels of densification within city centres to reduce urban sprawl and remove dependency on carbon intensive forms of travel.

Belfast's city centre has experienced a revival in recent years with increased investment and regeneration. The development of a Regeneration and Investment Strategy has made the city centre an area of strategic focus, and has resulted in masterplanning of strategic sites in the city, e.g. Belfast Inner North West, and the Linen Quarter. Importantly, targets to increase the 'rates base', are intended to enable further investment in the city. Furthermore the city council established a city centre Investment Fund to identify strategic opportunities to develop the city. This has boosted Belfast's economic resilience and made it much more capable of being prepared for shocks in the future.

A step change in the city's resilience would be achieved by the development of residential housing at scale in the city core. Prioritised as an area of focus in the Belfast Agenda, the city's community plan, a new generation of housebuilding would transform Belfast city centre and complement existing ongoing regeneration and development.

Progress in recent years in this area has been too slow- with just 103 new homes completed in the city in 2019/20. This pace of completions significantly undermines Belfast's competitiveness and reduces opportunities for sustainable economic growth. Thriving cities need a ready supply of people living in the city core to contribute to a mixed economy and to make the city an attractive place to visit and invest.

While the existing economic headwinds for Belfast make large-scale residential development challenging, land values in Belfast are competitive, relative to other UK city centres. The right housing product at the right point in the economic cycle could prove successful. Examples from other cities include creative use of public subsidy (land or finance) through joint ventures with private or social partners to build at scale. Financial models might include borrowing against future receipts to fund a greater number of products, including shared ownership or 'key worker' housing.

Social and affordable housing need

Lack of supply in the city core represents just one of several city-wide housing challenges. Social housing comprises almost 25% of all housing in the city, and therefore plays an important role in the city's economy, and contributes to the health and well-being of the population. However, housing need in Belfast has been consistently high in recent years, impacting the economic resilience of the city, with significant social consequences. Total applicants as at the end of September 2020 for Belfast City Council area is 11,288 with 8,545 applicants in housing stress. The 2019 Northern Ireland Housing Executive Investment Plan proposes a 'new build requirement' of 4,421 social homes from 2018-23 and intermediate housing demand of 550 for the decade from 2019.

Thriving, successful and inclusive cities require effective housing systems, that provide safe, decent and affordable housing for everyone. Belfast has a strong history of high quality, well-managed social housing provision. The city's future economic and climate resilience is therefore dependent on a supply of social and affordable housing, to ensure genuinely inclusive growth.

Conclusion

Significant success has been achieved in making Belfast city centre an attractive investment proposition and this has yielded results for the local economy and the city more generally. However the city's future economic resilience and sustainable levels of growth require a permanent city centre population. Housebuilding at scale, which gives priority to good design and includes family housing is critical to the economic resilience of the city.

A new generation of homes should include a mix of tenures to accommodate households on a range of incomes. Lessons should be learned from other cities that have successfully applied cross-subsidy models to build social, affordable, shared ownership and key-worker housing alongside market rent and market sale.

Furthermore, smart and low-carbon housing respectful of the city's existing built heritage which encourages and incentivises use of public transport, would have additional benefits to the city including reduced air pollution.

2

SEGREGATION AND DIVISION

The signing of the Belfast/Good Friday Agreement in 1998 was a milestone in the city's history. Since then, the creation of new institutions, implementation of key aspects of the peace agreement and dramatic reductions in conflict related violence in the city have created the conditions for a more resilient Belfast. As the Belfast City Council Good Relations Strategy for the city sets out, 'we have come a long way as a city over the past 20 years…but there is much more to be done'.

Existing levels of segregation in Belfast

It is important to state that conflict is no longer the overriding risk factor for Belfast. However, the legacy of conflict has manifested in division, which continues to directly impact on the city and to undermine its urban resilience.

- Division between communities remains prevalent with low levels of trust and high levels of residential, educational, physical and social segregation in many areas.
- Belfast contains the highest number of interface areas in the region where segregation remains high. Inter-community tensions are reducing but continuing. There are estimated to be around 97 security barriers and forms of defensive architecture across residential areas in Belfast.
- Many people within our society still think of Belfast in binary terms - of a society made up of two communities; Catholic and Protestant. In many ways this binary view and its influence on public service decision making has accentuated division in our society by duplicating services and hampering the connectivity between people and communities. (GR Strategy).
- Physical and psychological barriers between communities make travel around parts of the city difficult. This has resulted in people avoiding certain areas perceived to be unsafe.

In developing this strategy, the issue of division emerged repeatedly as a perceived inhibitor to the city's resilience. In our stakeholder engagement, many individuals contended that until Belfast was truly a connected city, we would continue to be vulnerable to many risks.

> "We have come a long way as a city over the past 20 years…but there is much more to be done."

The data bears this out. Several studies exist that demonstrate that conflict in cities significantly lowers their overall resilience to key risks- such as climate-related impacts, or food security. The existence of conflict or the threat of conflict exacerbates shocks and stresses, often making them more complex or expensive to solve.

If the residents of Belfast continue to think, travel and live in a binary way- the city's ability to respond to significant risks is weakened considerably.

The provision of parallel services adds to the cost of public services, reducing capacity in the system to respond to unexpected shocks.

Crisis management tends to be less effective when systems are disjointed or separate. Resilience requires integrated systems and cities, where a single decision is rolled out universally and speedily.

When cities are well networked, capacity can be shared - sometimes human capacity- e.g. moving people across cities during times of extreme weather events.

This is made more difficult and sometimes more expensive in cities where residential segregation is prevalent.

Lack of trust between communities, particularly those living in close proximity, means they are less likely to support each other - this adds to a city's vulnerability in times of crisis.

Conclusion

Belfast's resilience is weakened because unlike other cities, it is not a socially cohesive unit. Yet cohesion and integration are critical in a crisis. Furthermore, separation reduces efficiency and wastes resources. For example, thousands of additional journeys are taken in Belfast each day because of its separate education system. In such a carbon intensive and car oriented city, this significantly adds to our CO2 emissions and makes responding to climate change more difficult, and potentially more expensive.

Climate change will present profound risks to all cities globally, during this century. Cities that can build their capacity to maintain essential services, recover from shocks and continually adapt are more likely to survive. Divided cities will be much more exposed to risk.

It is not a coincidence that Belfast's Resilience Strategy and its Good Relations Strategy have both prioritised 'connectedness' as a major problem to be solved. If Belfast is to thrive in the face of unexpected challenges, it must do so as a united, socially cohesive city.

2

MENTAL ILL-HEALTH

A healthy city is a resilient city. An abundance of data now exists that proves that cities that invest heavily and consistently in health and wellbeing of their populations - particularly in their children and young people - feel the benefits beyond social impacts, but also on their economic performance over the longer term. The Belfast Agenda rightly prioritises the reduction in health inequalities and encouragingly, the city's community planning structures are focusing attention on a range of health related urban 'problems' for example on reducing avoidable winter deaths.

We have identified the issue of mental ill-health and use of prescription drugs as a major challenge for Belfast because of the regularity in which it emerged in our discussions with city partners.

In fact, the issue of mental ill-health was one of the most talked-about issues by stakeholders across the entire development of this strategy. It was just as likely to emerge in discussions on the economy as it was in discussions on societal challenges. Perhaps this should not be a surprise.

There is now a growing body of research examining the impact of cities on levels of anxiety and mental health. In 2019, Europe's first 'Urban Psychology Summit' was held to explore the links between urban renewal policy choices and serious mental and physical health impacts.

Four key findings emerged:

- Experience of place determines much of our development and wellbeing, and we should not separate the policies for one from the other.
- The discipline of psychology is missing from public policy debates and decisions at a city level.
- Cities have the unique potential to support the development of a positive shared identity for its population.
- Given rapidly rising urbanisation and worsening mental health, a stronger focus should be urgently placed on understanding more about the psychological impact of place upon people, and people upon place.

This emerging research suggests that Belfast is not alone in experiencing increased levels of anxiety and mental-ill health among its population. In developing this strategy, stakeholders repeatedly emphasised their perception of a prevalence of mental illness across all age groups.

Prescription drugs are also playing a role in making some people less healthy, rather than more so.

> "A growing number of young children presenting with anxiety, stress and in some cases trauma."

These two areas of focus featured overwhelmingly in our conversations with health and social care professionals.

Belfast's mental health challenges

Data on mental health points to a significant challenge for the city and its people.

- NI has a suicide rate of 24.8 for men and 7.6 for women (2014-18). For Belfast LGD rates were 39.6 for men and 11.2 for women (all per 100,000 population).
- Since the 1990's the absolute number of deaths from suicide in NI have increased from around 151 to 197 (2019 Provisional). In Scotland, they have decreased by a quarter from 912 in 1993 to 680 now.
- Belfast LGD has the highest overall suicide rate of any of the LGD's in NI (Source: NI Health & Social Care Inequalities Monitoring System)
- Anecdotal evidence from our conversations with practitioners across the city would suggest that people are presenting to health and social care services with anxiety, stress or more serious forms of mental-ill health at an increasingly younger age.
- One organisation reported that a recent review of their case files demonstrated a growing number of young children presenting with anxiety, stress and in some cases trauma.
- One-to-one conversations with mental health practitioners confirmed their view that Belfast is experiencing growing levels of mental ill-health, and a small number suggested further work is required to understand the relationship between today's presentations and the conflict.

USE OF PRESCRIPTION DRUGS

Data on dispensing of medical prescriptions paints a worrying picture of the health and well-being of the population.

In 2018, for a city with a population of 341,900 people, 8 million prescriptions were dispensed- an average of 23 prescriptions per person across the city. This figure is 9% higher than in 2012.

Drugs related deaths are also on the increase. In 2017, 136 people died as a result of drug taking, an increase of 60% on the decade before. Men are much more likely than women to die as a result of drug taking.

Health outcomes for drug-related mortality, male life expectancy at birth and teenage births were much worse than the NI average. The gap is also widening between the most deprived and least deprived areas of Belfast in relation to drug related mortality, smoking during pregnancy and respiratory admissions.

The NI Outcomes Framework monitors the self-efficacy scores of the population as a measure of confidence. Self-efficacy is a person's beliefs about their capability to produce results or effects. Those with high self-efficacy have confidence in their abilities and produce sustained efforts to achieve goals. Those with low self-efficacy often doubt their capabilities, are less ambitious and give up on their aims when challenged.

In Belfast, half of our Year 9-12 pupils have low self-efficacy but are satisfied with their life (2019). This is significantly larger than it was on 2016 and worrying that so many children are lacking in confidence.

Conclusion

Belfast is already a World Health Organisation Healthy City and considerable progress continues to be made to improve health outcomes for its population. Because of the dominance of the issue of mental ill-health and prescription drug use in our workshops, and what the data suggests, we have highlighted the issue as a major challenge. Furthermore, there is a strong case for better understanding the impact of cities and indeed of place on our mental health, and greater involvement of the discipline of psychology in how we design, plan and manage our city.

2

THE GOVERNANCE AND FINANCING OF RISK

Stable governance is an essential prerequisite for any resilient city. Compared to some global cities where decision-making is marred by conflict or corruption, Belfast has well-defined political and administrative structures, underpinned by law, and with modern modes of accountability.

However, the complexity of challenges faced by cities demands governance in which comprehensive policy reform, supported by strategic long-term financing is the norm, and whereby the relationship between central and local government is mature and collaborative. These characteristics are not sufficiently in place in NI, which leads to significant implications for its regional capital.

The 2019 Competitiveness Study commissioned by Belfast City Council made a number of prescient comments regarding growth in the city. 'It is difficult to quantify the impact that NI's governance structures (and indeed lack thereof) have on Belfast's competitiveness but it is evident that other competitor cities, with a larger arsenal of policy levers, have delivered faster growth across key competitiveness areas.

This section examines the particular characteristics of governance in Belfast and makes some observations intended to improve the governance and financing of risk.

- Governance in NI is more regionally centralised than other parts of the UK. From a city perspective, this is particularly relevant, as resilient cities require robust urban policy- with clear strategic objectives and the levers to deliver them. In NI, a much greater range of responsibilities sits at central government level when compared with powers of local authorities in England, Scotland and Wales. Strategy and delivery is spread across a range of arm's length bodies, usually working to a regional remit. Further devolution of powers from central government to local government has been slow, and inhibits real partnership and collaboration between central and local government, which is often necessary to unlock external investment at a city level. The draft Programme for Government (2016-2021) contains just one proactive 'city policy' - an ambition to strengthen Belfast as the regional economic driver but is not accompanied by a tangible plan. The draft PfG outcomes framework are lacking indicators at a city level, and no single government department or body has responsibility for cities. Furthermore, the 'New Decade, New Approach' document, agreed by the political parties as part of the re-establishment of the Northern Ireland Executive in 2020, made no specific references to distinct governance arrangements for cities. However, it did contain several welcome references to City Deals, which in some parts of the UK have led to significant additional powers being devolved to city level structures. Nevertheless, urban policy in NI is immature and ill-developed. This, coupled with a highly centralised system of governance, and a fragmented spread of powers and obligations across arm's length bodies, makes the building of Belfast's long term resilience more challenging.
- Lack of urban policy was, for some time, compounded by the long-term absence of Executive government in NI. A recent report by the Institute of Government examined some of the implications for NI of governing without ministers. It noted the work of the Northern Ireland Civil Service in carrying out departmental functions and running public services on a day-to-day basis. However, it was definitive in its assessment that long term public sector reform is virtually impossible without Ministers, pointed to a growing list of outstanding policy decisions and concluded that it is the people of NI who suffer the consequences of a lack of political leadership.
- The return of Executive government in January 2020 has enabled several major policy programmes to be reconsidered by ministers. However, at the time of writing, several of immediate priorities agreed for 2020 remain unimplemented. Nevertheless, the response of the NI Executive to COVID-19 has demonstrated what can be achieved through coherent, cross-Executive planning and implementation.
- The length of the suspension hampered long term reform, and NI is likely to be impacted by this, for several years to come, when it was needed. Several of the 'shocks and stresses' identified in this strategy have emerged or been accelerated due to lack of public service reform in NI or due to how services and infrastructure are financed (see below). Tackling these issues will require long term vision, collaboration between central and local government and the private and NGO sectors, and a shift in risk appetite to enable untried policy reform to commence. Ensuring a resilient recovery from the economic and social impacts of COVID-19, coupled with the effects of the UK's decision to leave the EU requires systemic, cross government planning of the long-term implications of a reformed relationship with the European Union and the long-term trading relationship between NI and the rest of the world. Without ministers, substantive decisions on how NI transitions to a low-

carbon economy have not commenced, whereas regions and cities elsewhere are gaining competitive advantage from large scale investment in innovation.

- However, it should be noted that policy reform, even when ministers are in place, is often difficult. As the IoG notes, 'the politics of NI and its distinctive constitutional arrangements militate against effective policy making on long-term issues.' These particular characteristics of NI's governance potentially weaken our resilience to stresses over the long term and may incentivise 'shortermism'. There is therefore a strong case for reviewing and reforming how difficult, complex and contentious decisions are made - at a regional and a city level. Some regions and cities have identified new structures, such as citizens assemblies to make recommendations to government on contentious issues. In other instances, independent commissions are established to focus on a particular complex issue. In the long term, when ministers are returned, new structures to aid and advise them through difficult policy decisions, and preferably with a strong civic voice, are needed. Lessons should be learned from other countries that have prioritised the development of a vibrant policy community and strong civic participation.
- Despite the difficulties associated with power sharing and during the suspension of the Northern Ireland Executive, political parties continued to work together effectively at local government level. Councils across NI have been developing and delivering community plans - critical documents to inspire and drive cross agency collaboration at a city-wide level. In Belfast, the Community Planning Partnership has taken strong ownership of the Belfast Agenda, and meaningful collaboration is taking place across agencies on issues relevant to the city. For example, the Living Here Board is currently progressing a cross-agency project to reduce winter deaths in the city. This sharing of risk and reward has also been seen working very effectively across local councils in the Belfast city region, working collaboratively with universities and colleges to successfully bid for a Belfast Region City Deal, which could leverage £1bn in funding across the city region.
- The affordability of building resilience is a major challenge for the city, though Belfast is not alone in struggling to finance future risks. In its 2019 Risk Report, the World Economic Forum warned that 'Robust risk financing strategies will be required, both to fund investment in adaptation and to pay for recovery when floods occur'.

However, as has been documented, some of the risks to the city of Belfast are not currently solvable at a city-level, because governance and finance is centrally held. The city is reliant on NI central government to develop funding models for infrastructure. If Belfast is to succeed in meeting those highly complex challenges, the city and the NI Executive must work in partnership to find new forms and models of finance as other cities have done. Councils are increasingly reliant on the district rate for their funding, and this fact should be reflected in the decisions taken on future financial structures.

The 'New Decade, New Approach' document makes a welcome commitment to a multi-year budget to underpin a multi-year Programme for Government. However, whether this results in the kind of reformed approach to long term planning necessary, remains to be seen.

- Improvements to how government is financed should include reform of the existing 'short-termism' applied to financing at a regional level. Unlike in the UK where three-to-five year spending rounds are the norm, NI departmental allocations are chiefly managed on an annual basis. This has obvious implications for how major programmes are designed and delivered.
- Perhaps most challenging and importantly of all are the decisions to be made in how major long term infrastructure is funded. This must be a major area of priority for the Executive and must include local government as a partner in the process. The Institute of Government report makes an interesting, if controversial, point regarding the level of regard shown to value for money in NI. It points to examples of where NI has continually extracted finance from the UK taxpayer or the EU and suggests this readiness to accept external funding disincentives difficult decisions from being taken. Whatever the reasons for not having well planned financial models in place, as levels of infrastructure investment increasingly become a chronic risk for the city, decisions must be taken on how best to make up the shortfall, while also building in resilience for the future. This is a major risk for the future, and must be tackled urgently.
- The development of this strategy has identified a number of areas of risk which could be dealt with effectively at a city level. Stronger city-wide economic levers would be beneficial in enabling the city to plan for its future. The RSA's City Growth Commission concluded that 'innovative, competitive and resilient economies are built on stable institutions that engender trust between trading partners, encourage investment in infrastructure and public services, and build socially productive communities'. This is a complex area and will require collaboration across central and local government and agencies, e.g. the Department for Infrastructure, Belfast City Council, Northern Ireland Water, Translink etc. At the very least, agencies and organisations in Belfast should work together to arrive at a single figure for the cost of building the necessary infrastructure to make the city resilient for this century, and identify the 'GDP at Risk' figure of not funding it

2

effectively. They should then work together with the NI Civil Service to explore and identify new financial models that would encourage investment in long term infrastructure and other necessary capital projects, in a coordinated and joined up way.

- Thinking beyond NI's internal partnerships, the decision of the UK to leave the EU re-emphasises the importance of 'city to city diplomacy' for Belfast. The quality of its relationships with other cities in Europe and globally will be a key determinant of its potential to attract investment, encourage trade and build partnerships. Its membership of Eurocities, and of the Resilient Cities network is important, and so too is its 'sister cities' programme, however this work must be brought to the fore as a core driver of its growth strategy. There is sufficient global research, from the OECD and elsewhere to make the case for a focus on cites to be driven by central government. The Northern Ireland Executive should take greater responsibility for the future of its cities and design a new form of governance to drive collaboration between NICS, Belfast City Council and agencies across the city. This should inspire a renewed focus on how cities have enormous potential to be engines of sustainable growth and places for innovation, creativity and well-being.

Conclusion

Governing a post-conflict city with continued high levels of segregation is a daily challenge, and therefore continuity of stable local government in this context should be considered a success. However, Belfast's governance needs to be increasingly designed for future challenges- and for dealing with complex challenges that are taxing all cities, such as sustainable recovery from the effects of the COVID-19 pandemic, climate change, energy transition and creating a low-carbon economy. There is a strong case for reviewing and enhancing the powers and obligations of local government to ensure they are fit for purpose given the complex challenges ahead.

Robust urban policy is needed at Northern Ireland Executive level if Belfast is genuinely to be a driver for sustainable economic growth not just at city level, but at city region level.

Long term financial planning and new financial models for funding city infrastructure are critical if Belfast is to be genuinely resilient to climate change and to future economic cycles. A review of investment opportunities should be undertaken to explore opportunities for funding infrastructure at a city level, potential partnering with local government and new accountability frameworks.

Agencies and organisations in Belfast should work together to arrive at a single figure for the cost of building the necessary infrastructure to make the city resilient for this century, and identify the 'GDP at Risk' figure of not funding it effectively. They should then work together to explore and identify new financial models that would encourage investment in long term infrastructure and other necessary capital projects, in a coordinated and joined up way.

3

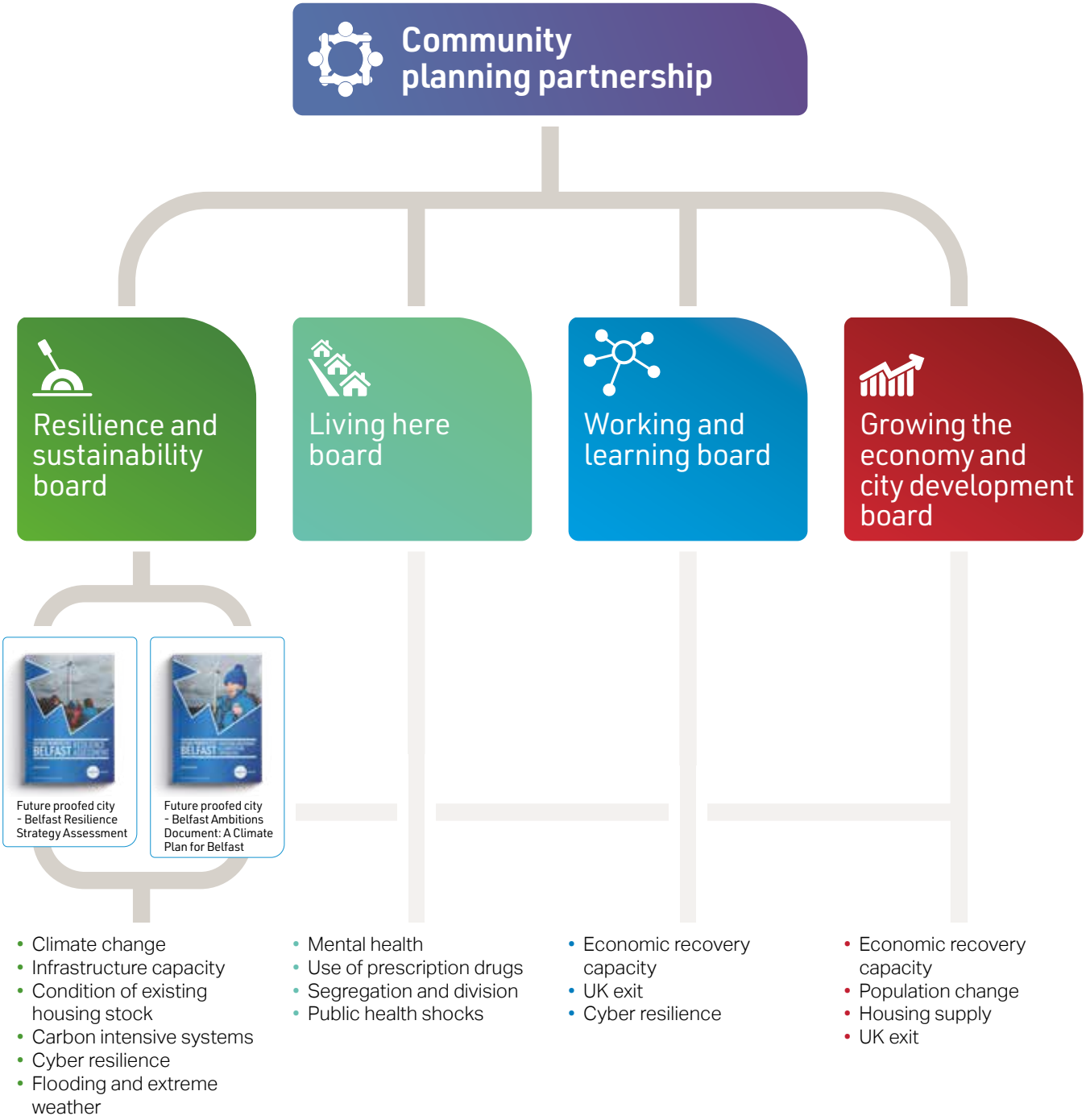
NEXT STEPS

The shocks and stresses outlined in the Resilience Assessment identify a range of risks to the city of Belfast. The Community Planning Partnership Board will oversee how these risks are managed, collaboratively, into the future.

This document will be reviewed and revised every two years, based on available official data and inclusive engagement across city partners. The process will be overseen by the Resilience and Sustainability Board, with support from officers in Belfast City Council. Each board will take forward the management of specific 'shocks and stresses' as set out below. In a small number of cases, responsibility sits across both boards.

The issue of 'Poverty and Inequality' being central to the Inclusive Growth ambition within the Belfast Agenda, will remain a core responsibility of the Community Planning Partnership Board.

To make contact with the team at Belfast City Council, email resilient@belfastcity.gov.uk



SOURCES OF INSPIRATION

SOURCES OF INSPIRATION: BIBLIOGRAPHY

EU Exit, Long-term Economic Analysis (November 2018).
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/760484/28_November_EU_Exit_-_Long-term_economic_analysis__1_.pdf

The Economics of Low Carbon Cities, A Mini-Stern Review for the Leeds City Region (2019). Andy Gouldson, Niall Kerr, Corrado Topi, Ellie Dawkins, Johan Kuylenstierna, Richard Pearce.
https://www.sei.org/publications/the-economics-of-low-carbon-cities-a-mini-stern-review-for-the-leeds-city-region/

Matrix Digital ICT Report Foresight and Horizon Scanning (2016).
https://matrixni.org/wp-content/uploads/2016/03/2016-Matrix-Digital-ICT-Report.pdf

Using a Resilience Lens to make a more Resilient Economy, Greater Manchester (2019). Tom Lindsay, John White, Alex Ryan Reviewer: Braulio Eduardo Morera.

Analysing Baseline Data Around Peace Walls (4): Who are the people? (2017)Cathy Gormley-Heenan, Duncan Morrow, Jonny Byrne, Michael Rosato and Sally Cook.
https://www.community-relations.org.uk/publications/analysing-baseline-data-around-peace-walls-4-who-are-people-0

Analysing Baseline Data on Peace Walls (5): Exploring the Socio-economic, education and employment factors Institute for Research in Social Sciences (IRiSS) (2017). Jonny Byrne, Cathy Gormley-Heenan, Duncan Morrow, Michael Rosato and Sally Cook.
https://www.community-relations.org.uk/publications/analysing-baseline-data-peace-walls-5-exploring-socio-economic-education-and-employment

Analysing Baseline Data on Peace Walls (6): Implications for policy (2017). Duncan Morrow, Cathy Gormley-Heenan, Jonny Byrne, Michael Rosato and Sally Cook
https://www.community-relations.org.uk/publications/analysing-baseline-data-peace-walls-6-implications-policy

Belfast Region City Deal - Industrial Strategic Framework (2018).
https://minutes3.belfastcity.gov.uk/documents/s72693/Appendix%202%20BRCD_Industrial%20Strategic%20Framework.pdf

Sectarianism in Northern Ireland: A Review (2018).
https://www.ulster.ac.uk/__data/assets/pdf_file/0016/410227/A-Review-Addressing-Sectarianism-in-Northern-Ireland_FINAL.pdf

AI in the UK: ready, willing and able? Select Committee on Artificial Intelligence, House of Lords (2018).
https://publications.parliament.uk/pa/ld201719/ldselect/ldai/100/10002.htm

DSD/NIHE Asset Commission Summary Report (2015). Department for Social Development and the Northern Ireland Housing Executive.

Attitudes to Peace Walls, Research Report to the Office of the First and Deputy First Minister (2012).
https://www.ark.ac.uk/peacewalls2012/peacewalls2012.pdf

Carbon Accounts and the Scope for Low Carbon Development Belfast, Can Do Cities (2019).
http://www.candocities.org/sites/default/files/Belfast.pdf

Belfast Infrastructure Study, Belfast City Council, ARUP (2018).

The UK's EU Withdrawal Agreement, Briefing Paper 08453 (2018).
https://researchbriefings.parliament.uk/ResearchBriefing/Summary/CBP-8453

Business on a Connected Island (2018).
https://www.bl.uk/collection-items/cbisc-business-on-a-connected-island-2018

Child Centred Resilience Framework (2016).
https://www.arup.com/perspectives/publications/research/section/child-centred-urban-resilience-framework

Cities, Prosperity and Influence. The role of city diplomacy in shaping soft power in the 21st century, Jo Beall and David Adam (2017).
https://www.britishcouncil.org/sites/default/files/g229_cities_paper.pdf

Cities Alive, Designing for Urban Childhoods (2017).
https://www.arup.com/perspectives/publications/research/section/cities-alive-designing-for-urban-childhoods

Powers to Grow: City Finance and Governance (2014).
https://www.thersa.org/discover/publications-and-articles/reports/powers-to-grow-city-finance-and-governance

People Powered Money, Designing, Developing & Delivering Community Currencies (2015).
https://neweconomics.org/2015/05/people-powered-money

Cost to make Dwellings in Northern Ireland more Energy Efficient (2019).
https://www.nihe.gov.uk/index/corporate/housing_research/house_condition_survey.htm

City Resilience Profiling Tool, UN Habitat (2018).
http://urbanresiliencehub.org/wp-content/uploads/2018/02/CRPT-Guide.pdf

Do councils have a duty to consider climate change? Ends report 530 (2019).

Domestic Consumer Insight Tracker 2018/19. Utility Regulator (2019).
https://www.uregni.gov.uk/sites/uregni/files/media-files/Domestic%20Consumer%20Insight%20Tracker%202018%20Summary%20Final.pdf

Draft Good Relations Strategy (2018).

Draft Northern Ireland Children and Young people Strategic Partnership, Plan 2019-2021 (2019).

Economic Resilience: A new set of vulnerability indicators for OECD countries (2015).
https://www.oecd-ilibrary.org/economics/economic-resilience-a-new-set-of-vulnerability-indicators-for-oecd-countries_5jrxhgjw54r8-en

Why Local Authorities should Prepare Food Brexit Plans, Tim Langa, Erik Millstoneb, Tony Lewisc & Gary McFarlaned (2018).
https://www.reading.ac.uk/foodlaw/pdf/2018-Food-Research-Brexit-LAs.pdf

Our Resilient Glasgow, A City Strategy (2016).
https://www.understandingglasgow.com/assets/0003/7198/Our_Resilient_Glasgow_Strategy.pdf

Electricity Sector in Northern Ireland, third report of session 2016-17 (2017).
https://publications.parliament.uk/pa/cm201617/cmselect/cmniaf/51/51.pdf

House Conditioning Survey, main report, Northern Ireland Housing Executive (2016).
https://www.nihe.gov.uk/Working-With-Us/Research/House-Condition-Survey

The Rise of Innovation Districts: A New Geography of Innovation in America, Bruce Katz and Julie Wagner, Introducing Innovation Districts (2014).
https://www.brookings.edu/wp-content/uploads/2016/07/InnovationDistricts1.pdf

This is a Crisis Facing up to the Age of Environmental Breakdown, Laurie Laybourn-Langton, Lesley Rankin and Darren Baxter (2019).
https://www.ippr.org/files/2019-02/this-is-a-crisis-feb19.pdf

Next Generation Northern Ireland, British Council (2018).
https://www.britishcouncil.org/sites/default/files/next_generation_ireland_northern_ireland_2018_report_final_web_v2.pdf

Removing Peace Walls and Public Policy Brief (1): the challenge of definition and design Cathy Gormley-Heenan, Duncan Morrow and Jonny Byrne (2015).
http://uir.ulster.ac.uk/32566/1/Policy_Brief_1_(2015).pdf

Local Development Plan, Belfast, technical supplement 9, flood risk (2018).
https://www.belfastcity.gov.uk/buildingcontrol-environment/Planning/ldp-plan-strategy.aspx

Leading Cities, global review of city leadership, Elizabeth Rapoport, Michele Acuito, Leonora Grcheva (2019).
http://discovery.ucl.ac.uk/10069076/1/Leading-Cities.pdf

Manchester City Council's Climate Change Delivery Plan 2010 - 2020, The Council's contribution to Manchester - A Certain Future.
https://secure.manchester.gov.uk/info/500002/council_policies_and_strategies/3833/climate_change/3

Resilient Medellin, a strategy for our future (2017).
https://www.100resilientcities.org/wp-content/uploads/2017/07/Medellin-English-PDF.pdf

National Climate Projections, UKCP18, Jason A. Lowe, Dan Bernie, Philip Bett, Lucy Bricheno, Simon Brown, Daley Calvert, Robin Clark, Karen Eagle, Tamsin Edwards, Giorgia Fosser, Fai Fung, Laila Gohar, Peter Good, Jonathan Gregory, Glen Harris, Tom Howard, Neil Kaye, Elizabeth Kendon, Justin Krijnen, Paul Maisey, Ruth McDonald, Rachel McInnes, Carol McSweeney, John F.B. Mitchell, James Murphy, Matthew Palmer, Chris Roberts, Jon Rostron, David Sexton, Hazel Thornton, Jon Tinker, Simon Tucker, Kuniko Yamazaki, and Stephen Belcher, (2018).
https://www.metoffice.gov.uk/research/approach/collaboration/ukcp/index

Mission-Oriented Innovation Policy, Challenges and Opportunities, Mariana Mazzucato (2017).
https://www.ucl.ac.uk/bartlett/public-purpose/publications/2018/jan/mission-oriented-innovation-policy-challenges-and-opportunities

Northern Ireland Climate Change Adaptation Programme (2014).
https://www.daera-ni.gov.uk/sites/default/files/publications/daera/Northern%20Ireland%20Climate%20Change%20Adaptation%20Programme.pdf

2019 Energy Across the Authority, more examples of how local authorities are taking advantage of energy opportunities (2019).
https://www.apse.org.uk/apse/index.cfm/local-authority-energy-collaboration/apse-energy-publications1/energy-across-the-authority-2019/

Making Cities in Conflict Areas more Resilient, A conceptual iteration using climate resilience and security for policies in practice, Michel Rademaker, Karlijn Jans, Paul Verhagen, Aster Boeschoten, Hannes Rõõs & Stephan Slingerland (2018).
https://www.clingendael.org/sites/default/files/2018-05/Paper_Making_cities_in_conflict_areas_more_resilient_0.pdf

The Paris Agreement (2018).
https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement

New Decade, New Approach document (2020).
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/856998/2020-01-08_a_new_decade__a_new_approach.pdf

Northern Ireland Peace Monitoring Report, number four, Robin Wilson (2016).
https://www.community-relations.org.uk/sites/crc/files/media-files/NIPMR-Final-2016.pdf

The Challenge of Peace Building and Conflict Transformation: A Case Study of Northern Ireland, Kyiv-Mohyla Law and Politics Journal., (2), 117-128 (2016).
https://pure.qub.ac.uk/portal/files/112387464/Peace_Building_and_Conflict_Transformation.pdf

The Political Declaration on the Framework for Future EU-UK Relations, briefing paper 08454, (2018).
https://researchbriefings.parliament.uk/ResearchBriefing/Summary/CBP-8454#fullreport

CEOs' Curbed Confidence Spells Caution, 22nd annual global CEO survey (2019).
https://www.pwc.com/gx/en/ceo-agenda/ceosurvey/2019/gx.html

Planning for Spatial Reconciliation, Civic place-making in a divided society, draft one, Sterrett, K., Morrissey, M, Gaffikin, F, Karelse, C, Mulholland, C, (2015).

Reducing Emissions in Northern Ireland, committee on climate change (2019).
https://www.theccc.org.uk/publication/reducing-emissions-in-northern-ireland/

NS Live Case Series 2017, the Vejle resilience strategy, Jonas Kroustrup, Rachel Calleja (2017).
https://www.pgionline.com/wp-content/uploads/2017/08/Vejle-2017.pdf

The Resilience of a London Great Estate: urban development, adaptive capacity and the politics of Stewardship, Juliet Patricia Davis (2018).
https://www.tandfonline.com/doi/full/10.1080/17549175.2017.1360378

Resilient DC, A Strategy to Thrive in the Face of Change (2019).
https://resilient.dc.gov/

Resilient Cities Research Project, a Grosvenor report (2014).
https://www.resiliencefirst.co.uk/our-work/resources/resilient-cities-grosvenor-research-report

Rethinking the Smart City, Democratizing Urban Technology (2018).
https://www.urenio.org/2018/10/04/rethinking-smart-city-democratizing-technology/

National Development Plan, project Ireland 2040 (2018).
https://www.gov.ie/en/policy-information/07e507-national-development-plan-2018-2027/

Impacts, the Future of Global Real Estate, Savills (2019).
https://www.savills.com/impacts/Savills_Impacts_2019_download.pdf

Smart City Resilience: Digitally empowering cities to survive, adapt, and thrive (2017).
https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights/smart-city-resilience-digitally-empowering-cities-to-survive-adapt-and-thrive

The State of Ireland 2019, A review of housing and infrastructure in Ireland (2019).
http://engineersireland.ie/communications/state-of-ireland-2019.aspx#

The Rise of Innovation Districts: A New Geography of Innovation in America, Bruce Katz and Julie Wagner (2014).
https://www.brookings.edu/essay/rise-of-innovation-districts/

The Global Outlook, Speech given by Mark Carney Governor of the Bank of England (2019).
https://www.bankofengland.co.uk/-/media/boe/files/speech/2019/the-global-outlook-speech-by-mark-carney.pdf?la=en&hash=6725EA590D46F11FBFDFF4744E4E90158D4BCECE

Electrifying Montréal, Transportation electrification strategy 2016-2020 (2016).
http://ville.montreal.qc.ca/pls/portal/docs/PAGE/PROJ_URBAINS_FR/MEDIA/DOCUMENTS/TRANSPORTATION_ELECTRIFICATION_STRATEGY_2016_2020_.PDF

Visit Belfast business plan 2019/2020 (2019).

Waking up in a Different Country: Brexit and Northern Ireland Cathy Gormley-Heenan, Arthur Aughey and Paula Devine (2017).
https://www.ark.ac.uk/publications/updates/update116.pdf

The Global Risks Report 2019, 14th Edition, World Economic Forum (2019).
http://www3.weforum.org/docs/WEF_Global_Risks_Report_2019.pdf

The Global Risks Report 2020, 15th Edition, World Economic Forum (2019).
https://www.weforum.org/reports/the-global-risks-report-2020

Supporting Wellbeing and Resilience in Belfast 2018-2021, making life better together (2018).
https://www.makinglifebettertogether.com/wellbeing-resilience/

World Happiness Report, John Helliwell, Richard Layard and Jeffrey Sachs (2017).
https://s3.amazonaws.com/happiness-report/2017/HR17.pdf

Agile Cities, preparing for the Fourth Industrial Revolution, World Economic Forum (2018).
http://www3.weforum.org/docs/WP_Global_Future_Council_Cities_Urbanization_report_2018.pdf

Governing without Ministers: Northern Ireland Since the Fall of the Power Sharing Executive, Institute for Government, (September 2019).
https://www.instituteforgovernment.org.uk/publications/governing-without-ministers-northern-ireland

EirGrid Group All-Island Generation Capacity Statement (2019-2028).
http://www.soni.ltd.uk/media/documents/EirGrid-Group-All-Island-Generation-Capacity-Statement-2019-2028.pdf

Northern Ireland Gas Capacity Statement (2019-20 to 2028-29).
http://gmo-ni.com/assets/documents/Transparency/NI-Gas-Capacity-Statement/Northern-Ireland-Gas-Capacity-Statement-2019-20-to-2028-29.pdf

Forecasts for the UK economy (October 2020)
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/928008/Forecomp_October_2020.pdf

World Energy Outlook 2020, International Energy Agency (IEA)
https://www.iea.org/reports/world-energy-outlook-2020#executive-summary

New Decade New Approach, January 2020
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/856998/2020-01-08_a_new_decade__a_new_approach.pdf

World Economic Forum, Global Risks Report 15th Edition, 2020
https://www.weforum.org/reports/the-global-risks-report-2020

DCMS Guidance on Consumer Protection and IoT, October 2018
https://www.gov.uk/government/publications/code-of-practice-for-consumer-iot-security/code-of-practice-for-consumer-iot-security

Northern Ireland Climate Change Adaptation Programme (NICCAP2), Sept 2019
https://www.daera-ni.gov.uk/publications/northern-ireland-climate-change-adaptation-programme-2019-2024

Urban Trees, Benefits and Planting Strategies, Belfast Million Trees Report, Perla Mansour, QUB, 2020

All-Island Generation Capacity Statement, 2019-2028, EIRGRID, SONI (transmission system operator for Ireland and Northern Ireland respectively)
http://www.eirgridgroup.com/site-files/library/EirGrid/EirGrid-Group-All-Island-Generation-Capacity-Statement-2019-2028.pdf

UK housing: Fit for the Future? Committee on Climate Change, Feb 2019
https://www.theccc.org.uk/publication/uk-housing-fit-for-the-future/

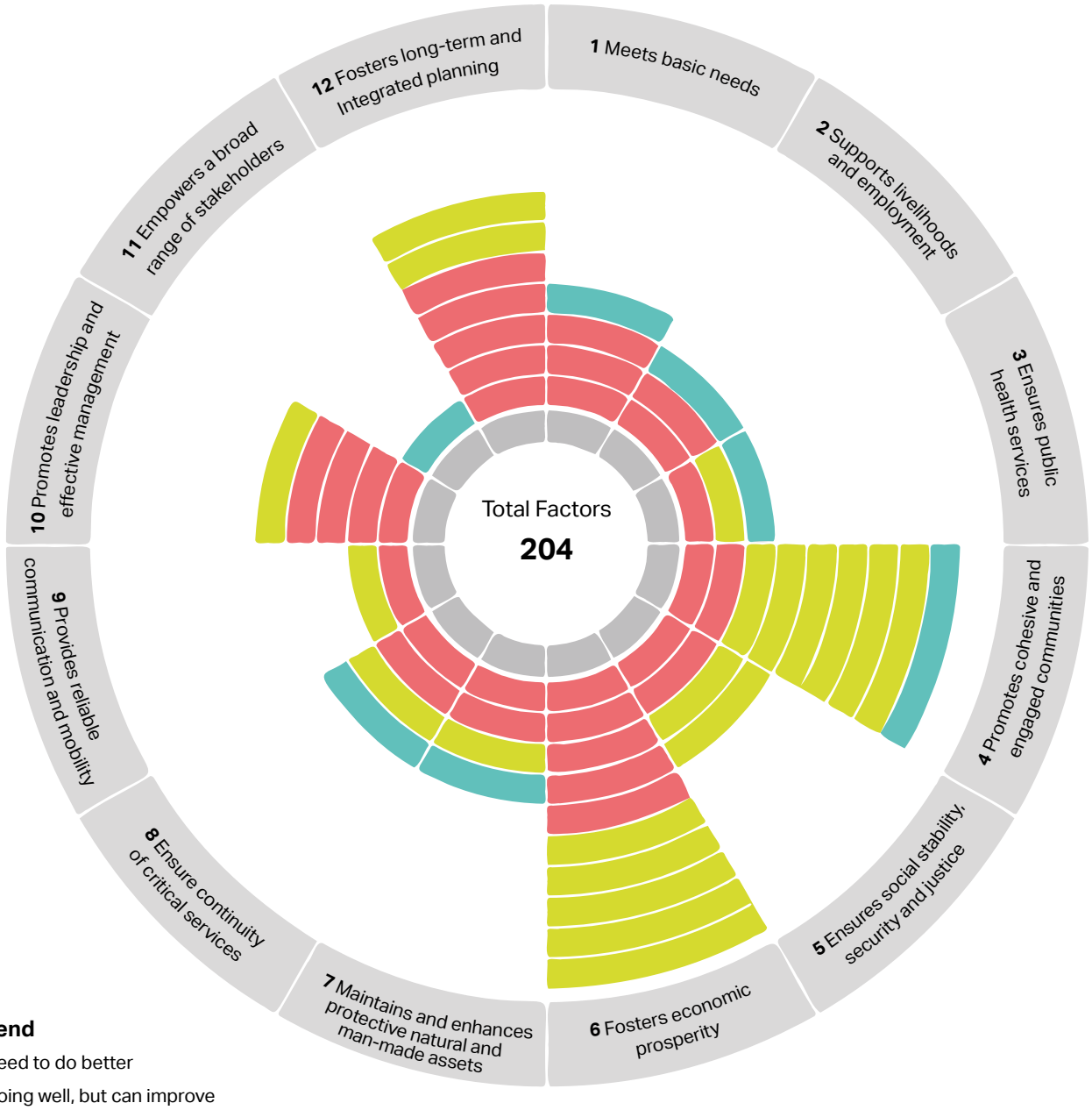
UK Climate Change Risk Assessment 2017 Evidence Report
https://www.theccc.org.uk/uk-climate-change-risk-assessment-2017/national-summaries/northern-ireland-2/

Ministerial Advisory Panel on Infrastructure (MAPI) – Report, October 2020
https://www.infrastructure-ni.gov.uk/publications/ministerial-advisory-panel-infrastructure-mapi-report

Housing Statement from Communities Minister Carál Ní Chuilín 3 November 2020
https://www.communities-ni.gov.uk/news/housing-statement-communities-minister-caral-ni-chuilin-3-november-2020

APPENDICES

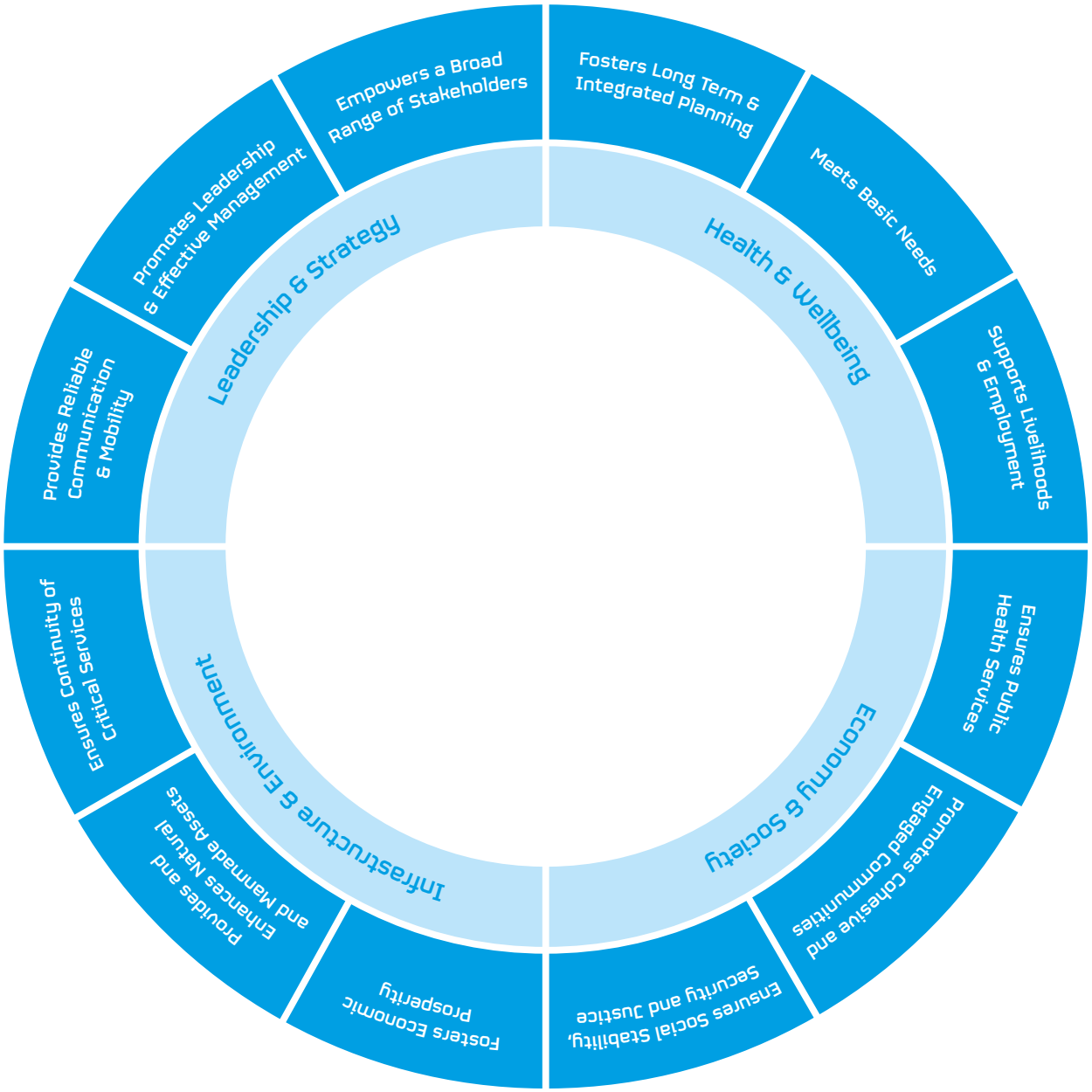
City Resilience Framework
identified areas of city resilience



Legend
- Need to do better
- Doing well, but can improve
- Area of strength

Each segment represents 3.6 factors

City Resilience Framework
identified areas of city resilience



As part of our commitment to promoting equality of opportunity and good relations, we want to ensure that everyone is able to access the documents we produce. This document is available in different languages and formats and we can provide others on request, please contact: Richard McLernon, Project Coordinator, Commissioner for Resilience on 028 9050 2091.

BCC 1100

Belfast City Council
City Hall
Donegall Square South
Belfast
BT1 5GS

www.belfastcity.gov.uk/resilientbelfast
resilient@belfastcity.gov.uk
028 9050 2091
@belfastcc
@belfastcitycouncil
Belfast City Council

Belfast City Council