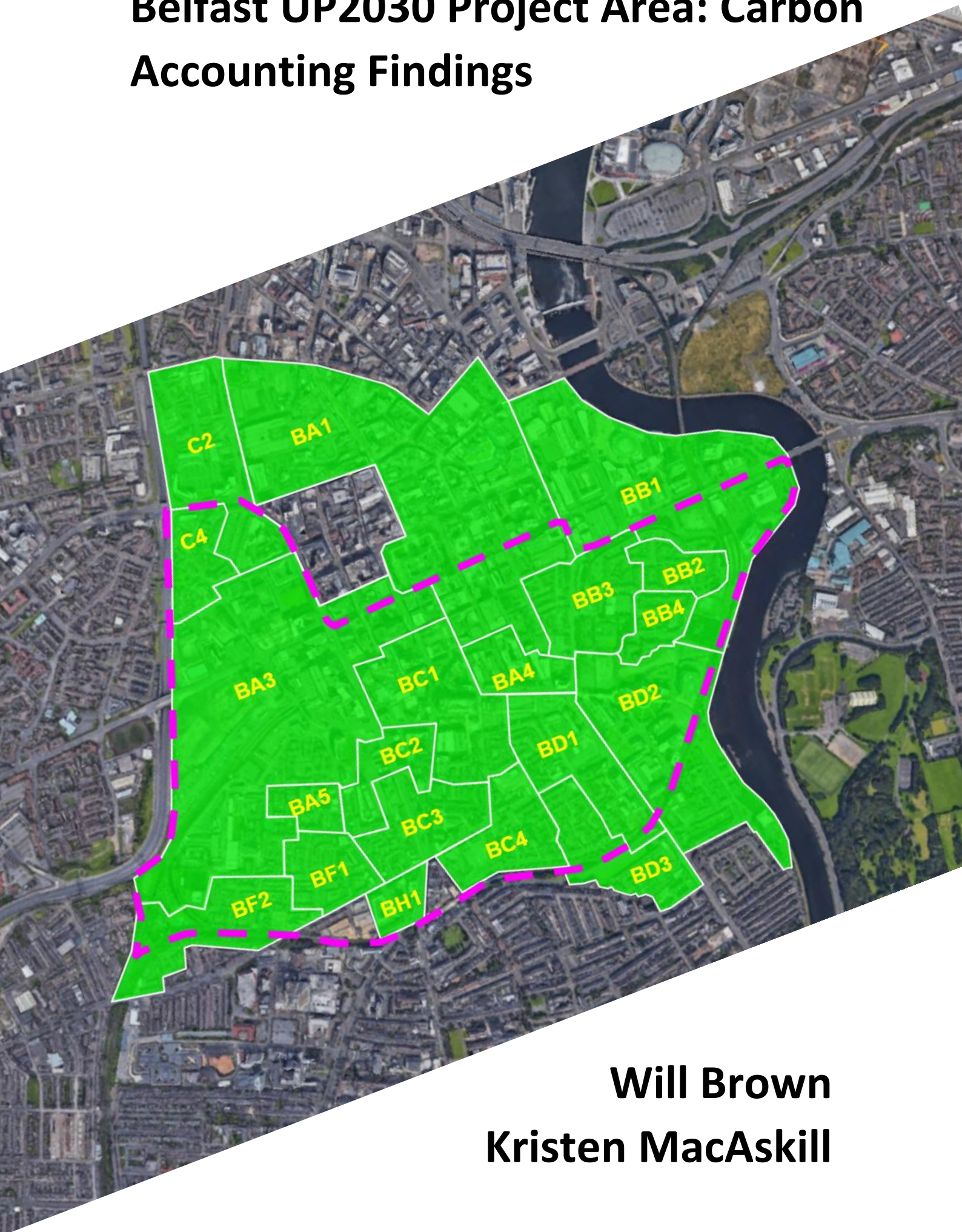
Belfast UP2030 Project Area: Carbon Accounting Findings



Will Brown
Kristen MacAskill

Belfast UP2030: Carbon Accounting Findings

Executive Summary:

The city of Belfast's contribution to the UP2030 project centres on the Linen Quarter and the inner south surrounding communities of the city centre. Intitally focusing on the area's 'Business Improvement District', the city's focus expanded outwards, going on to include the neighbourhoods of Sandy Row, The Market, Donegall Pass and Barrack Street. Alongside actions focusing on active travel and community engagement, one task was to estimate the carbon emissions of the project area. This report highlights the preliminary results of this investigation.

The boundary of calculations aligned with the UP2030 project boundary and covers the assessment of annual carbon emissions produced by households and resident mobility, alongside the carbon reduction benefits of urban greening.the assessment of annual carbon emissions produced by households and resident mobility, alongside the carbon reduction benefits of urban greening. This baseline data was then used to estimate the emission reduction potential of improved household insulation, the installation of solar PV and the potential increase in cycle commuting as a result of improved urban greening. The methods used to conduct these calculations are contained within the methodology document, with only the results included here.

As part of the development of the Belfast Net Zero Neighbourhood Framework, the University of Cambridge worked with Belfast to create a carbon accounting methodology for these elements. The workbooks developed for this study were designed specifically for Belfast using publically available open datasets and the BCC's Local Area Energy Plan. This has served to support further the BCC's understanding of emissions activity in the area to identify actions and interventions would have the most significant impact.

In total, the carbon emissions for the above three areas is estimated to be 15,227 mtCO2/yr, with 13,325 mtCO2/yr coming from households and 1,902 mtCO2/yr coming from resident mobility.

Regarding the four forms of emission reduction estimate, a total of 1,273 mtCO2/yr is reduced, an 8.3% reduction. The most impactful approach was to improve household insulation, which reduced carbon emissions by 1,104 mtCO2/yr, followed by solar PV with 162 mtCO2/yr reduced.

An important finding concerns the emission impacts of urban greening. The trees within the UP2030 project area have been estimated to only sequester 0.84 mtCO2/yr; an insignificant 0.006% of the estimated emissions. However, if broader impacts for trees are taken into account, such as by considering a 20% increase in cycle commuting through planting more trees, an annual saving of 6 mtCO2/yr is estimated, a 760% increase on the imact through tree sequestration alone.

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mtCO2 = Metric Tonnes of CO2

All findings are estimates

Household Carbon Emissions Estimate

Households are the leading source of cerbon emissions within the UP2030 project area. The types of household accounted for are as follows (with the number of each type):

Detached: 125 *(3%)*
Semi-Detached: 245 *(6%)*
Terraced: 1630 *(39%)*
Flat/Apartment: 2205 *(52%)*
Total: 4205

On the right is a breakdown of household emissions per census data zone.

A significant influence on individual household carbon emissions is the heating fuel used. As can be seen below, mains gas is by far the most common:

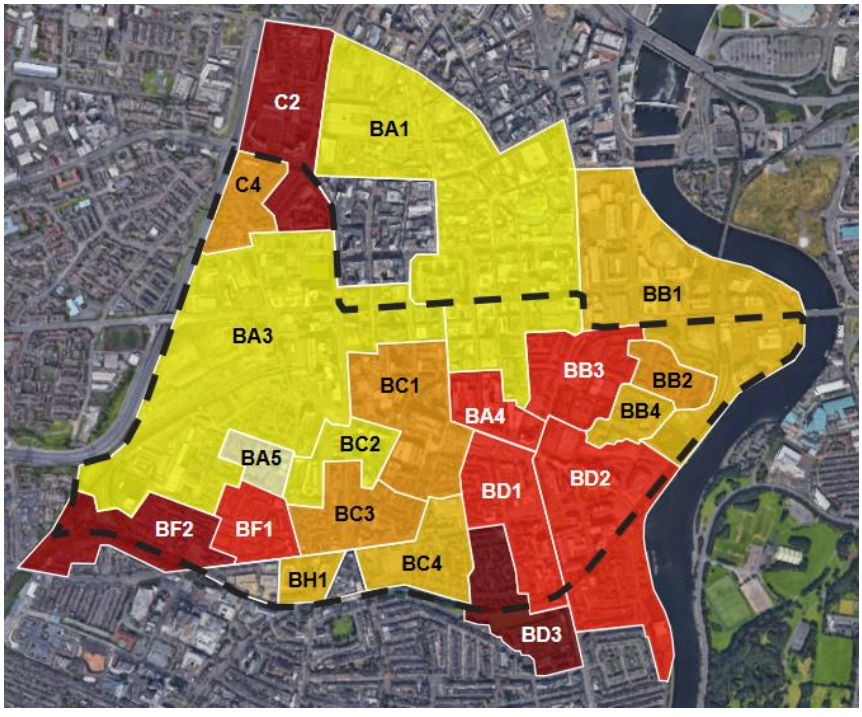
Mains Gas: 88%
Oil: 3%
Community: 3%
Electric Heating: 3%
Other: 3%

Total carbon emissions: **13,325 mtCO2/yr – 88% of total emissions**

Each household type is estimated to contribute to the project area's carbon emissions in the below manner:

Detached: 5.8%
Semi-Detached: 7.3%
Terraced: 49%
Flat/Apartment: 37.7%

Below is a map of the UP2030 project area and the household emissions of each data zone.



Data Zone	Estimated mtCO2/yr
Botanic_A5	364.16
Botanic_C2	471.44
Botanic_A3	486.81
Botanic_A1	492.93
Botanic_H1	550.16
Botanic_B1	554.85
Botanic_B4	590.79
Botanic_C4	594.25
Botanic_C1	621.66
Botanic_B2	627.96
Court_4	649.00
Botanic_C3	684.17
Botanic_D1	705.95
Botanic_B3	732.31
Botanic_F1	789.41
Botanic_D2	791.50
Botanic_A4	798.04
Court_2	845.25
Botanic_F2	912.94
Botanic_D3	1061.39
Total	13325.09

Mobility Carbon Emissions Estimate

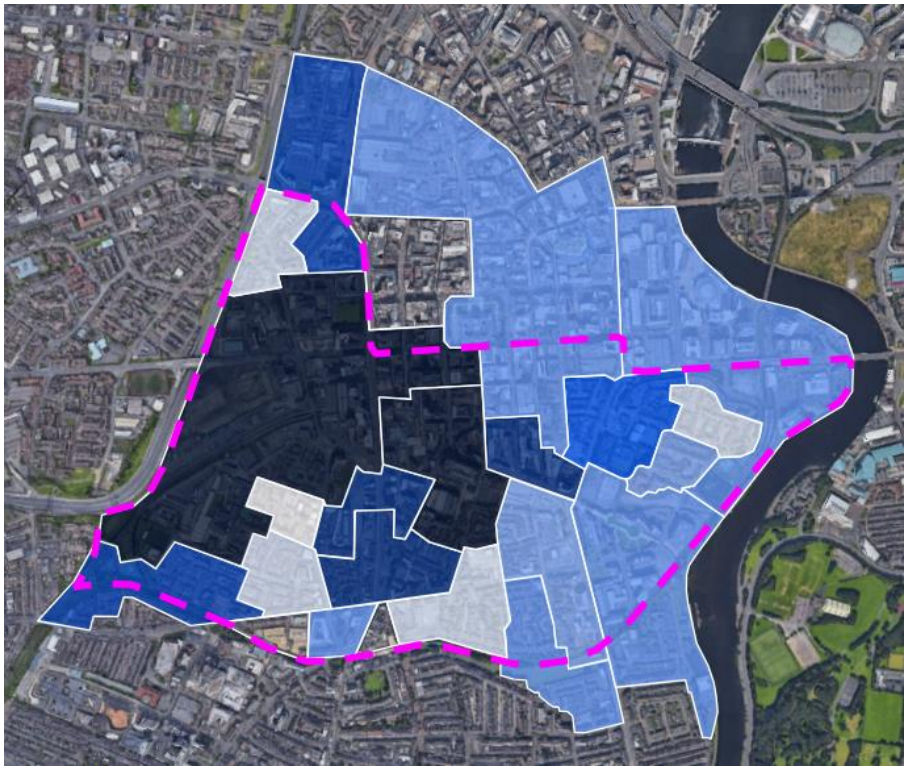
Whilst estimated to be less impactful than households, mobility carbon emissions are still significant.

The estimated total mobility emissions of the UP2030 project area are:

1902 mtCO2/yr – 12% of total emissions

A significant influence on the distribution of emissions across the project area is the prevalence of car ownership. Given the relatively low levels of car or van availability in the area, the mobility emissions are proportionally lower than may be expected. Another significant influence on the data zone emission outcomes is the average age of residents, with younger residents being more likely to produce more mobility emissions.

Below a map outlines the distribution of emissions across the data zones.



Botanic_A5	42.9
Botanic_C4	63.2
Botanic_F1	65.1
Court_4	65.5
Botanic_B2	67
Botanic_B4	75.7
Botanic_D1	79.2
Botanic_D2	80
Botanic_A1	82.8
Botanic_D3	85.9
Botanic_H1	86.7
Botanic_B1	89.5
Botanic_B3	90.1
Botanic_F2	100.7
Court_2	101.2
Botanic_C2	111
Botanic_A4	126
Botanic_C3	133.5
Botanic_A3	157
Botanic_C1	198

Tree Carbon Storage and Sequestration

The third baseline calculation concerned the ability of trees in the project area to absorb carbon emissions. Using the Belfast public tree database to create an average tree archetype for the project area, and the estimated tree land coverage contained within the city's *Valuing Belfast's Urban Forest Report* the estimated annual carbon sequestration for the proejct area is:

0.84 mtCO2/yr – 0.006% of total emissions

The three above estimates comprise the baseline from which potential carbon reducing actions can be assessed. What follows is the estimated impacts for:

- Improved insulation
- Household Solar Installation
- Cycle Commuting due to increased urban greening

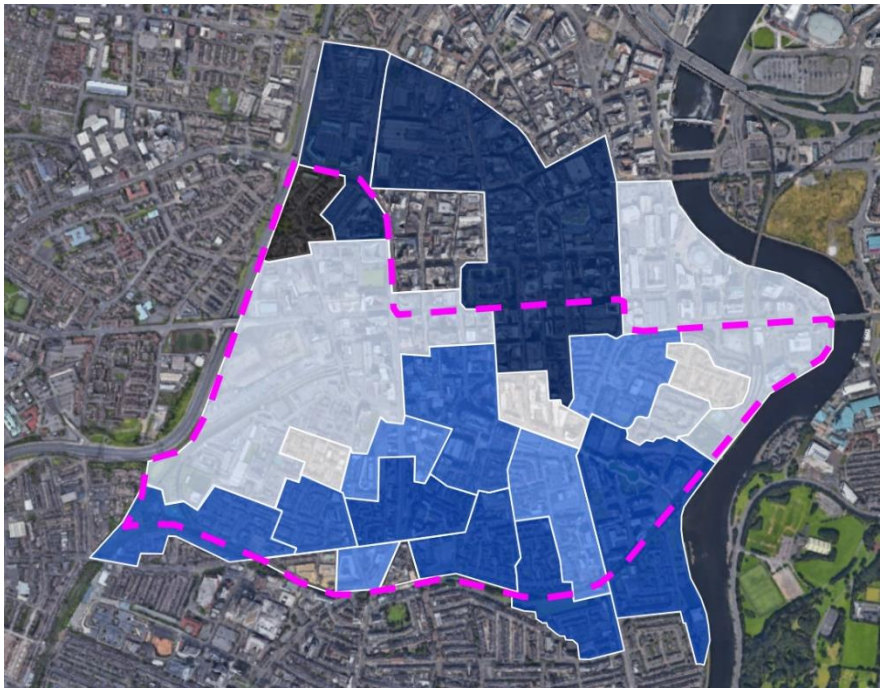
Household Insulation Carbon Reduction Estimate

The improvement of household insulation is the most effective approach to reducing carbon emissions assessed so far. This is a conservative estimate, one which does not account for the replacing of pre-existing insulation, but rather the enhancement of non or low insulated households. A crucial determining factor here is the types of walls featuring within the households.

For instance, the Court 2 and 4 data zones are set within neighbourhoods which feature a larger stock of uninsulated walled homes – resulting in the most effective impacts being in these areas. Conversely, Botanic A4 is comprised of relatively recent apartment buildings, meaning the scope for retrofit is very low.

The estimated emission reduction if the same level of insulation retrofit was adopted is:

1105 mtCO2/yr - 7.64% reduction of total emissions



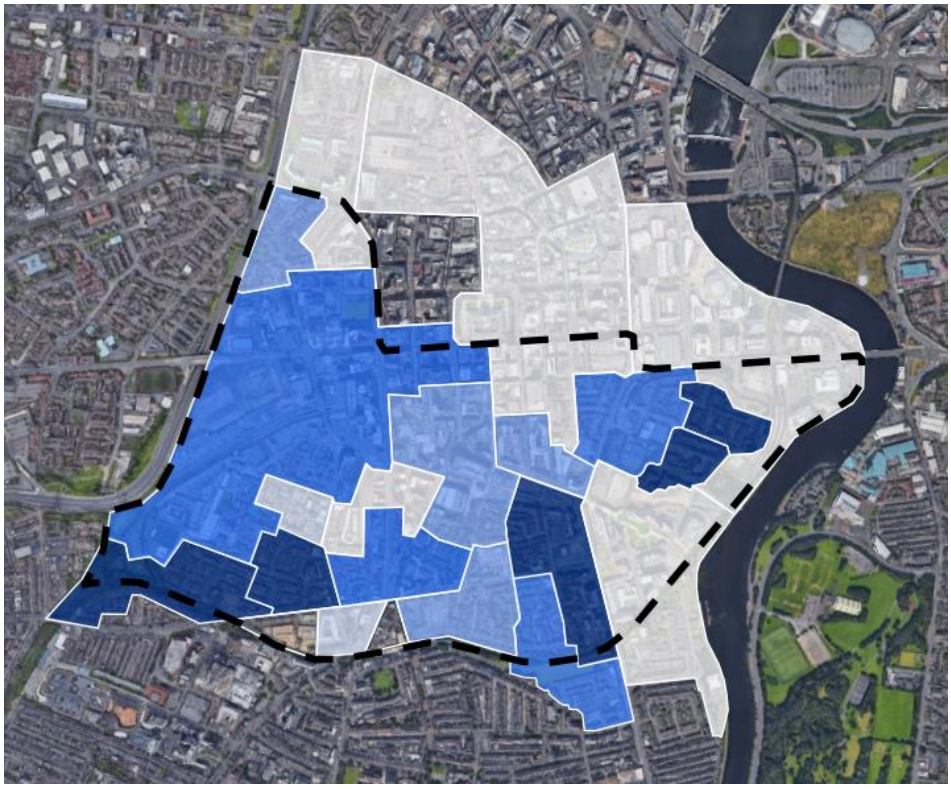
Botanic_A4	0
Botanic_A5	0.26
Botanic_B2	0.97
Botanic_A3	1.82
Botanic_B1	2.29
Botanic_B4	2.91
Botanic_B3	4.10
Botanic_H1	4.98
Botanic_C2	5.25
Botanic_D1	5.87
Botanic_F2	7.17
Botanic_C1	7.63
Botanic_F1	7.99
Botanic_C3	9.90
Botanic_D2	10.16
Botanic_C4	10.73
Botanic_D3	12.61
Botanic_A1	13.40
Court_4	17.64
Court_2	27.09

Household Solar Installation Carbon Reduction Estimate

Whilst upgrading the insulation of a house will improve its energy efficiency, the installation of solar panels will reduce the consumption of energy in the first place. Taking the total number of households within the UP2030 project area which are deemed to be solar suitable, taken from Local Area Energy Plan data, the total solar emission reductions are estimated to be:

162 mtCO2/yr mtCO2/yr – 1% reduction of total emissions

Below is a map oulining the percentage of households within each data zone which are suitable for solar panel installation



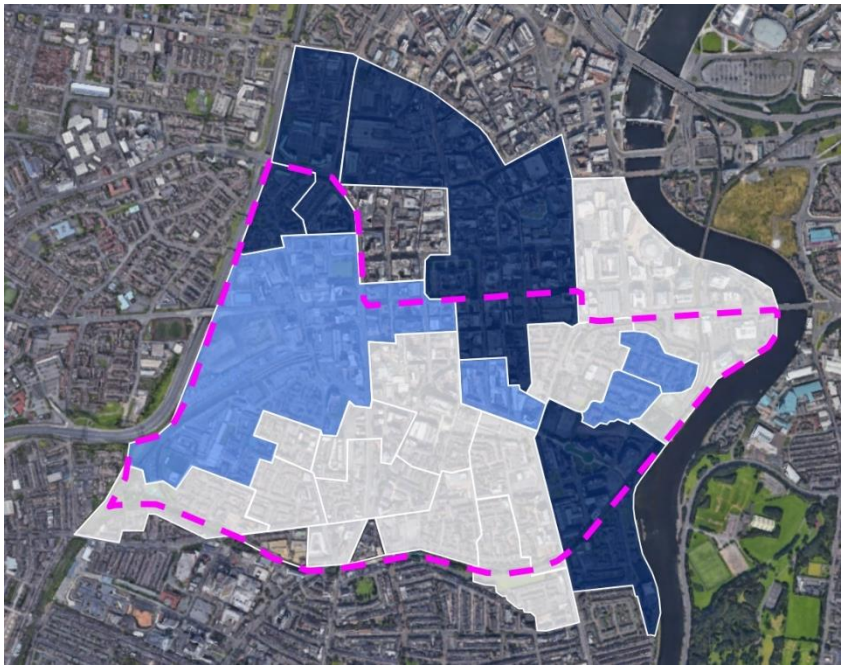
B1	0
D2	0
BC2	3
C2	8
A1	9
H1	12
A5	16
A4	22
BC1	22
C4	22
BC4	29
D3	31
B3	39
BC3	41
A3	42
F2	61
D1	63
F1	71
B4	96
B2	98

An interesting observation is that whilst many data zones are suitable for either approach, some are more suited for one over the other. For instance Court 2 is the data zone with the highest potential for emission reductions through enhanced insulation, but is one of the least suited for solar. Conversely, Botanic B2 has the largest potential for solar installation, but relatively little potential emission reductions through enhanced insulation.

Therefore, based on the estimations presented here, more targeted measures can be adopted. Beyond those which can be approached with a balance between the two approaches (white in the belwo map), the targeted data zones are below.

Insulation Focus (dark blue):
C4, C2, A1, D2

Solar Focus (light blue):
B2, B4, A3, A4

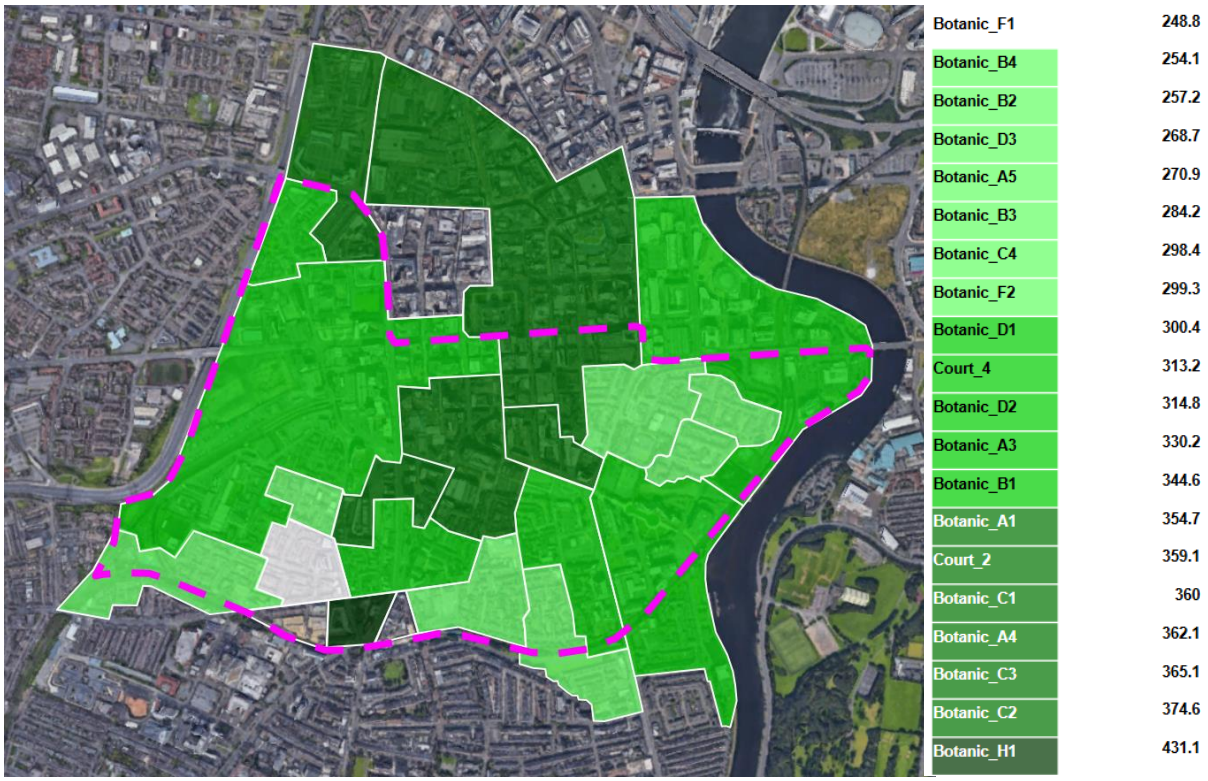


Cycle Commuting due to Increased Urban Greening

The below estimate was based upon a combination of the mobility emission baseline (presented above) and the Travel Survey for Northern Ireland, which found that 20% of respondents would cycle more if there were more pleasant routes. Therefore, the estimate of increased urban greening centred upon reducing car-based commuting by 20% on days conducive to cycling (dry and with max temperatures above 10 degrees – 83 in total) thereby estimating the impact of increased cycle commutes. Estimated emission reduction is:

6.4 mtCO2/yr – 0.04% reduction of total emissions

The map below demonstrates the distribution of the emission reductions across the different data zones based on age, sex, and car ownership statistics.



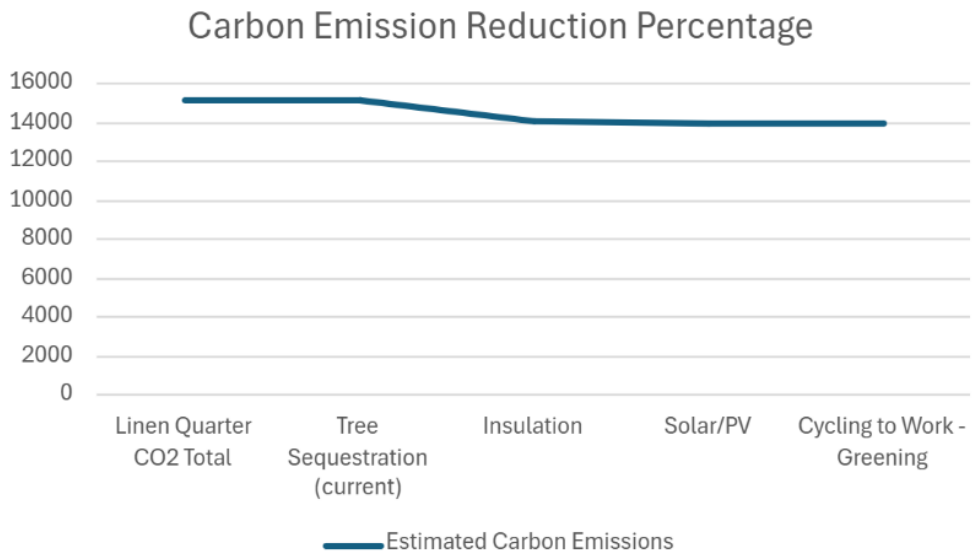
Summary

In total, across the three areas accounted for here, the baseline emission total is **15,227 mtCO2/yr**. By combining the estimates provided here, this baseline can be reduced to **13,954 mtCO2/yr** – an emission reduction of approximately **8.3%**.

Below is a chart demonstrating the cumulative emissions reduction from the original baseline. It has been presented to demonstrate the total impacts in relation to carbon neutrality. Whilst it may appear that the gap towards carbon neutrality is large, only a handful of approaches have been estimated here, with alternatives like electric vehicle adoption, heat pumps and further active travel initiatives not assessed.

Another area where emissions could fall within the project area would be the decarbonisation of national electricity. The Northern Ireland specific emission factor used for electricity (0.371 kgCO2/kWh) is relatively high in comparison to the UK wide factor (0.204 kgCO2/kWh). As efforts to reduce nationwide electricity carbon emissions progress, emissions will fall; given that 22% off household emissions are assumed here to be from domestic electricity use. A hypothetical 22%

reduction of household carbon emissions (representing carbon neutral energy production) would be just under 3,000 mtCO2/yr, representing a reduction of 19.7%. This is without considering the potential adoption of EVs, both domestic and within the public sector, which would be more impactful, given the lack of carbon emissions from charging the vehicles.



Another element to be considered are further developments within the UP2030 project area. The map below shows potential sites for development (green), representing a total of 2131 units within the black line. This would require estimations of embodied emissions within building materials, the emissions produced through construction and the estimated ongoing emissions associated with the unit's use, which could be estimated by producing building archetypes from the household data used here.