Item 3

13th August 2024

Glasgow City Council

Net Zero and Climate Progress Monitoring City Policy Committee

Report by George Gillespie, Executive Director of Neighbourhoods Regeneration and Sustainability

Contact: Gavin Slater Ext: 78437

UPDATE ON CITYWIDE CO_2 EMISSIONS

Purpose of Report:

To provide Committee with an update on CO_2 emissions in the city following publication of the 2022 dataset by the Department of Energy Security and Net Zero.

Recommendations:

The Committee is asked to:

1) Note the contents of this report;
2) Note that this report will be updated annually.

Ward No(s):	Citywide: ✓
Local member(s) advised: Yes ☐ No ✓	consulted: Yes ☐ No ✓

1. Introduction

1.1 The Department for Energy Security and Net Zero (DESNZ), formerly the Department for Business, Energy and Industrial Strategy (BEIS), releases data on energy consumption and carbon emissions for local authorities annually, two years in arrears.

1.2 Each year, in addition to providing new data, the historic data available from DESNZ is updated due to recorded changes in the carbon intensity as a result in changes to the energy sources feeding into the grid, this is referred to as the carbon equivalent.

1.3 This report provides an update on the carbon emissions for Glasgow based on the most recent data which covers the calendar year 2022.

2 Background

2.1 The previous report to Committee (August 2023) detailed the annual carbon emissions data for 2021. Within the 2021 year there was an emissions increase of 12.8% from the prior year (2020). The report outlined that the increase witnessed in 2021 was a result of an anticipated emissions 'bounce back' as lockdown restrictions, in place due to Covid-19, eased across Glasgow.

2.2 Data from 2020 outlined a 13.3% decrease in emissions from 2019. This was largely attributed to the impacts of Covid-19 related lockdowns. This had a significant impact on the emissions profile of Glasgow in 2020, with emissions from transport dropping by 20% from the previous year.

2.3 The data from 2021 and 2022, highlighted that Glasgow has endured a significant period of change which has been reflected in statistically anomalous data. Therefore providing analysis on Glasgow's progress in reducing emissions from this period is challenging. The variance in the data has however been reflected across most local authorities in Scotland during this time. Commentary on Glasgow's emissions as it compares to other Scottish local authorities is included in section 6 of this report.

2.4 This report provides information on Glasgow's CO_2 emissions in 2022, with comparisons against both baseline and the previous year's emissions. It is important to note the impact of significant geopolitical events on emissions, these are discussed further in section 3.5.

2.5 It should be noted that this paper is focussed on Scope 1 and 2 emissions in the city. Scope 3 emissions have not been fully quantified to a degree yet reliable at this point due to absence of a consistent and agreed methodology or baseline for comparison.[1] An agreed method for quantifying Scope 3 emissions is being explored by Glasgow City Council.

[1] The DESNZ dataset includes (i) scope 1 emissions relating to gas consumption and transport (ii) scope 2 emissions relating to electricity consumption (iii) scope 3 emissions relating to waste generation and (iv) emissions generated or sequestered through Land Use, Land-Use Change and Forestry (LULUCF). As Glasgow currently reports on carbon emissions and not the

2.6 Waste emissions, which are considered scope 3 emissions, are included within the DESNZ dataset. However, these account for 0.02% of total carbon emissions in Glasgow during 2022.

3. Analysis of Emissions Data (2022)

3.1 Glasgow's CO_2 emissions in 2022 totalled 2,323.5 kilo-tonnes[2] of carbon dioxide ($ktCO_2$). This represents a **6.6% reduction from the 2021 total of 2,487 $ktCO_2$** and a **45.7% reduction in emissions from the baseline** year of 2006.

3.2 The trajectory of Glasgow's CO_2 emissions reduction is represented in Figure 1 below, noting that Glasgow met the interim target of a 30% reduction in carbon emissions by 2020 five years ahead of schedule – as outlined by the 'CO_2 target line' which plots a linear 30% reduction from 2006 to 2020. The target trajectory line following from 2020 is being revised through the development of our Net Zero Routemap.

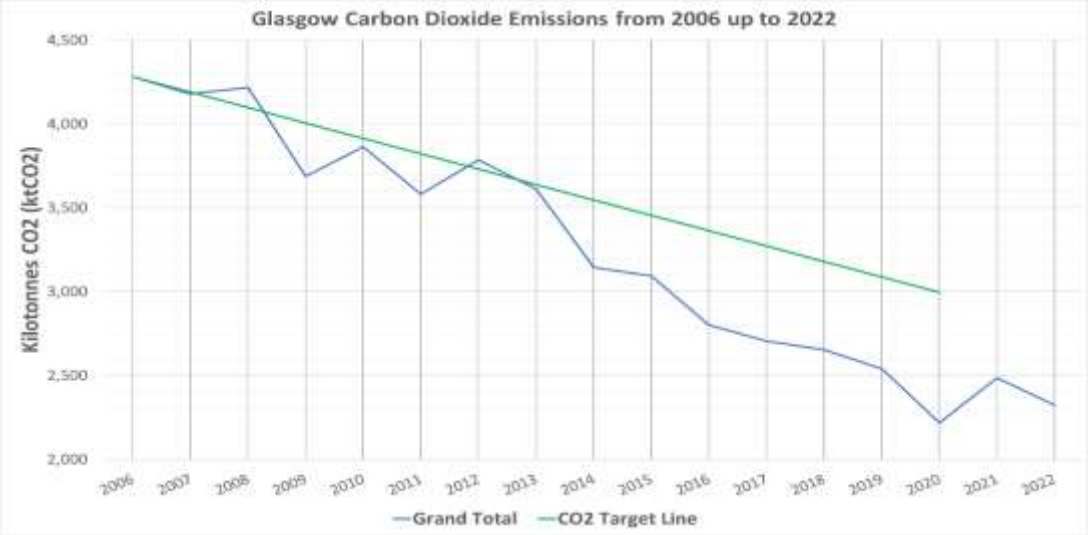

Figure 1 - Glasgow CO_2 emissions 2006-22

3.3 Table 1 below outlines the year-on-year emissions reductions witnessed in Glasgow since the baseline year. It highlights an average annual reduction of 3.51%. If this average was to be maintained until 2030, Glasgow's emissions would have reduced by 73.81% from baseline. Our understanding of whether maintaining this rate of reduction will be sufficient to achieve a net zero position by 2030 is being developed through the production of our Net Zero Routemap, which will be brought to this committee in November. However, ahead of finalising the Routemap, it is fair to assume that we will need to increase and maintain the annual average pace considerably.

full range of greenhouse gases, carbon emissions from waste generation are minimal as they do not consider methane which is the primary greenhouse gas emitted through waste disposal.

[2] 1 kilo-tonne (kt) is equal to 1000 tonnes.

Calendar Year	Grand Total	Reduction (per annum)	Reduction (%)
2006	4,281.2		
2007	4,178.2	103.1	2.41%
2008	4,219.3	-41.2	-0.99%
2009	3,688.2	531.1	12.59%
2010	3,863.2	-175.0	-4.75%
2011	3,581.5	281.7	7.29%
2012	3,785.8	-204.3	-5.70%
2013	3,611.6	174.2	4.60%
2014	3,145.4	466.3	12.91%
2015	3,095.0	50.4	1.60%
2016	2,800.4	294.6	9.52%
2017	2,705.8	94.5	3.38%
2018	2,653.0	52.8	1.95%
2019	2,540.3	112.7	4.25%
2020	2,217.7	322.6	12.70%
2021	2,487.0	-269.3	-12.14%
2022	2,323.5	163.5	6.57%
		Average	**3.51%**

Table 1 - Annual Emissions Reductions 2006-22

3.4 This report outlines that one of the primary drivers in emissions reductions witnessed in 2022 was the onset of the energy crisis[3] which drove up energy prices across the nation and resulted in reduced consumption, particularly in consumption of gas.

3.5 City Council, and city stakeholders, continue to make progress on initiatives aimed at reducing carbon emissions such as (i) the Low Emissions Zone (ii) the ongoing electrification of the city's bus fleet (iii) installation of solar PV across the Council estate, and (iv) increased cycle lane infrastructure. Further update on initiatives will be included in the annual report to Committee (Nov 2024) on the Climate Plan.

4. Sectoral Emissions

4.1 Glasgow's carbon emissions can be broken down into sectors to allow for further analysis. The sectoral profile for the period 2006 until 2022 can be found in Figure 2 below.

4.2 The reductions in sectoral emissions between 2021 and 2022 are outlined below:

- Domestic: 112.8 $ktCO_2$ (15%)
- Transport: 0.7 $ktCO_2$ (0.1%)
- Industrial: 14.8 $ktCO_2$ (6.2%)

[3] A term used to describe the increase in energy prices that characterised 2022. A result in part to (i) the UK recovering from the impact of the Covid-19 pandemic (ii) the emergence of an inflationary period in the economy (the cost of living crisis) and (iii) the Russian invasion of Ukraine. More information can be found here (IEA article)

- Commercial: 29 $ktCO_2$ (7%)
- Public Sector: 6.9 $ktCO_2$ (3%)

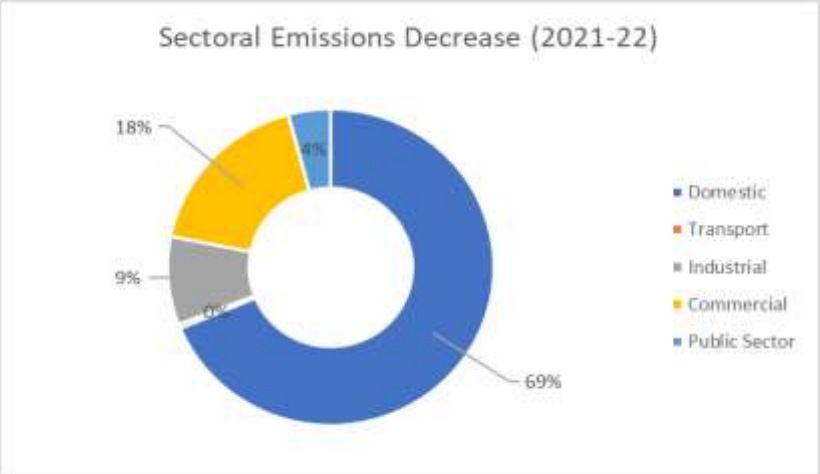

Figure 2 - CO_2 Emissions by Sector

4.3 Figure 3 below displays how the overall 6.6% decrease between 2021-22 is split across sectors. Domestic emissions account for a significant proportion of the emissions reductions (112.8 $ktCO_2$, **69% of total emissions reductions**) as rapidly rising energy costs were experienced by residents.

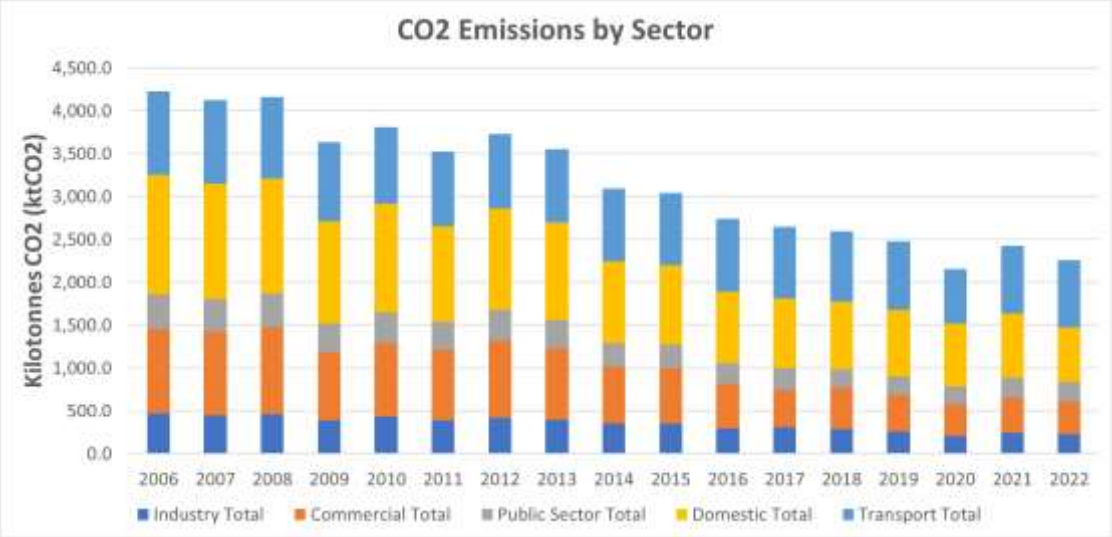

Figure 3 - Sectoral Emissions Decrease 21-22

4.4 Commercial emissions witnessed the second largest reductions at 29 $ktCO_2$ (7%) from 2021. Industrial emissions also fell by 14.8 $ktCO_2$ (6.2%) whilst public sector emissions dropped only by 6.9 $ktCO_2$ (3%). The smaller drop seen in all other sectors in comparison to the domestic sector may be a result of (i) non-domestic organisations having longer term fixed-price contracts (ii) reduced flexibility of the non-domestic sector to reduce consumption due to minimum operational or service requirements or (iii) higher energy requirements than the average homeowner which then translates into a lower cost per kWh. It is however, challenging to provide robust conclusions on this variance. It is also

worth considering the reductions in the non-domestic sectors against the increased activity of those sectors returning from lockdown restrictions.

4.5 Transport emissions had minimal reductions at 0.7 $ktCO_2$ but the overall contribution still remains lower than pre-pandemic levels.

5. Source Emissions

5.1 Figure 4 below outlines the trajectory of emissions reductions by source from the 2006 baseline, showing the 2022 decreases across all sources. It clearly shows that emissions from gas consumption decreased most in 2022. Electricity consumption remains the lowest source of carbon emissions for Glasgow, a fact worth noting as plans for increased electrification of heat and transport progress. Below this, Figure 5 highlights how emissions in 2022 are split by source.

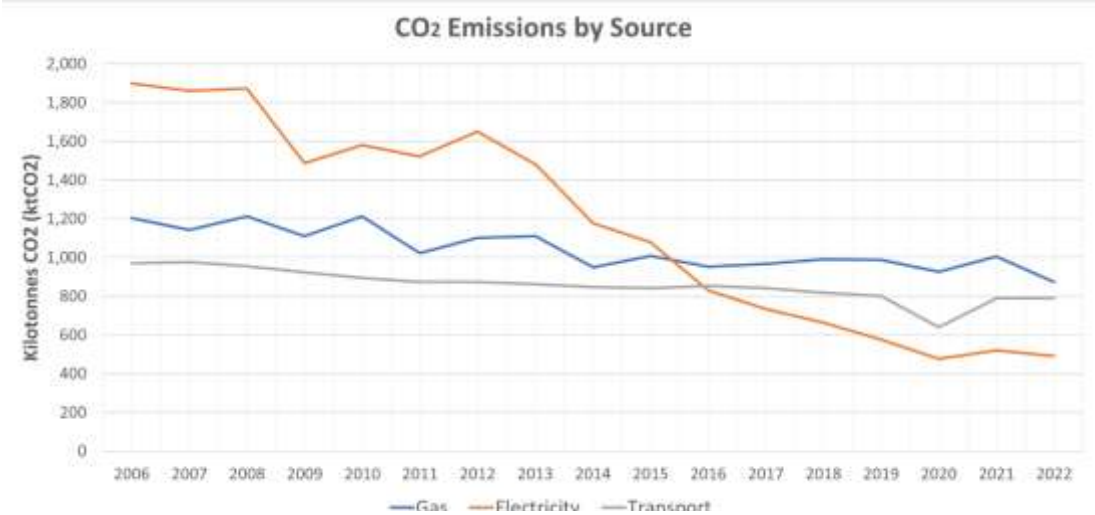

Figure 4 - CO_2 Emissions by Source

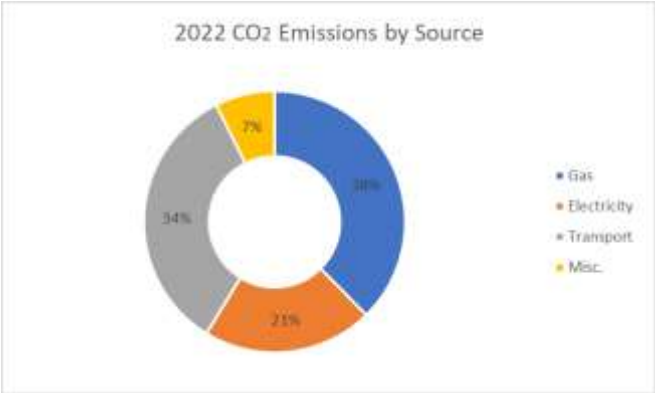

Figure 5 - 2022 CO2 Emissions by Source

5.2 Gas Emissions

5.2.1 In 2022, gas emissions dropped by 13.1% from the previous year, reducing by 131.3 $ktCO_2$. From baseline (2006), gas emissions have reduced by 328 $ktCO_2$ (27.3%). The data points to a substantial drop in gas emissions, particularly from the domestic sector. **40% of total gas emissions reduced since baseline occurred between 2021-22.**

5.2.2 The drop in gas emissions accounted for a significant proportion (81%) of overall emissions reduced in Glasgow between 2021-22, outlined in Figure 6 below. If gas emissions are then disaggregated on a sectoral basis, it is evident that the bulk of the drop in gas emissions (70%) came from the domestic sector, outlined in Figure 6 below.

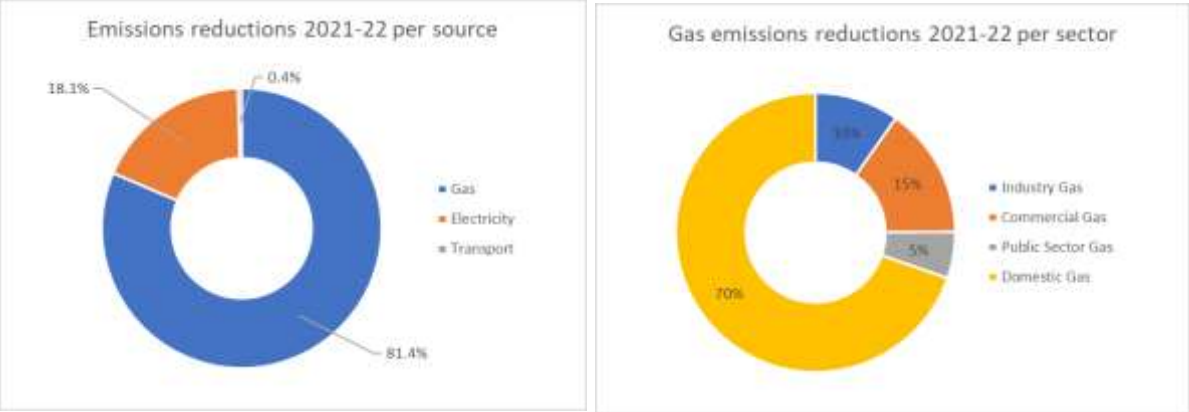

Figure 6 – Total Emissions reduction per Source, Gas emissions reduction per sector 2021-22

5.2.3 A 13.1% reduction in gas emissions from '21 (accounting for 40% of all gas emissions reduced since 2006) should be considered irregular. It is likely that the bulk of this drop is the result of the emerging energy crisis in 2022.

5.2.4 The local context of the energy crisis was that Glasgow was a city recovering from the impact of the Covid-19 pandemic whilst entering a cost-of-living crisis. However, the primary catalyst of the energy crisis was the Russian invasion of Ukraine in February of 2022. Natural gas prices were already beginning to show instability as a result of the standoff over the Nord-Stream II pipeline between Russia and Europe in Autumn of 2021. However, by April 2022, the energy price cap increased energy costs for the typical household by 54%. The energy price cap, which was increased in response to rising wholesale energy costs, was planned to then be increased by 80% in October 2022. However, it rose only 27% due to the establishment of the Energy Price Guarantee which was implemented to protect consumers from the significant increases anticipated in October 2022.[4]

5.2.5 Research into the impact that the energy crisis had upon domestic energy consumption profiles indicates that citizens took action to reduce or optimise their gas consumption, highlighting that they were (i) more likely to turn their heating off in the winter of 22/23 than in previous winters (ii) more likely to turn the heating off in rooms that were not typically occupied in the home (iii) heated their home for fewer hours than they would normally (iv) turn their thermostats down and (v) lower the flow temperature of their heating systems.[5] It is likely

[4] https://commonslibrary.parliament.uk/research-briefings/cbp-9491/#:~:text=Typical%20household%20energy%20bills%20increased,their%20winter%202021%2F22%20levels.
[5] https://www.nature.com/articles/s41598-023-48181-7

that in addition some residents simply couldn't afford to turn the heating on during this time.

5.2.6 Degree Day analysis points to 2022 being 10% colder in Glasgow than the previous year, highlighting that it was not warmer weather that reduced the need for heating in 2022 and that the colder weather in fact may have depressed an even more significant drop in gas emissions.

5.3 Electricity Emissions

5.3.1 In 2022, electricity emissions dropped by 5.6% from the previous year, reducing by 29.2 $ktCO_2$. From the baseline, electricity emissions have reduced by 1,407.6 $ktCO_2$ (74.1%). Figure 7 outlines the sectoral split in electricity emissions reductions over the last data year (2021-22).

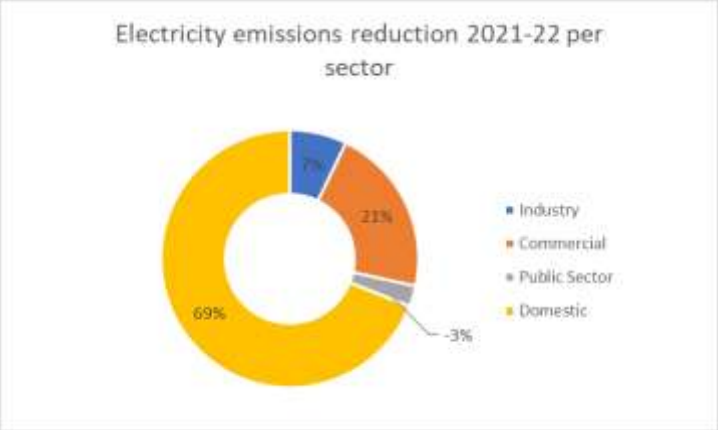

Figure 7 - Electricity Emissions per Sector

5.3.2 Figure 7 above outlines that most emissions reductions from electricity between 2021-22 came again from the domestic sector (69%). Following a similar trend as gas emissions, it is likely that these reductions are in part due to the onset of the energy crisis.

5.3.3 Emissions from electricity since the baseline year have reduced significantly. This can be attributed to the ongoing decarbonisation of the electricity grid, which has seen the carbon intensity of the electricity grid fall 59.4% from 2006 to 2022, and the local influence that Glasgow City Council and city stakeholders have had in delivering renewable energy projects and energy efficiency measures across the city. Without the action taken locally since 2006, Glasgow would have only reductions consistent with reduction in grid intensity. This indicates success of local action both from demand reduction and local renewable energy generation.

5.3.4 However, in reference to Figure 7 above, emissions from electricity have likely also dropped as a result of rising energy costs in 2022 which incentivised residents in Glasgow to use electricity more sparingly.

5.3.5 There are two likely reasons why gas emissions dropped more than electricity emissions in 2022. Firstly, variances in the reporting periods for gas and electricity emission means that the energy crisis features more prominently throughout the gas reporting period for 2022. Secondly, the domestic sector accounts for a higher proportion of overall gas emissions (53%) than it does for overall electricity emissions (34%) so the impact of the energy crisis, which impacted on domestic emissions over any other sector, produced a greater drop in total gas emissions than it did for electricity.

5.4 Transport Emissions

5.4.1 In 2022, transport emissions dropped by 0.1% from the previous year, reducing by 0.7 $ktCO_2$. From baseline (2006), transport emissions have reduced by 183.3 $ktCO_2$ (18.9%). The total drop in emissions between 2021-22 per Transport category is outlined in Table 2 below. This outlines that, whilst total transport emissions dropped slightly, emissions from minor roads and A roads increased slightly between 2021-22.

	Road Transport (A roads)	Road Transport (Motorways)	Road Transport (Minor roads)	Diesel Railways	Transport 'Other'
2021	146.50	307.18	320.36	2.90	10.97
2022	146.88	306.22	320.56	2.77	10.81
21/22 DIFF	0.38	-0.96	0.19	-0.13	-0.16
21/22 DIFF (%)	0.26%	-0.31%	0.06%	-4.63%	1.48%

Table 2 - Transport Emissions per Sector

5.4.2 Transport emissions, more than any other source of emissions, witnessed the biggest drop (20%) during 2020 during the lockdown restrictions brought on by the Covid-19 pandemic. The following years data confirmed an expected return in transport emissions due to a covid 'bounce back' as restrictions eased, increasing transport emissions by 23% from 2020.[6] For 2022, emissions have changed little for transport, dropping by 0.1%.

5.4.3 Whilst 0.1% is a relatively insignificant figure, transport emissions were anticipated to rise in 2022 as Glasgow continued to recover from the pandemic. Scotland's transport emissions rose by 2% in this time (from 9,732.3 $ktCO_2$ to 9,922.5 $ktCO_2$). This trend is seen across other local authorities in Scotland with transport emissions typically rising in 2022. This is shown in Figure 8 below.

[6] Research commissioned by the UK Government on the impact of Covid-19 on transport profiles indicated that where there was a modal shift recorded by participants to the study due to the pandemic, it tended to be to a car as it was perceived as safer, had become more affordable for some due to more available free parking at workplaces, roads were less congested, and parking was more easily available. This provides possible indication of why transport emissions witnessed a significant bounce back post-Covid. The study can be found here.

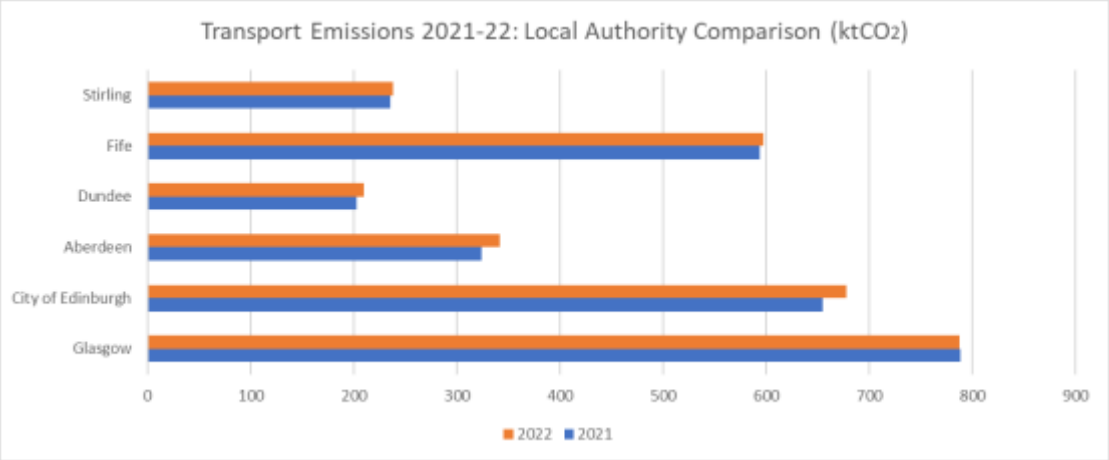

Figure 8 - Transport Emissions per Local Authority 2021-22

5.4.4 Assessing transport emissions prior to the pandemic, 2019 data shows transport emissions at 799.6 kt CO_2 in comparison to 2022 figure of 787.2 $ktCO_2$. This data outlines that Glasgow has managed to continue its downward trajectory in transport emissions and that the city has not fully 'bounced back' into the same position it was prior to the pandemic. Glasgow has reduced transport emissions by 18.9% reduction in transport emissions from baseline (2006).

6. Local Authority Comparison

6.1 Analysis of the carbon emissions, set out in table 3, of all the Scottish Local Authorities in 2022 shows that Fife continues to have the largest carbon emissions, followed by Glasgow, Falkirk, and Edinburgh. Evaluation of per capita CO_2 emissions across the same four authorities shows Glasgow with the lowest at 3.7 tCO_2 per capita.

	Total emissions ($ktCO_2$)	Per capita (t)	Reduction from 2006
Glasgow	2,323.5	3.7	45.70%
City of Edinburgh	2,000.10	3.9	44.90%
Falkirk	2,145.90	13.5	38.70%
Fife	2,900	7.8	38.20%

Table 3 - Total Emissions per Local Authority

7. Conclusions

7.1 Glasgow in 2022 has reduced its emissions by 45.7% from our baseline of 2006 and by 6.6% from 2021. Additionally, Glasgow's emissions are lower than they were at pre-pandemic levels.

7.2 The data and analysis provided in the report demonstrates that policies and projects aimed at supporting Glasgow's transition to a Net Zero Carbon city are

having a positive impact. The Council continues to deliver work which is aimed at reducing transport emissions – this includes expanding active travel infrastructure in the city through the City Network, Liveable Neighbourhoods and Avenues programmes, working with transport operators to enhance public transport service provision in the city through the Glasgow City Region Bus Partnership & City Centre Taskforce groups, behaviour change initiatives such as annual campaigns and funding for communities to increase access to active travel choices, and targeting higher levels of public EVCI through regional collaboration, all of which are and will continue to contribute to an environment where it is convenient for citizens to make lower carbon transport choices as well as reducing transport inequalities. Additionally, Glasgow continues to support the national shift towards renewable electricity with the rollout of solar PV across the estate alongside contribution of low carbon or renewable electricity into the national grid through the GRREC and the Cathkin wind turbine.

7.3 Whilst emissions from gas have dropped significantly in 2022, it is anticipated that they will bounce-back in future years as the impacts of the energy crisis abate. Even with the large reduction in gas emissions in 2022, gas is still the largest source of emissions in comparison to transport and electricity. As such, this report reaffirms the city's focus on reducing emissions from gas as a critical successful factor for achieving Net Zero Carbon by 2030. In addition, the ambition to accelerate the deployment of heat networks that utilise locally available sources of heat as a mechanism of lowering heating-based emissions will provide greater energy security for the city, minimising the impacts from the types of global economic shocks that caused energy prices to rise in 2022.

7.4 There continues to be significant work undertaken to continue the progress that the City is making towards Net Zero Carbon, noting that future years data should outline the continued impacts the events of recent years.

7.5 The work underway to establish Climate Investment and Climate Delivery vehicles, will support unlocking delivery of Net Zero Carbon at pace for Glasgow, something that future years emissions reporting will reflect.

7.6 These finance and delivery vehicles will continue to be supported by Glasgow City Council's robust policy framework that supports our Net Zero Carbon aspirations; including our Local Heat and Energy Efficiency Strategy (LHEES) and our Glasgow Transport Strategy (GTS).

7.7 Finally, the robust climate governance in place across the city, including Glasgow City Council's internal Climate and Sustainability Board and the citywide Sustainable Glasgow Partnership will ensure that the costs and the benefits of the Net Zero Carbon transition are shared equitably across the city and that the delivery of Net Zero Carbon is done in a manner which brings all key stakeholders along.

8 Policy and Resource Implications

Resource Implications:

Financial:	There are no new financial implications arising from the report.
Legal:	The report raises no new legal issues.
Personnel:	The Climate Plan for Glasgow is managed by the Sustainability team.
Procurement:	No relevant procurement issues.

Equality and Socio-Economic Impacts:

Does the proposal support the Council's Equality Outcomes 2021-25? Please specify.	Yes, it is broadly supportive of all the Council's Equality Outcomes.
What are the potential equality impacts as a result of this report?	No significant impact - an EQIA screening has been undertaken. Climate Change impacts all of society, however this can disproportionately impact on those most vulnerable communities. We must ensure that our actions minimise the negative impacts that climate change has on our most vulnerable communities, while also maximising their ability to participate and benefit from our just transition to a low carbon economy.
Please highlight if the policy/proposal will help address socio-economic disadvantage.	Yes. Examples would be reduced fuel poverty through localizing energy supplies and providing some protection against increasing energy costs, and increased social inclusion through improved public transport infrastructure.

Climate Impacts:

Does the proposal support any Climate Plan actions? Please specify:	Yes. This report supports the Climate Plan ambition of attaining Net Zero Carbon by 2030.
What are the potential climate impacts as a result of this proposal?	This report describes the cumulative reductions in carbon emissions until 2020. The progress demonstrated in this report contributes to less damage to the environment and contributes directly to lessening the pace of climate change. This report also describes progress on efforts to reduce carbon emissions. Many of the projects currently underway, as well as those in development will help sustain existing and create new jobs and require investment, thus contributing to the growth of a greener economy in Glasgow.
Will the proposal contribute to Glasgow's net zero carbon target?	Yes. This report highlights the emissions of the city and supports the Climate Plan ambition of attaining net zero carbon by 2030.
Privacy and Data Protection Impacts:	No data protection or privacy implications. This report presents analysis of publicly available data and does not represent any privacy or data protection issues.

9 Recommendations

The Committee is asked to:

1) Note the contents of this report;
2) Note that this report will be updated annually.