

The environmental impact of Glasgow and the wider City Region's economy

- an initial analysis



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Executive Summary

This report aims to quantify the environmental impact of the economies of Glasgow and Glasgow City Region (GCR) in order to inform the initial evidence base upon which the activities of the Glasgow Green Deal (GGD) will be based.

Key Findings

- Large numbers of people across Glasgow and GCR were employed in industries associated with high carbon emissions in 2019.
- Those industries with the lowest median hourly pay rates in Glasgow were industries associated with high carbon emissions.
- More than half of all businesses in Glasgow were operating in industries associated with low carbon emissions in 2019, whilst most businesses in GCR were operating in industries associated with high carbon emissions.
- Small-medium sized enterprises (SMEs) in Glasgow and GCR operate predominantly in industries associated with high carbon emissions.
- Industries associated with high carbon emissions generated the greatest value of output in Glasgow and GCR in 2019.
- Several industries in Glasgow and GCR face compound challenges to their green transition, including: Wholesale and Retail Trade; Accommodation and Food Service; and Transportation and Storage.
- Several wards in Glasgow face heightened challenges given the concentration of high carbon industries situated within them, including: Greater Pollok; Langside; Garscadden/Scotstounhill; Drumchapel/Anniesland; Springburn/Robroyston; and North East.

Recommendations

- Target green employability and skills support to those individuals currently employed within the following industries: Manufacturing; Construction; Other Service Activities; Electricity, Gas and Water Supply; Wholesale and Retail Trade; Accommodation and Food Service Activities; and Transportation and Storage.
- Implement support for SMEs to help them deal with the large number of barriers they face in transitioning.
- Endeavour to provide support to the areas of Glasgow that contain the largest concentration of industries most affected by the green transition.
- Continue developing the evidence base that is used to inform environmental and economic action across Glasgow and GCR.

Definitions and Key

GCC – Glasgow City Council

GCR – Glasgow City Region

GGD – Glasgow Green Deal

SMEs – Small-Medium Sized Enterprises

A number of figures in this report have been colour coded according to the Eco-Transformation of Industries Matrix, details of which will be outlined later in this report. The key below outlines the different definitions associated with each colour:

KEY	
Leader Industries	Green
Neutral Industries	Grey
Follower Industries	Blue
Laggard Industries	Orange

1 Introduction and Context

Local authorities have a significant role to play in addressing the climate emergency. 82% of emissions in the UK are within the scope of influence of local authorities (Climate Change Committee, 2020), whilst the Climate Change (Scotland) Act 2009 sets legal duties to for local authorities to reach 'net zero' and adapt their areas to the impacts of climate change.

Local authorities have the ability to drive direct action in this area through their powers and responsibilities, and they have the ability to facilitate action within their wider business and resident communities. It therefore cannot be understated how big a role local authorities must play as humanity tackles the defining crisis of its time.

On 16th May 2019, Glasgow City Council (GCC) declared a climate and ecological emergency. In response, a target to be net zero by 2030 was set and over sixty recommendations for achieving this were outlined. These recommendations were taken forward through the City Council's Climate Plan. The Climate Plan covers a wide range of sectors and will affect all departments within GCC.

The shift to a net zero, climate resilient city by 2030 requires a radical transformation of businesses, sectors, value chains and the whole economy to design out carbon - this will only be delivered in part by incremental improvements in the existing structures and system.

In response, GCC is leading the delivery of the Glasgow Green Deal (GGD). The GGD is a nine-year mission that aims to deliver that transformation, guided by three objectives: reducing carbon emissions and building resilience to the impacts of climate change; creating prosperity, sustainable jobs and high-quality places; and eliminating poverty and delivering justice through inclusion and equality. An important part of equipping and enabling the Council and other partners to deliver a Green Deal is to develop and improve the evidence base to inform the design and development of elements of the programme. The current evidence base on the environmental impact of local economies is poor – with limited assessments of businesses, sector or area-based emissions of businesses. As a result, the Green Economy team has committed to develop, publish and maintain an underpinning evidence base for the GGD and on the wider green economy.

This report sets out the findings of an initial piece of analysis that has been carried out based on existing analysis and aims to inform the evidence base upon which the activities of the GGD will be built. Whilst the following report is of importance, it must be noted that it is not the final goal.

Extensive further research in this area specific to Glasgow and GCR will be required to complement this initial piece of research to ensure the evidence base that informs the GGD remains relevant.

Targeted support for different groups will be required in local areas if we want to see a fair and just transition. Two examples of such groups that will depend on support in the net zero transition are businesses and workers. Businesses, particularly small-medium sized enterprises (SMEs) will require support to develop their skills, knowledge, and capacity to reach net zero, as well as to minimise the costs involved. Furthermore, workers across Glasgow will require direct support to enable them to reskill into new, green jobs as the economy transitions.

Where there are challenges there are also opportunities - as the economy transitions, productivity, efficiency and competitiveness will improve in the long-term, and there will be significant opportunities for innovation in the green economy that businesses and employees will be able to reap the rewards of.

In response to the target to be net zero by 2030, the Glasgow Green Deal (GGD) was launched on 21st October 2021. The GGD is a nine-year mission that aims to radically alter the structure of Glasgow's economy which is guided by three objectives: reducing carbon emissions and building resilience to the impacts of climate change; creating prosperity, sustainable jobs and high-quality places; and eliminate poverty and deliver justice through inclusion and equality. It has since been acknowledged that there is a need to develop and improve the evidence base upon which the activities of the GGD will be based, owing to the fact that there is a lack of local authority level data that can be used to analyse the environmental impact of local economies.

As a result, a commitment has been made to develop, publish and maintain the underpinning evidence base for the GCD.

2 Objectives

This report aims to form part of the initial evidence base for the Glasgow Green Deal. In particular it aims to:

- Analyse the environmental impact of employment within Glasgow and GCR.
- Analyse the environmental impact of output generation within Glasgow and GCR.
- Analyse the environmental impact of the business environment within Glasgow and GCR, according to different business sizes.
- Environmentally analyse median hourly pay rates in Glasgow.
- Determine the spatial distribution of industries within Glasgow and GCR, according to their environmental impact.

3 Methodology and Limitations

To produce a baseline estimate, the author took the following steps:

- A desk-based review of existing studies quantifying the environmental impact of local economies was undertaken
- The most relevant methodology was selected for transfer to Glasgow
- Data on the structure of the Glasgow and wider City region economy for 2019 was compiled prepared
- A taxonomy was applied to Glasgow and the wider City region
- The results were analysed and used to inform a series of recommendations to support the decarbonisation and environmental performance of different sections of the economy.

A full methodology of this work and the datasets underpinning the analysis are included in the Appendix 4.

The nature of this research means there are some limitations, notably:

- Generalisation - The categorisation of industries according to the taxonomy developed by Nesta is imperfect and requires a certain degree of generalization meaning unique characteristics of certain businesses operating within certain industries may not be accounted for.
- Limited consideration of local economic context – The taxonomy is an analysis of the overall UK economy, which means it will not reflect the relative performance of Glasgow or the City Region compared to other areas.
- Ability to monitor progress over time – Given the effort needed to calculate the underlying emissions intensity or degree of environmental activities used to produce a taxonomy of sectors, it is difficult to track progress over time.
- Use of Standard Industrial Classification (SIC) codes - the taxonomy classifies UK industries using SIC07 classifications. Consequently, this analysis does not account for changes in the industrial structure of the economy since the introduction of SIC07 codes in 2009, so for example, certain businesses operating within newer industries not included in SIC07 classifications may have been wrongly classified within the taxonomy.
- However, despite these limitations, the taxonomy was a useful tool for carrying out a piece of desk based environmental economic analysis. For future analysis, it is hoped that a tool specific to Glasgow/GCR will exist that can be used to quantify the environmental impact of the economy.

4 Existing Analysis Estimating the Environmental Impact of the Economy

At present, data that can be used to estimate the environmental impact of local economies is not provided by the Office for National Statistics (ONS). Instead, the ONS annually publishes high level estimates of the low carbon and renewable energy economy, not the whole economy and therefore not at the level of detail required to inform action.

Although there is generally a lack of local authority level environmental data that can be utilised by policy makers to inform action in this space, the review of evidence by the Economic Development division identified and reviewed three key approaches.

The UK Local Authority and Regional Carbon Dioxide Emissions National Statistics: 2005 to 2019 are a set of nationally consistent local authority CO2 emission estimates from 2005 to 2019 published by the Department for Business, Energy & Industrial Strategy (BEIS). Provided within these statistics are estimates for CO2 emissions by local authority split by source of emissions: industry, commercial, public sector, domestic, and land use, land-use change and forestry. These statistics were created and are kept up to date by combining the UK's Greenhouse Gas (GHG) Inventory with data from additional sources, such as local energy consumption figures.

Analysis of these statistics shows that Glasgow accounted for the greatest volume of territorial CO2 emissions in GCR (see Appendix 1), and that transport emissions accounted for the greatest volume of emissions in GCR (see Appendix 2).

Although useful, the grouping of all business emissions into two high level categories of 'industry' and 'commercial' mean that BEIS statistics do not provide enough detail to help Glasgow prioritise business support, employability support or other types of economic support. This is due to the fact that these are high level groupings that do not account for the industrial structure of the economy, and do not provide enough depth as to where emissions are coming from. An alternative to the BEIS statistics that would assist local authorities in their implementation of targeted support would be regularly updated local level, industry level emissions datasets.

There has been some innovation in this space. Examining Glasgow’s emissions and economy published in April 2021 by the Fraser of Allander Institute (FAI) combines data emissions and energy consumption data with a set of economic accounts for GCR to better understand current emissions levels in Glasgow. The FAI are currently still at an early stage of their work in this area and are therefore keen to engage with others interested in city level emissions. Although the FAI are still at an early stage in their work, several conclusions have been reached around the UK Local Authority and Regional Carbon Dioxide Emissions Statistics, how emissions are defined, transport emissions, and the use of a multi-sectoral approach to link economic activity with emissions.

Going Green: Preparing the UK workforce for the transition to a net-zero economy is another piece of analysis used to estimate the environmental impact of the economy. This analysis categorises UK industries according to their level of carbon emissions and their level of environmental activity using the Eco-Transformation of Industries Matrix outlined in Figure 1. The ‘Eco-Transformation of Industries Matrix’ is a taxonomy which classifies industries into one of the following four categories:

1. Leaders – low level of carbon emissions, high level of environmental activity.
2. Neutrals – low level of carbon emissions, low level of environmental activity.
3. Followers – high level of carbon emissions, high level of environmental activity.
4. Laggards – high level of carbon emissions, low level of environmental activity.

Industries with low emissions intensity are classified as leaders and neutrals and are generally categorised in the green sector, whilst industries with higher emissions intensity are classified as either followers and laggards and are generally categorised in the brown sector.

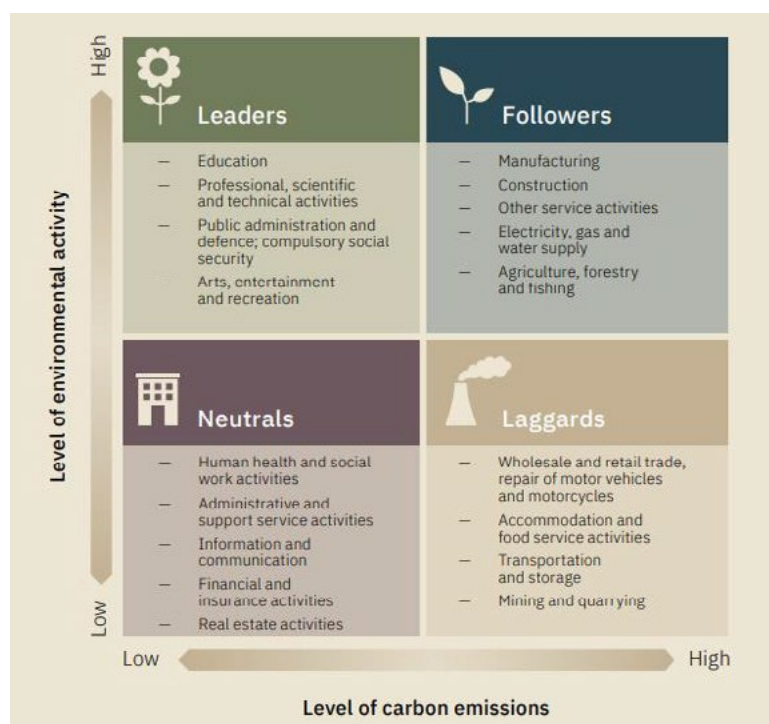


Figure 1 - The Eco-Transformation of Industries Matrix
Source: Nesta & Future Fit, 2021

To develop the taxonomy, Nesta ranked each industry by intensity of carbon emissions intensity and environmental activity. Industries with emissions intensities above the median were categorised within the brown sector; those below were categorised within the green sector. Similarly, industries were subdivided into two subcategories based on levels of environmental activity, again above or below the median. Further details of the methodology used by Nesta can be found in Appendix 3.

One other important piece of analysis consulted for the purpose of this report is the Just transition analysis by industry group in London dataset by GLA. This work apportions GHG emissions and energy consumption by industry group to London at a subnational level using regional employment estimates as a way to evaluate the environmental impact of the Greater London Authority's economy.

The analysis allowed for findings to be reached in several key areas including: the industry groups that likely account for the largest share of GHG emissions and energy consumption in London; the employment rates and economic output associated with these industry groups; the median gross weekly pay for full-time employees in these industry groups; the ethnicity of London workers in these industry groups; and the spatial concentration/distribution of these industry groups. An example of one of the outputs of GLA Economics' analysis can be found in Appendix 5 which shows that after apportioning emissions to London, the Transportation and Storage industry accounted for the largest share of emissions.

GLA Economics' analysis helped to inform the focus of the analysis that has been carried out on the Glasgow and GCR economy. However, it was decided by those involved in this analysis that a similar approach would not be used to analyse the environmental impact of the Glasgow and GCR economies. This down to the fact that the taxonomy developed by Nesta could yield similar outputs and it could be easily combined with existing industry level data at Glasgow and GCR levels; whilst GLA Economics had access to regional level emissions data for London.

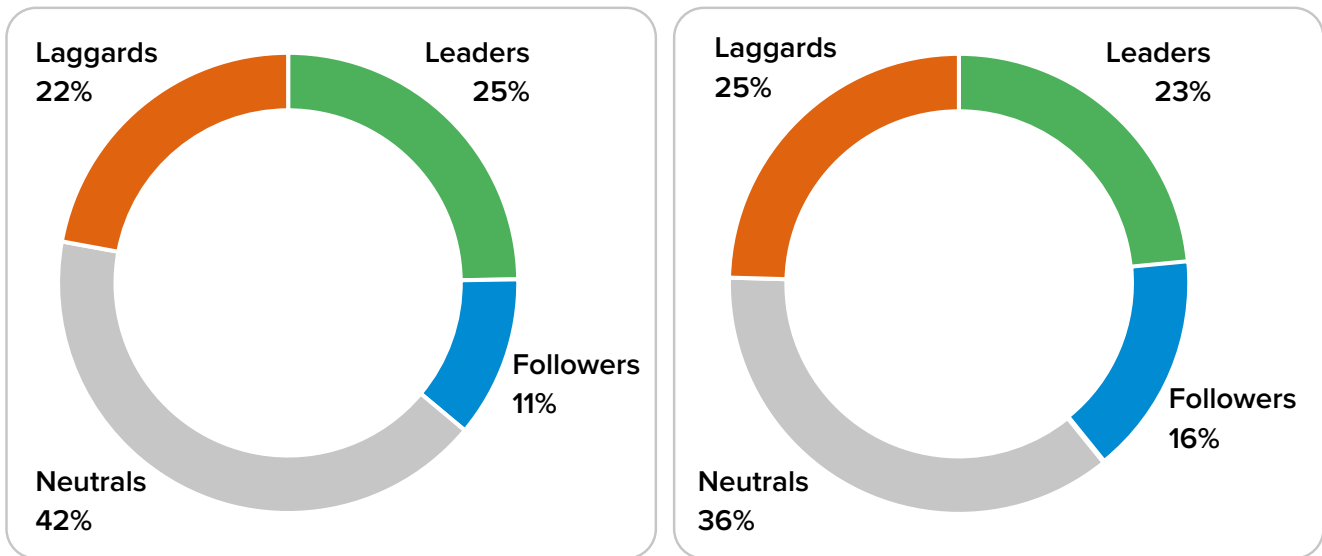
Following this review, the Economic Development team agreed to use the taxonomy developed by Nesta for the purposes of a baseline assessment.

5 Key Findings

In applying the NESTA taxonomy to Glasgow and the wider City Region, there were a number of key findings relating to the labour market, business, output, and the overall makeup of sectors.

Labour Market

Employment



Figures 2 and 3 - Percentage of Employees by Category, Glasgow and GCR, 2019
Source: BRES, 2019

Figures 2 and 3 show the concentration of employment in Glasgow and GCR across each category of the taxonomy. Neutral industries accounted for the greatest share of employment in both Glasgow and GCR. In Glasgow, 174,000 people were employed in neutral industries (42% of all employment), whilst 310,850 people were employed in neutral industries (36% of all employment) in GCR.

Glasgow’s economy is typically characterised by a strong business base, with strengths in a number key areas including finance and business services, a sector which falls into the neutral category.

However, many people were employed in follower and laggard industries in Glasgow and GCR in 2019 – 139,120 and 345,035 people respectively. This suggests that Green employability support, as well as reskilling and upskilling is likely to need to focus on individuals employed within the following industries that will be most affected by the transition: Manufacturing; Construction; Other Service Activities; Electricity, Gas and Water Supply; Wholesale and Retail Trade; Accommodation and Food Service Activities; and Transportation and Storage.

It is also worth noting that laggard and follower industries were responsible for a greater share of employment in GCR than in Glasgow, which may be explained by the fact that that businesses within these industries are typically located outside of cities.

Pay

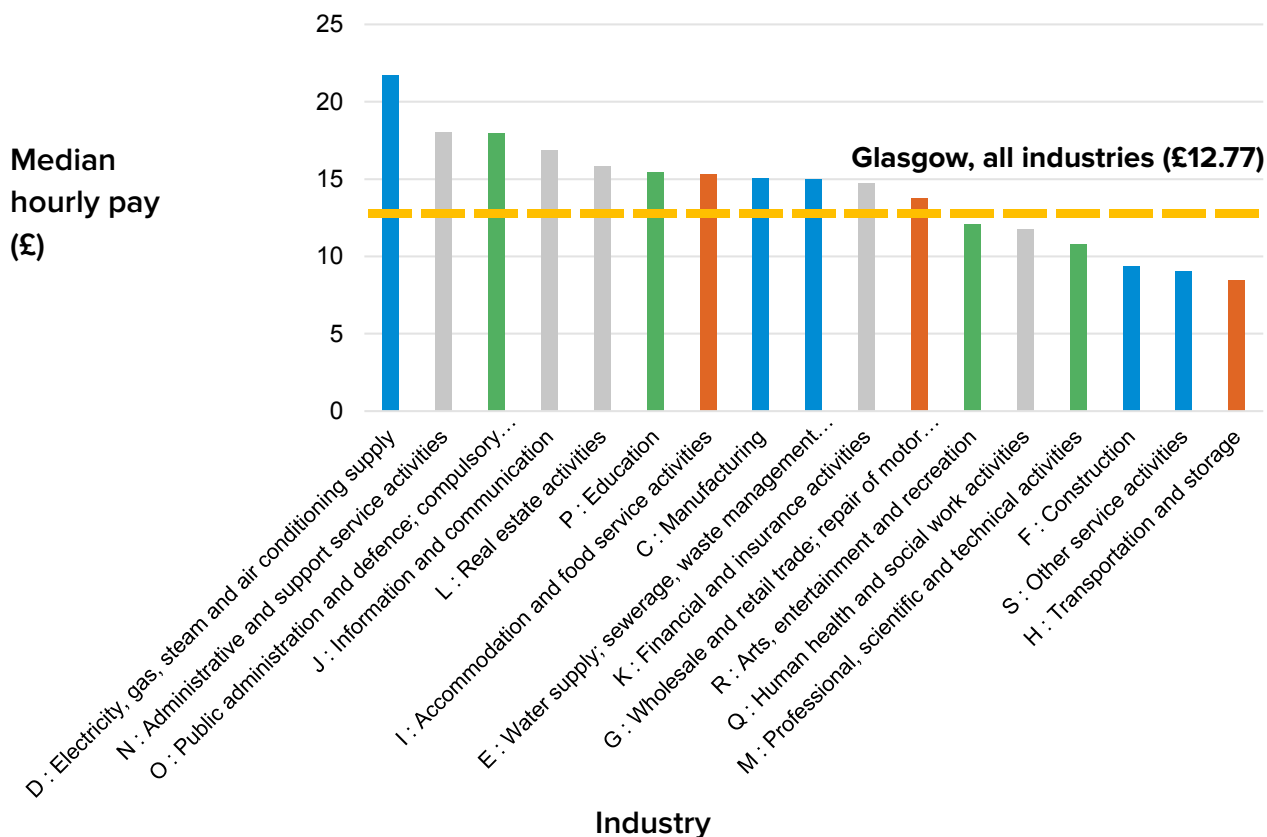
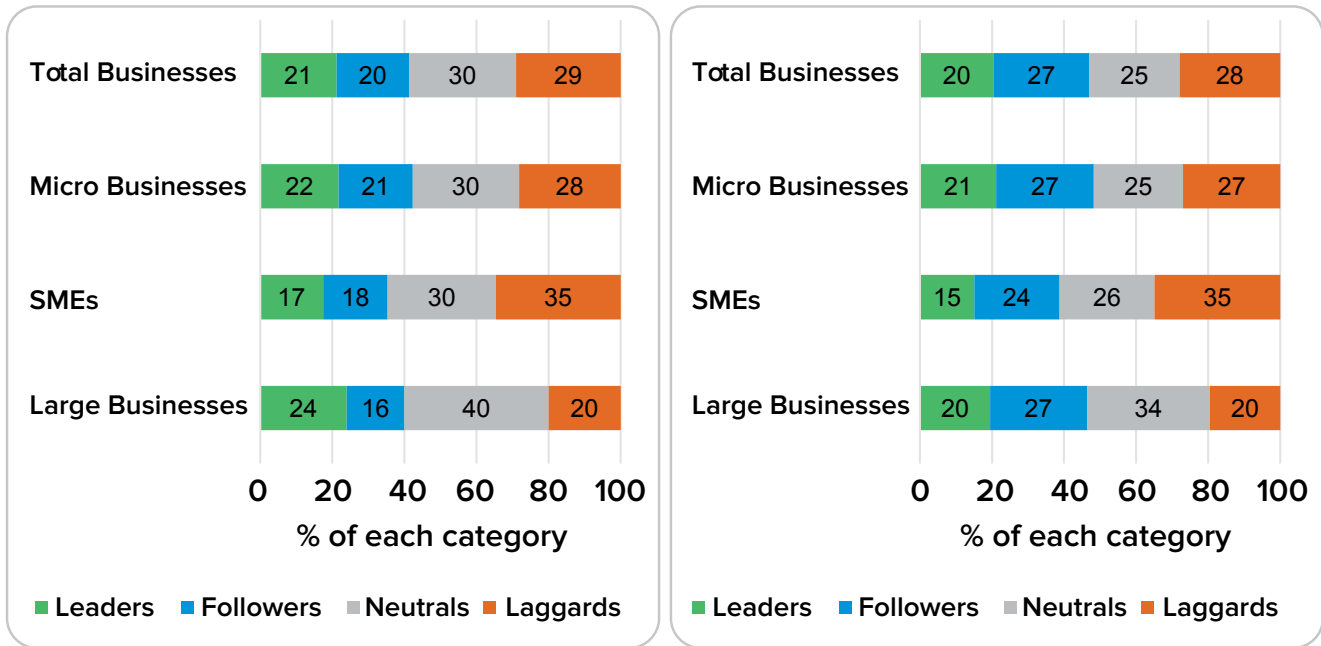


Figure 4 - Median Hourly Pay by Industry, Glasgow, 2019
Source: ASHE, 2021

With regards to pay, the three industries in Glasgow with the lowest median hourly pay rates were industries associated with high carbon emissions – Construction; Other Service Activities; and Transportation and Storage – although a number of industries with median hourly pay rates above the Glasgow average also were industries associated with high carbon emissions (notably Electricity, Gas, Steam and Air Conditioning Supply; Accommodation and Food Service Activities; Manufacturing; the Water Supply; Sewerage and Waste Management industry; and the Wholesale and Retail Trade industry).

This suggests that construction, transport, and services sectors will need to balance the investment required to reach net zero with the ongoing need to raise pay to attract a workforce.

Business



Figures 5 and 6 - Categories of businesses by business size, Glasgow and GCR, 2019
 Source: UK Business Counts, 2019

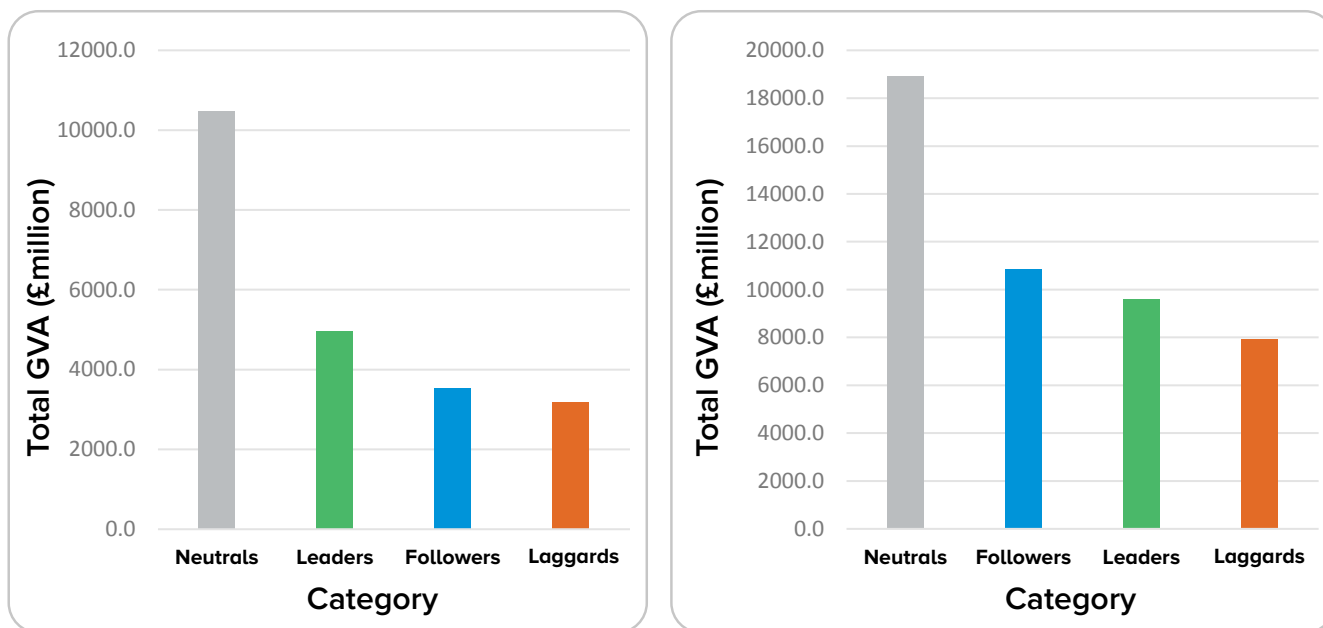
Figures 5 and 6 show the taxonomy composition of businesses according to business size – total businesses; micro businesses; SMEs; and large businesses. Micro businesses are businesses with between 0-9 employees, SMEs are businesses with between 10-249 employees, and large businesses are businesses with 250 or more employees. These definitions have been used in UK Business Counts data.

In Glasgow, 51% of all businesses were in industries associated with low emissions (leader and neutral industries). On the other hand, 55% of businesses in GCR operated in within industries associated with high emissions (follower and laggard industries).

In Glasgow, most SMEs operate within follower and laggard industries, and an even larger proportion of SMEs were in these industries in GCR. Combined with existing barriers to decarbonisation faced by SMEs, including cost and feasibility barriers (British Business Bank, 2021), this suggests the need for the allocation of additional resource to these businesses in Glasgow and GCR to support them through the green transition.

Furthermore, in GCR, the majority of total businesses, micro businesses, and SMEs were in industries associated with high emissions, highlighting the need for an aligned regional response to the challenges facing businesses as a result of the green transition.

Output



Figures 7 and 8 - Total GVA by Category (£million), Glasgow and GCR, 2019
 Source: ONS Regional GVA, 2019

Neutral industries generated the greatest value of GVA in Glasgow and GCR. In Glasgow, neutral industries generated a total of £10.5bn in GVA (47.3% of total GVA). In GCR, these industries generated a total of £18.9 billion in GVA (39.9% of total GVA). Although this was not the majority.

However, encouragingly, industries associated with low carbon emissions (leaders and neutrals) generated the majority of GVA in Glasgow and GCR – 67% and 59% respectively. On the other hand, industries associated with high carbon emissions (followers and laggards) generated 33% of GVA in Glasgow and 41% in GCR. This is positive for the economic outlook of Glasgow and GCR. Those industries that may experience the greatest impacts of the green transition currently make a smaller contribution to the economies of Glasgow and the wider City Region, therefore reducing the negative economic impacts of the transition.

For further breakdowns of total GVA by industry group in Glasgow and GCR please refer to Appendices 6 and 7. Appendix 6 shows that the industries responsible for the largest value of GVA generated in 2019 were the Human Health and Social Work Activities industry, Financial and Insurance Activities industry, and the Real Estate Activities industry respectively. Appendix 7 shows that the Production sector generated the greatest amount of GVA in GCR, followed by the Human Health and Social Work Services industry and the Real Estate Activities industry.

Cumulative Sectoral Impacts

Several industries across Glasgow and GCR face compound challenges in their green transitions, adding additional pressures on top of an already extensive list of challenges facing industries across the country, including the recovery from the pandemic and Brexit induced challenges. Outlined below are some of specific industries that face compound challenges:

Wholesale and Retail Trade: Those employed in the Wholesale and Retail Trade industry face challenges in the green transition. Appendices 8 and 9 show that many people were employed in this industry in Glasgow and GCR – 49,000 and 115,000 people respectively. This industry accounted for the largest share of employment out of both laggard and follower industries – industries associated with high carbon emissions.

Similarly, businesses operating in the Wholesale and Retail Trade industry in Glasgow face challenges. Appendices 10 and 11 show that this industry accounted for the largest number of businesses on the whole across Glasgow and GCR– 3,090 and 7,725 businesses respectively. Furthermore, Appendices 12 and 13 highlight that there were a large number of SMEs across Glasgow and the wider City Region operating in this industry – 360 and 890 SMEs respectively.

Appendices 6 and 7 highlight the significant GVA contribution made by this industry to the economies of Glasgow and the wider City Region. It is evident for the reasons outlined above, along with the significant economic contribution made that the Wholesale and Retail Trade industry will require a substantial package of employability, skills, and business support to ensure that employees, businesses, and the wider economy are not adversely affected by the green transition.

Accommodation and Food Service: Businesses and employees in the Accommodation and Food Service industry also face challenges to their transition in Glasgow and GCR. Appendices 8 and 9 highlight that this industry accounted for a large amount of employment in Glasgow and GCR- 31,000 and 58,250 employees respectively. Appendices 10 and 11 show that there were many businesses operating in this industry in Glasgow and GCR– 1,840 and 4,015 respectively, as well as a large number of SMEs – 535 and 1,000 respectively – shown in Appendices 12 and 13.

It is therefore indisputable that this industry will require additional support packages to assist those businesses and employees operating in it through the green transition.

Transportation and Storage: The Transportation and Storage industry also faces compound challenges across the domains of employment and pay. Appendices 8 and 9 show that a large number of people were employed in this industry in Glasgow and GCR– 12,000 and 36,900 people respectively. This industry has the lowest wages out of all industries in Glasgow, with a median hourly pay of £8.47 in Glasgow, lower than the Glasgow average of £12.77.

Clearly, as the green transition progresses, individuals employed in this industry will require significant employability and skills support to ensure they are not left behind.

6 Spatial Analysis

In addition to providing an overview of the whole economy of the Glasgow and City Region economy, the use of the Nesta taxonomy means it is possible to undertake a degree of spatial analysis. Figure 9 shows the category of the taxonomy that accounted for the greatest share of workplace-based employment in each ward of Glasgow in 2019.

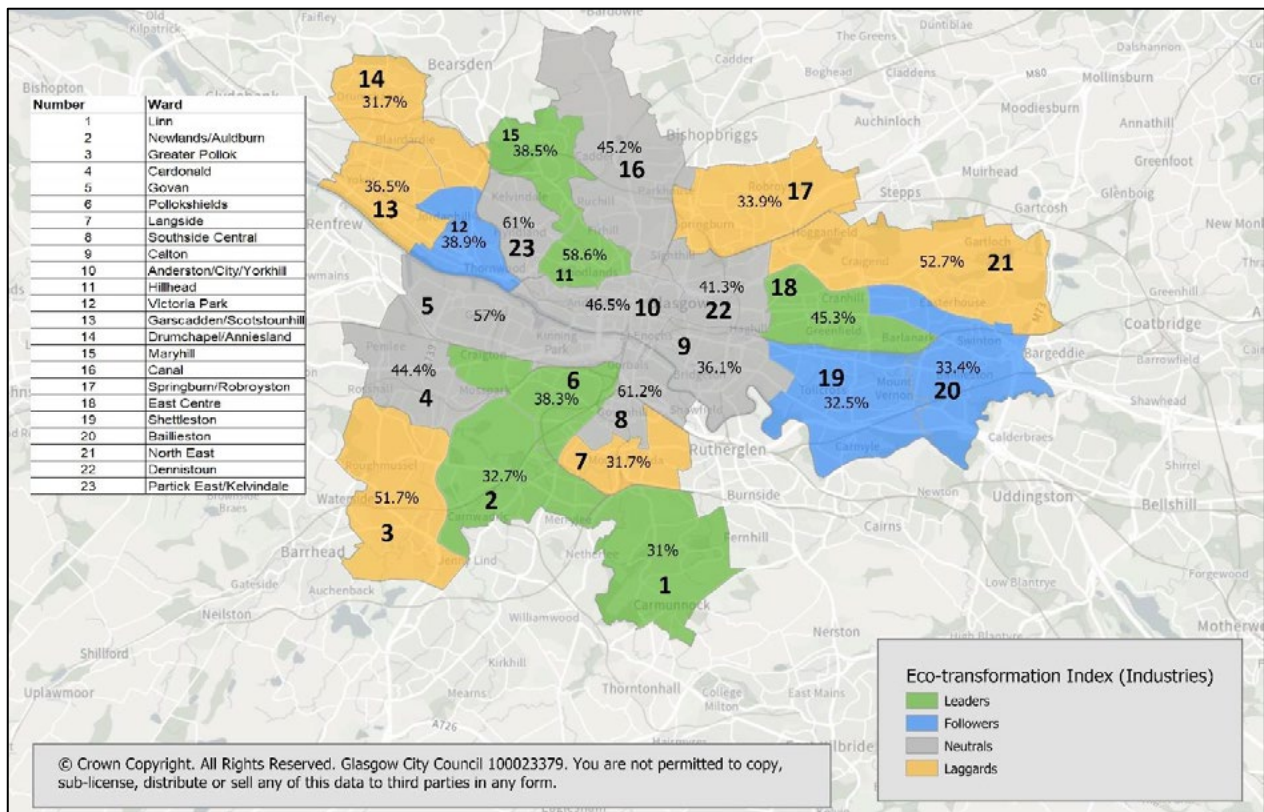


Figure 9: Main Category of Employment by Ward, Glasgow, 2019, based on BRES, 2019.

For the purpose of this report, Figure 9 provides a breakdown of the dominant category of employment in each ward, therefore providing a general view of where industries in each category of the taxonomy are located across Glasgow. It is important to note that this not necessarily the category which accounts for the majority of employment in each ward – the percentages assigned to each ward on Figure 9 are values for how much employment each category of the taxonomy accounts for.

Although it is not the case for every ward, there tends to be spatial concentrations of each category in specific groups of wards. Where one ward has a high concentration of one category, other wards in the surrounding area tend to also have a high concentration of the same category.

A number of wards in the city have a reliance upon jobs in neutral industries. Neutral industries make up the greatest share of employment in the City Centre (Anderston/City/Yorkhill ward), east into Dennistoun and Calton, and south into Southside Central, Govan and Cardonald, West into Partick East/Kelvindale and North into Canal. Concentrations of laggard industries tend to be located on the outskirts of the city and follower industries are located alongside these laggard industries. It is reasonable to assume that the areas of Glasgow where the majority of carbon emissions are released are where the map is shaded yellow and blue.

When comparing Figure 9 with the Scottish Index of Multiple Deprivation (SIMD), 2020 it is clear that the areas shaded yellow and blue, associated with high carbon emissions, are largely shaded red on the SIMD showing that these areas are relatively deprived across the domains of income, employment, health, education and skills, housing, geographic access and crime.

Encouragingly, Figure 10 shows that the largest share of employment in each local authority of GCR is composed of employment in leader and neutral industries, both of which are associated with low carbon emissions.

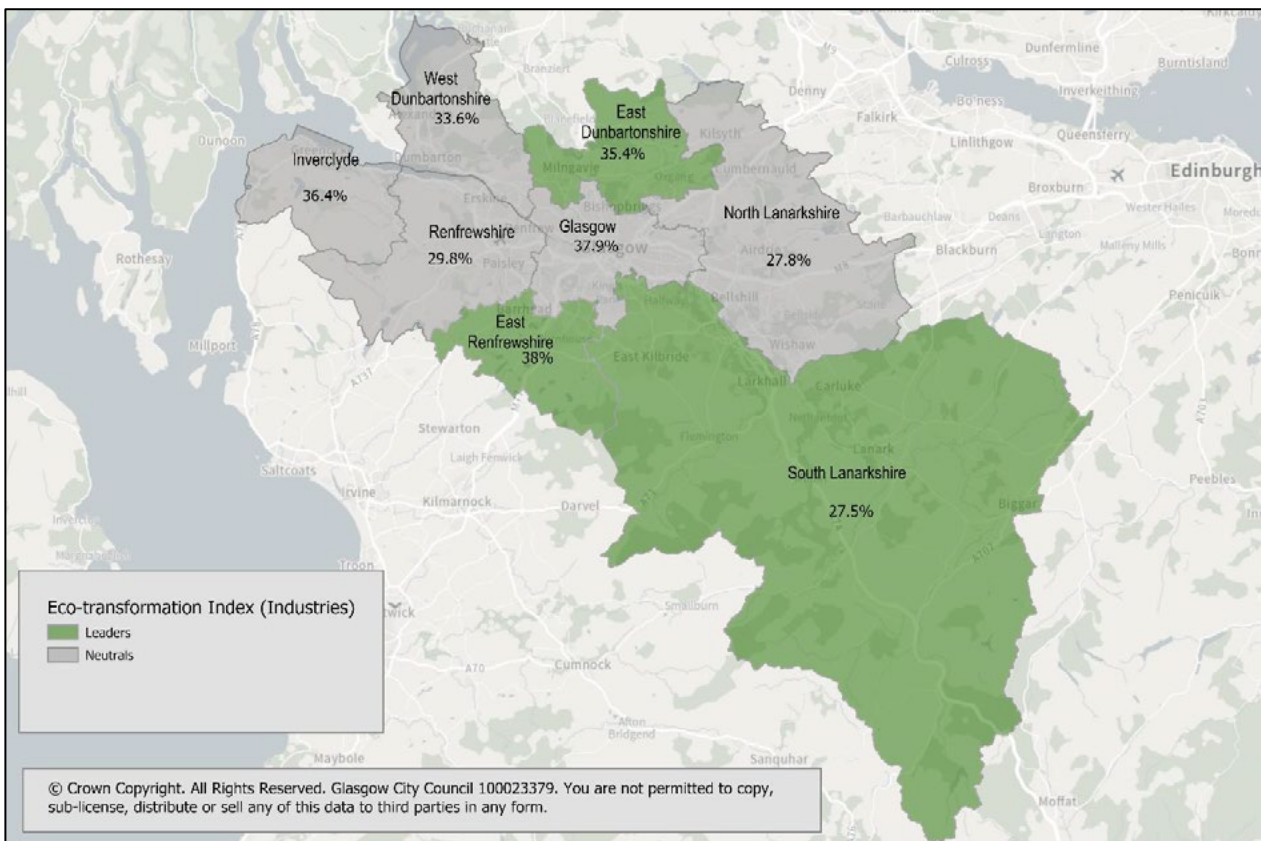


Figure 10: Main Category of Employment by Local Authority, GCR, 2019, based on BRES, 2019.

Similar to Figure 9, it is important to note that the Figure 10 outlines the category of the taxonomy that is the dominant employer, not the majority employer. The percentages assigned to each local authority on Figure 10 are values for how much employment each category of the taxonomy accounts for.

7 Recommendations, Response & Measuring Progress

It is recommended that the Economic Development department understands the implications of how this report could impact on the delivery of services across Glasgow, and the wider City Region, notably the delivery of business, employability and skills support, as well as targeted support for different areas of the city.

It is recommended that the Economic Development department understands the implications of how this report could impact on the delivery of services across Glasgow, and the wider City Region, notably the delivery of business, employability and skills support, as well as targeted support for different areas of the city.

Outlined below are different suggestions of how this report could impact on the delivery of services according to the different sections of the Economic Development department:

Employability and Skills: Green employability support, as well as reskilling and upskilling is likely to need to focus on individuals employed within the following industries that will be most affected by the transition: Manufacturing; Construction; Other Service Activities; Electricity, Gas and Water Supply; Wholesale and Retail Trade; Accommodation and Food Service Activities; and Transportation and Storage.

Business: The business team may wish to allocate resource to SMEs in Glasgow and across the wider City Region. As was outlined in Chapter 5, the majority of SMEs in Glasgow and GCR operate within follower and laggard industries – industries associated with high carbon emissions. As SMEs already face several barriers in the green transition, these businesses should be prioritised for support.

Spatial Distribution of Support: Based upon Figure 9, the following areas of the wards of Glasgow may require additional support given the concentration of laggard employment: Greater Pollok; Langside; Garscadden/Scotstounhill; Drumchapel/Annie'sland; Springburn/Robroyston; and North East. Figure 9 was created using workplace base employment estimates by industry and so it therefore provides insight into where the least environmentally friendly industries are located within the city.

In addition to the suggestions outlined above, it is also important that the evidence base upon which the activities of the Glasgow Green Deal are built is developed further. This report uses an existing method to analyse the environmental impact of the Glasgow and GCR economies which is appropriate at this early stage. However, going forward more detailed Glasgow and GCR specific analysis must be carried out. Depending on the availability of reliable open-source data, this analysis may be carried alongside key partners or externally as a piece of commissioned work. Although, one key feature of any future research should be that it is carried out in partnership with others.

Finally, it is important that the progress this report implements is measured, to ensure that the Economic Development department continues to move forward in achieving the ambitions of the GGD. It is recommended that the progress of this report is measured in alignment with the Glasgow Economic Strategy 2022-2030, and the Glasgow Regional Economic Strategy. Over time, new quantitative and qualitative ways of measuring progress in this area will be developed in partnership with key partners at local and national levels.

8 Conclusion

Using the Eco-Transformation of Industries Matrix developed by Nesta as a tool for analysing the environmental impact of the economies of Glasgow and GCR, it is evident that these economies will face challenges in the coming years as they go through the green transition. Challenges face almost all businesses, employees, and residents of Glasgow and GCR in the coming years, however, some will experience greater challenges than others. It is important that there is a recognition of the additional challenges different people and sectors of our economy face, and appropriate support is implemented to help those most affected by the transition.

As this report outlines, those industries in Glasgow and GCR that will be most affected by the transition are Manufacturing; Construction; Other Service Activities; Electricity, Gas and Water Supply; Wholesale and Retail Trade; Accommodation and Food Service Activities; and Transportation and Storage. Those employed in these industries will require employability and reskilling/upskilling support to ensure they are not left behind, whilst businesses in these industries will require support to diversify their operations, and to move away from carbon intensive activity, allowing them to thrive in the new green economy.

It is also clear that specific areas of the city will require additional given the large concentration of environmentally damaging industries in these areas, including: Greater Pollok; Langside; Garscadden/Scotstounhill; Drumchapel/Annie'sland; Springburn/Robroyston; and North East, all of which have been highlighted in Figure 9.

Whilst this report focuses on the challenges facing different sections of the economies of Glasgow and GCR, it is important to note that where there are challenges there are opportunities. The three interlinked objectives of the GGD are: reduce carbon emissions and build resilience to the impacts of climate change; create prosperity, sustainable jobs and high-quality places; eliminate poverty and deliver justice through inclusion and equality. When achieved, these objectives have the power to make Glasgow and the wider City Region fairer, greener, and more prosperous areas with opportunities for all, a vision which should leave residents feeling hopeful for the future.

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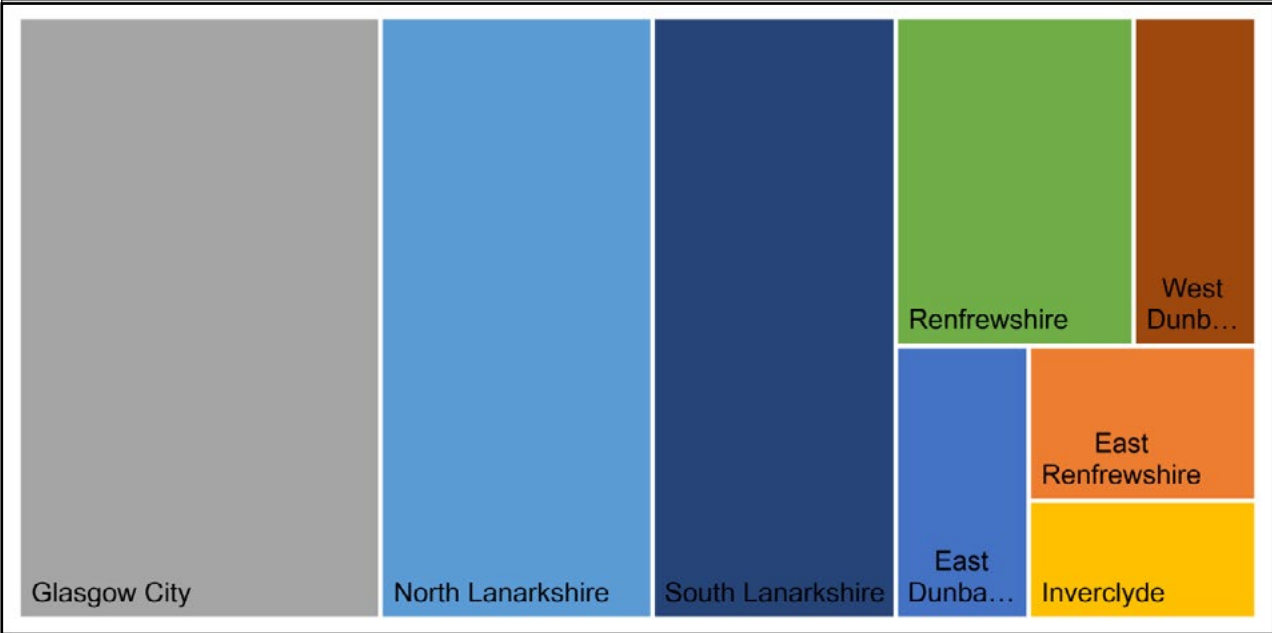
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Appendices

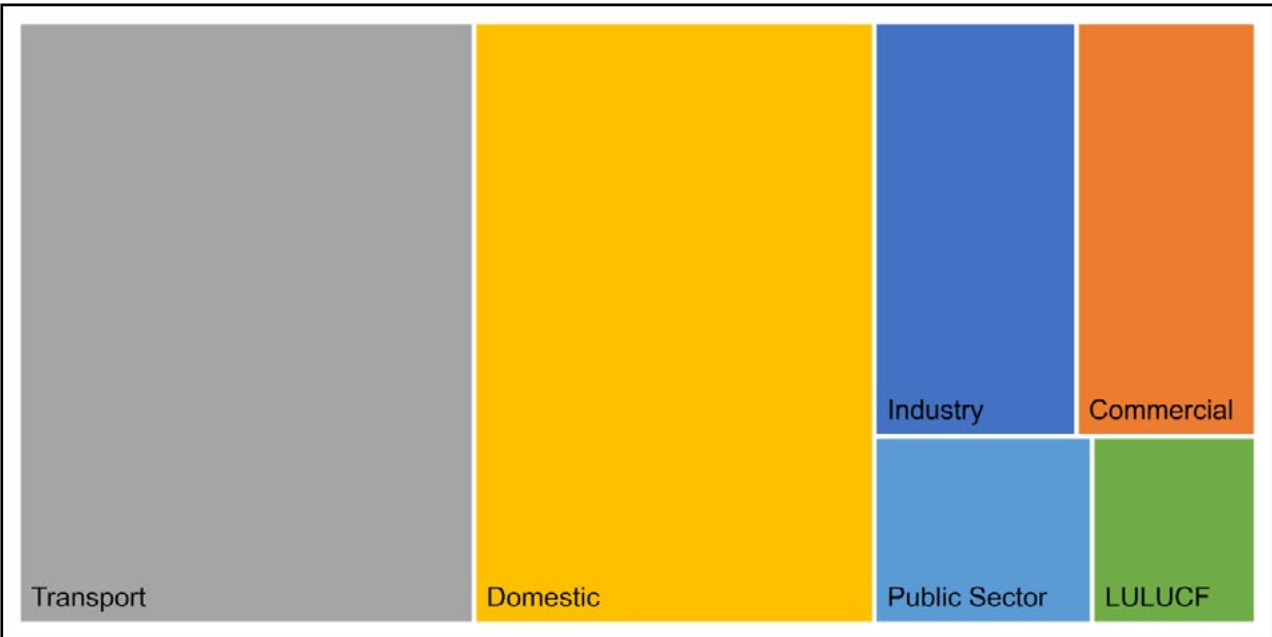
Appendix 1

Total territorial CO2 emissions in Glasgow City Region by Local Authority, 2019
Source: BEIS, 2019



Appendix 2

Glasgow City Region CO2 Emissions by Type, 2019
Source: BEIS, 2019



Appendix 3

The Classification of Industries by Environmental Activities and Carbon Emissions

Source: Nesta & Future Fit, 2021

Industry	Level of environmental activities	Level of carbon emissions	Category
Agriculture, forestry and fishing	0.199	0.497	Follower
Mining and quarrying	0.003	0.872	Laggard
Manufacturing	0.032	0.281	Follower
Electricity, gas and water supply	1.000	0.934	Follower
Construction	0.092	0.096	Follower
Wholesale and retail trade, repair of motor vehicles and motorcycles	0.000	0.078	Laggard
Transportation and storage	0.000	1.000	Laggard
Accommodation and food service activities	0.000	0.066	Laggard
Information and communication	0.000	0.014	Neutral
Financial and insurance activities	0.000	0.000	Neutral
Real estate activities	0.000	0.004	Neutral
Professional, scientific and technical activities	0.022	0.018	Leader
Administrative and support service activities	0.008	0.041	Neutral
Public administration and defence; compulsory social security	0.020	0.056	Leader
Education	0.011	0.030	Leader
Human health and social work activities	0.001	0.049	Neutral
Arts, entertainment and recreation	0.066	0.058	Leader
Other service activities	0.022	0.059	Follower
Median	0.009	0.058	

The four categories of eco-transformation in the UK by industry, 2018

Notes – The two variables (intensity of carbon emissions and intensity of environmental activities) were normalised between 0 and 1 using the min-max normalisation technique. Followers and laggards are considered to be brown sectors, as they are associated with high carbon emissions. Leaders and neutrals are considered to be green sectors, as they are associated with low carbon emissions. Leaders and followers are intensely engaged in activities that directly protect the environment.

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Appendix 4

Data Used

To analyse employment rates by each category of the Eco-Transformation of Industries Matrix, the Business Register and Employment Survey (BRES) was used. The BRES provides data on the number of jobs held by employees broken down by industry at a local authority level. For the purposes of the BRES, a job is recorded at the location of the employee’s workplace therefore providing workplace-based estimates of employment by industry group across the UK.

For Glasgow, employment rates of each category of the taxonomy were calculated by aggregating the number of employees in each industry associated with each category, divided by total number of employees in Glasgow.

For GCR, employment rates by industry by each local authority of GCR were combined and then aggregated by the number of employees in each industry associated with each category, divided by the total number of employees in GCR.

Analysis of output generated by each category of the taxonomy, and by industry, at Glasgow and GCR levels was carried out using the Office for National Statistics (ONS): Regional gross value added (balanced) by industry: local authorities by ITL1 region dataset. To achieve an understanding of the value of GVA created by each category of the taxonomy, value of GVA created by each group of industries was aggregated according to their categorisation on the taxonomy.

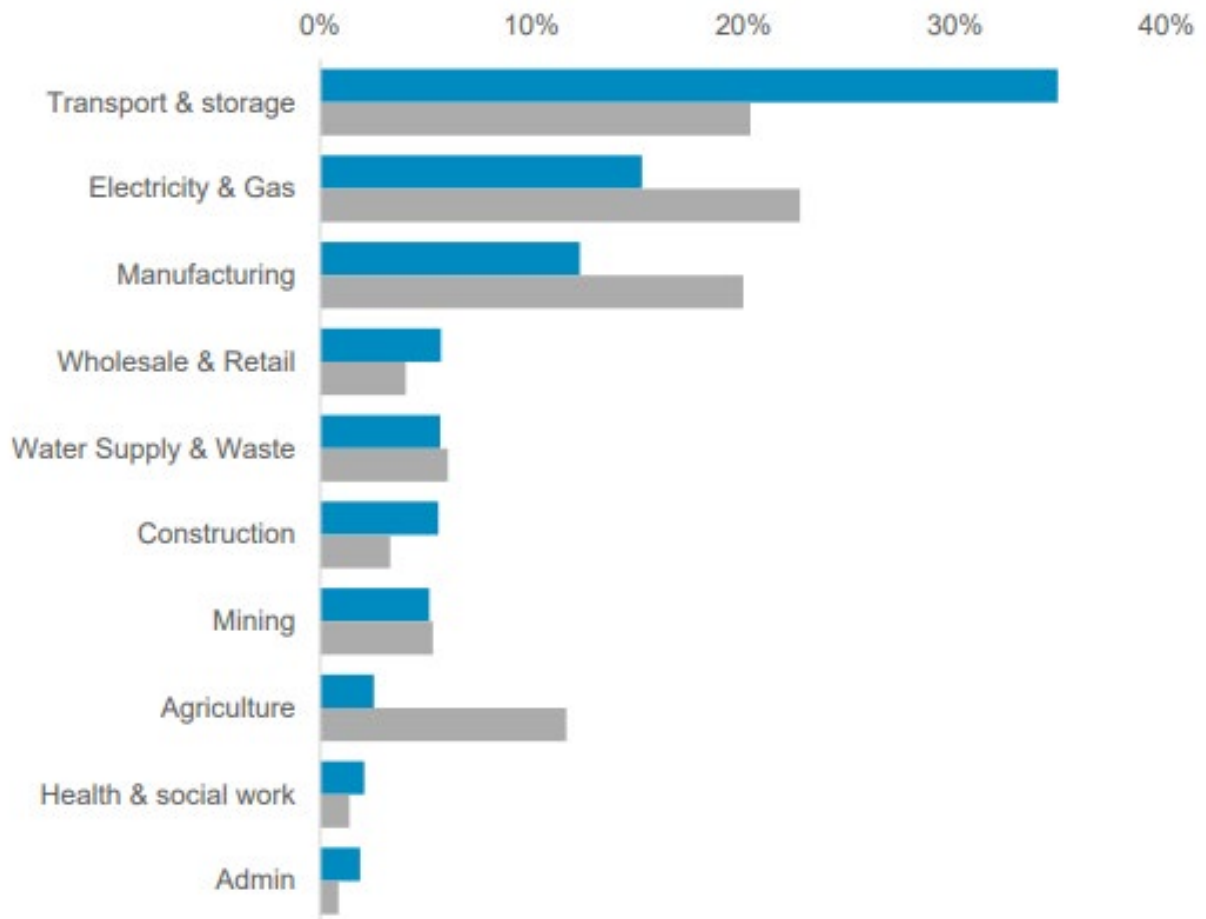
UK Business Counts data has been analysed at a Glasgow level and a GCR level. To understand the number of businesses in each category of the taxonomy, the number of businesses in each group of industries were aggregated according to their categorisation. To analyse median hourly pay rates by each category of the Eco-Transformation of Industries Matrix, the Annual Survey of Hours and Earnings (ASHE) was used. An ad hoc requested dataset was used for the purposes of this analysis as Nomis does not contain ASHE data at an industry level in the UK. The ad hoc requested dataset that was used in this analysis provides estimates of annual and hourly earnings for industry and occupation by NUTS2 and NUTS3 regions in the UK. Due to the breakdown of areas by NUTS2 and NUTS3 regions, this section of the analysis has only been carried out at a Glasgow level and does not include analysis for GCR.

To analyse the spatial distribution of businesses in Glasgow and GCR according to their taxonomy categorisation the BRES has been used broken down to electoral wards and local authorities for Glasgow and GCR respectively. As the BRES provides workplace-based estimates of employment by industry, this section details the category of jobs that are most common in each electoral ward/local authority, not the category of jobs that the greatest number of residents of a ward/local authority are employed in.

Appendix 5

GLA Economics Output

% of GHG emissions in London (apportioned) and UK (actual), 2018 – ten highest emitting London industry groups



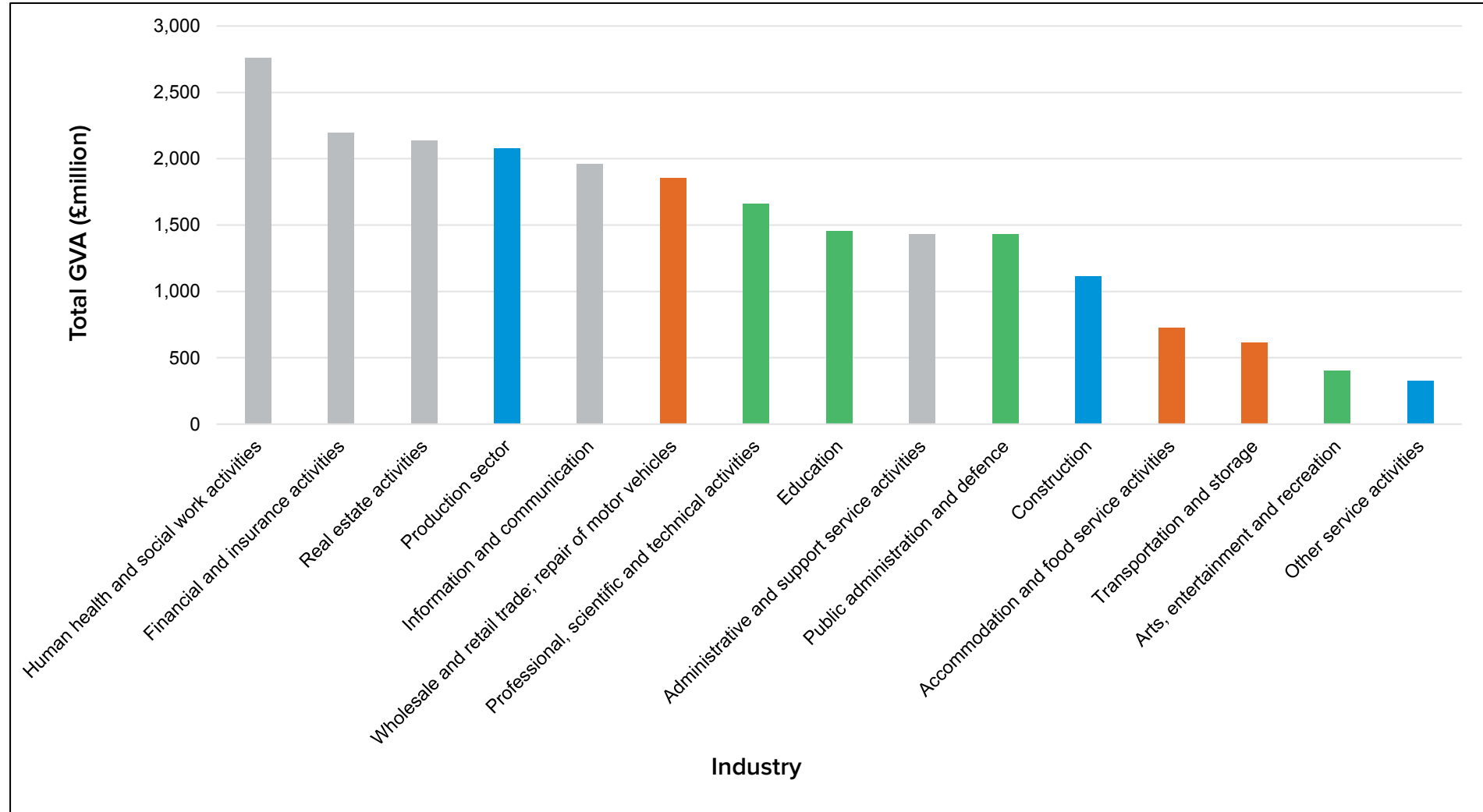
Key for Appendices 6-13

KEY	
Leader Industries	Green
Neutral Industries	Grey
Follower Industries	Blue
Laggard Industries	Orange

Appendix 6

Total GVA (£million) by Industry, Glasgow, 2019

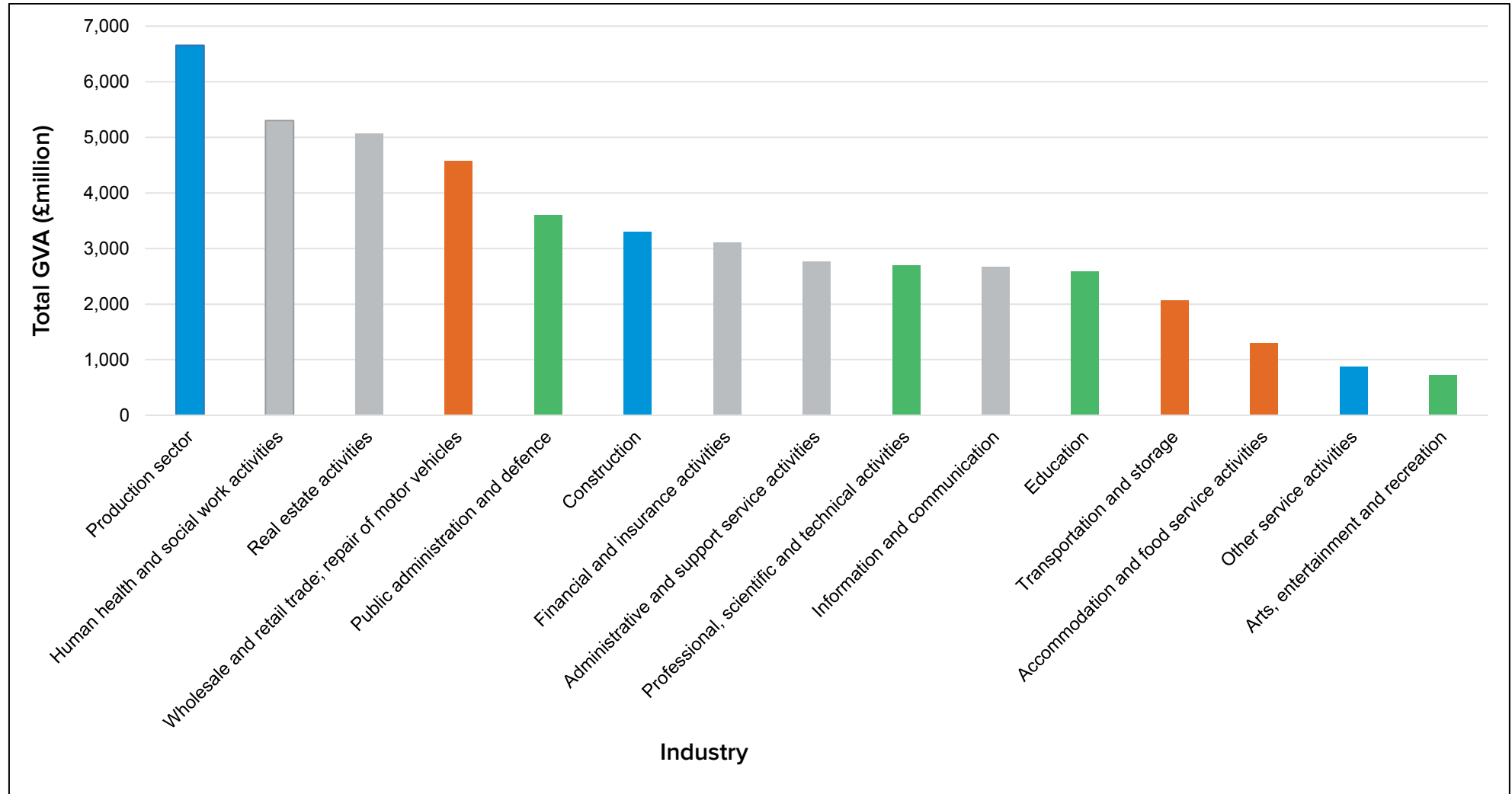
Source: ONS, Regional GVA, 2021



Appendix 7

Total GVA (£million) by Industry, GCR, 2019

Source: ONS, Regional GVA, 2021



Appendices 8 and 9

Number of Employees in Follower and Laggard Industries, Glasgow and GCR, 2019

Source: BRES, 2019

Industry	Number of Employees
G : Wholesale and retail trade; repair of motor vehicles and motorcycles	49000
I : Accommodation and food service activities	31000
F : Construction	18000
C : Manufacturing	17000
H : Transportation and storage	12000
D : Electricity, gas, steam and air conditioning supply	3000
E : Water supply; sewerage, waste management and remediation activities	3000
A : Agriculture, forestry and fishing	100
B : Mining and quarrying	20

Industry	Number of Employees
G : Wholesale and retail trade; repair of motor vehicles and motorcycles	115000
I : Accommodation and food service activities	58250
F : Construction	51850
C : Manufacturing	51450
H : Transportation and storage	36900
D : Electricity, gas, steam and air conditioning supply	7595
E : Water supply; sewerage, waste management and remediation activities	6960
A : Agriculture, forestry and fishing	2300
B : Mining and quarrying	480

Appendices 10 and 11

Total Number of Businesses in Follower and Laggard Industries, Glasgow and GCR, 2019

Source: UK Business Counts, 2019

Industry	Number of Businesses
G : Wholesale and retail trade; repair of motor vehicles and motorcycles	3090
I : Accommodation and food service activities	1840
F : Construction	1760
C : Manufacturing	890
H : Transportation and storage	560
E : Water supply; sewerage, waste management and remediation activities	55
A : Agriculture, forestry and fishing	40
D : Electricity, gas, steam and air conditioning supply	15
B : Mining and quarrying	5

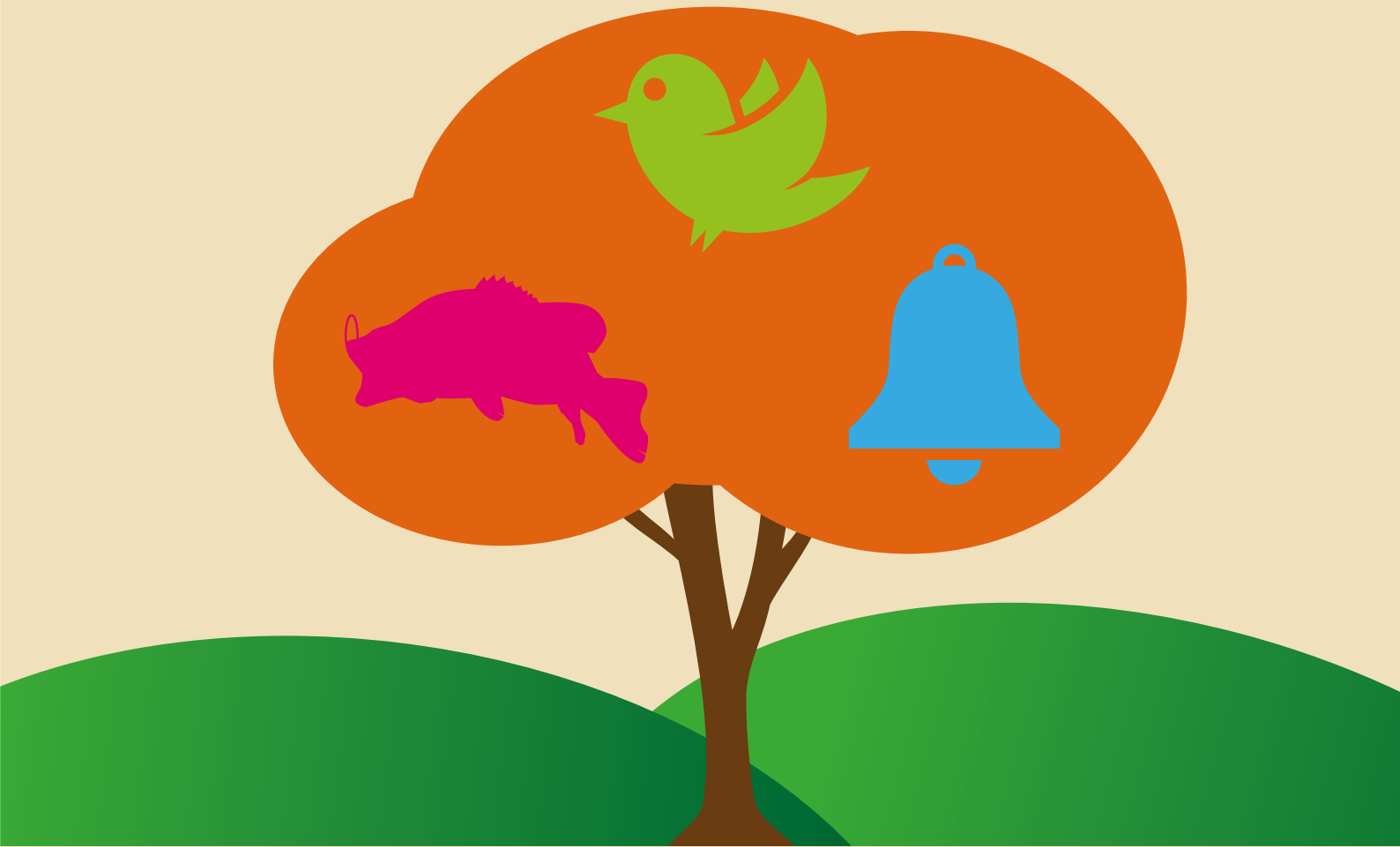
Industry	Number of Businesses
G : Wholesale and retail trade; repair of motor vehicles and motorcycles	7725
I : Accommodation and food service activities	6190
F : Construction	4015
C : Manufacturing	2770
H : Transportation and storage	2010
E : Water supply; sewerage, waste management and remediation activities	1080
A : Agriculture, forestry and fishing	140
D : Electricity, gas, steam and air conditioning supply	100
B : Mining and quarrying	10

Appendices 12 and 13

Number of SMEs in Follower and Laggard Industries, Glasgow and GCR, 2019
 Source: UK Business Counts, 2019

Industry	Number of SMES
G : Wholesale and retail trade; repair of motor vehicles and motorcycles	535
I : Accommodation and food service activities	360
F : Construction	195
C : Manufacturing	170
H : Transportation and storage	55
E : Water supply; sewerage, waste management and remediation activities	20
A : Agriculture, forestry and fishing	5
D : Electricity, gas, steam and air conditioning supply	5
B : Mining and quarrying	0

Industry	Number of SMES
G : Wholesale and retail trade; repair of motor vehicles and motorcycles	1000
I : Accommodation and food service activities	890
F : Construction	595
C : Manufacturing	560
H : Transportation and storage	245
E : Water supply; sewerage, waste management and remediation activities	40
A : Agriculture, forestry and fishing	35
D : Electricity, gas, steam and air conditioning supply	10
B : Mining and quarrying	0



This report has been produced by Glasgow City Council's economic development team.

For any further information, or to get in touch about collaborating, please email the Glasgow Green Deal team at glasgowgreendeal@glasgow.gov.uk.

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