TRANSPORT SCOTLAND
CÒMHDHAIL ALBA

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Scottish Transport Statistics 2021

Transport Environment

Contents

1. Introduction

1.1 This chapter provides information about the impact of transport on certain aspects of the environment with a focus on greenhouse gas emissions and air quality. Statistics include atmospheric pollutants and emissions of greenhouse gases by types of transport as well as details of emissions levels of road vehicles. Data from other chapters within Scottish Transport Statistics are referred to in the analysis.

Key points

- **In 2019 (the most recent year available), transport (including international shipping and aviation) accounted for 36% of Scotland's greenhouse gas emissions under the definition set out in the Climate Change Scotland Act.**
- **Road transport made up 66% of transport greenhouse gas emissions.**
- **Through September of 2020 there were 6,545 Ultra Low Emission Vehicles registered in Scotland for the first time – 80% up on the corresponding period in 2019.**
- **In 2019, transport accounted for 57% of emissions of oxides of nitrogen, 17% of particulate matter PM_{10} and 21% of particulate matter $PM_{2.5}$. As at 15 October 2021, there were 36 active Air Quality Management Areas related to these pollutants.**

2 Main Points

Air pollutant emissions

2.1 The main pollutants of current concern in Scotland are:

- Nitrogen oxides (NO_x);
- Particulate matter (PM10 and PM2.5);
- Sulphur dioxide (SO2);
- Non-methane volatile organic compounds (NMVOCs);
- Ground-level ozone (O3); and
- Ammonia (NH3).

2.2 Of these pollutants, transport is a significant contributor to emissions of oxides of nitrogen and particulate matter. Transport is also linked to ground level ozone, which is a secondary pollutant produced by chemical reactions involving oxides of nitrogen.

2.3 Historically, transport was also a major contributor to emissions of lead and non-methane volatile organic compounds (NMVOCs). The significant decline in lead emissions (99% since 1990) has been mainly driven by the progressive phasing out of leaded petrol. The lead content of petrol was reduced from around 0.34 g/l to

0.143 g/l in 1986. From 1987, sales of unleaded petrol increased, particularly as a result of the increased use of cars fitted with three-way catalysts. Leaded petrol was phased out from general sale at the end of 1999. For NMVOCs, transport sector emissions declined significantly during the 1990s due to the increased use of catalytic converters and fuel switching from petrol to diesel cars. (Chart 13.1a).

2.4 Emissions of nitrogen oxides (NOx) were estimated to be 85kt in 2019 of which transport accounted for 57%. Since 1990, transport emissions have declined by 68%. Transport emissions have declined due to a number of reasons including the requirement for new petrol cars to be fitted with three-way catalysts since 1989 and, in more recent years, “Euro standards” for new cars have driven a reduction in emissions, although studies show that the diesel Euro 5 cars have not performed as well as expected. Since 2008, there has been a general reduction in the emissions from passenger cars, mainly driven by improvement in catalyst repair rates. In 2019, diesel cars and light goods vehicles (LGVs) accounted for 40% of NOx emissions from transport compared with less than 2% in 1990 (Table 13.1a).

2.5 Emissions of PM10 were estimated to be 14kt in 2019, of which transport accounted for 17%. Since 1990, transport emissions have declined by 65%. For particulate matter, the main source of transport emissions is non-exhaust emissions from tyre and brake wear and road abrasion. In 2019, these accounted for 54% of PM10 emissions from transport compared with 14% in 1990. Since 1990, exhaust emissions from road transport have decreased by 88% due to the penetration of new vehicles meeting tighter PM10 emission regulations ("Euro standards" for diesel vehicles were first introduced in 1992). Over the same period emissions from shipping fell by 82% (Table 13.1a).

2.6. Emissions of PM2.5 were estimated to be 9kt in 2019 of which transport accounted for 21%. Trends in emissions of PM2.5 from transport follow a similar pattern to those for PM10. PM2.5 accounts for all road transport exhaust PM10 emissions and most of such emissions from shipping but only around 55% of PM10 emissions due to road abrasion and tyre and brake wear.

Air quality

2.7 Concentrations of air pollutants are sampled at automatic monitoring sites and the information is held in the “Scottish Air Quality Database” on the “Air Quality in Scotland” website (http://www.scottishairquality.co.uk/), The data section of the “Air Quality in Scotland” website provides detailed information on all sites while the publication section of the website includes reports showing trends. Table 13.b in this publication shows concentrations of nitrogen dioxide, ozone and PM10 at a mixture of urban and rural monitoring sites with long time series. Air quality is monitored

against standards set as air quality objectives (see environment section of the user guide).

Nitrogen dioxide (NO_2)

2.8 For some of the selected monitoring sites, nitrogen dioxide concentrations show a downward trend. In 2020, all of the 11 selected operational sites that recorded nitrogen dioxide concentrations with a data capture rate of over 75% had the lowest concentrations recorded over the period 2010-2020. In 2010, concentrations at nine of the selected sites reached their highest value over the period 2010-2020. Note that this excludes figures for years where the data capture rate was 75% or lower. In 2020, 75 sites in Scotland recorded nitrogen dioxide concentrations with a data capture rate of over 75%, of which 58 were roadside or kerbside locations. None of these 75 sites had concentrations in excess of the air quality strategy objective of 40 μg/m3 as an annual mean (Table 13.1b)

Ozone (O_3)

2.8 Though transport emissions contribute to ozone formation, levels of ozone are generally higher in rural areas due to the long-range transportation of primary pollutants from urban sources. In addition, ozone reacts with nitric oxide, which is more abundant in urban areas due to traffic emissions, to form nitrogen dioxide; therefore ozone levels are usually lower in urban areas. While at the selected monitoring sites there has been some indication of a downward trend in the number of occurrences of maximum daily concentrations exceeding 100 μg/m3, this has since levelled off. There appears to be no trend in average annual concentrations. In 2020, all of the 11 sites in Scotland recording ozone with a data capture rate of over 75% met the air quality objective of no more than 10 occurrences of the maximum daily concentrations exceeding 100 μg/m3 (Table 13.1b)

Particulate matter (PM_{10})

2.9 PM_{10} concentrations show a general downward trend at the selected sites. In 2020, of the 65 sites in Scotland recording PM_{10} with a data capture rate over 75%, no sites had concentrations greater than the air quality objective of 18 $\mu g/m^3$ as an annual mean. No site exceeded the air quality objective set as 7 occurrences of a daily mean above 50 $\mu g/m^3$. (Table 13.1b)

Air Quality Management Areas

2.10 Whenever it appears that one or more of the air quality objectives is unlikely to be met by the required date, the local authority concerned must declare an Air

Quality Management Area (AQMA) covering the area of concern. The authority must then prepare and implement an action plan outlining how it intends to tackle the issues identified. Table 13.1c summarises active AQMAs and the pollutants of concern. As at 15 October 2020, there were 38 active AQMAs, all but one of which related to either NO2 or PM10, or both.

Greenhouse gases

2.11 In 2019, Transport (*including* international aviation and shipping) accounted for 14 million tonnes of carbon dioxide equivalent ($MtCO_2e$). This represents 29.2% of total net greenhouse gas emissions allocated to Scotland in the *Greenhouse Gas Inventories*, the same as in 2018. Total net emissions from *all* sources decreased by 2.3% between 2018 and 2019 falling from 48.9 $MtCO_2e$ to 47.8 $MtCO_2e$, with transport total emissions having decreased from 14.3 MtCO2e to 13.9 MtCO2e, a fall of 2.2%. Within Transport emissions, Road Transportation accounted for approximately 66.2% of the transport total. Heavy Goods Vehicles and Light Goods Vehicles were the other significant contributors to transport emissions accounting for 12.3% and 12.2%, respectively. International Aviation and Shipping contributed roughly 13.7% and domestic aviation 4.6% of transport's total emissions. The contribution from rail was 1.1% and domestic shipping, 14.4%. It should be noted that these estimates use a methodology designed to produce internationally-comparable figures so apparent year-to-year fluctuations could be due in part to limitations in or changes to the underlying data or calculations. See *Table 13.2* for more detail and emissions from earlier years and Section 4.2 below for more detail on the methodology used.

2.12 Figure 13.2 shows transport emissions over time, by mode. Estimated car emissions have fallen by 15.9% since 2006. Traffic levels (vehicle km) have increased slightly over the last few years so the reduction in emissions seen will be due to the introduction of more fuel efficient vehicles as well as other more fuel efficient driving, particularly in the business fleet. More detail on car emissions is set out from paragraph 2.16 of this chapter while more details on traffic volumes by mode can be found in chapter 5 of STS. Details of personal modal choice can be found in chapter 11.

2.13 The *Greenhouse Gas Inventories* report the emissions of the six gases that are listed under the Kyoto Protocol. In the case of transport, the quantities of gases involved are relatively small except for carbon dioxide, which accounts for about 99 per cent of transport's total. *(Table 13.3)*.

2.14 Table 13.4 presents some comparisons between the UK as a whole and Scotland. Overall, Scotland's transport emissions account for 8% of the UK total. At

14% Scottish bus emissions are above a proportionate share of the UK total, while domestic aviation, at 20%, is significantly above that benchmark.

2.15 Estimates of carbon dioxide emissions per passenger-km for different modes of transport are available only for GB/UK as a whole. The lowest emitting modes of land transport per passenger-km are coaches at 27 gCO_2e; and light rail and tram at 28 gCO_2e. Air travel tends to be the highest emitter per passenger-kilometre, particularly domestic flights, which account for 246 grams of CO_2 per passenger kilometre, inclusive of radiative forcing which accounts for higher levels of greenhouse gases emitted at altitude during the cruise phase (*Table 13.5*). The basis of these estimates is described in section 13.5 page 302.

Car emissions

2.16 Newly registered cars are becoming more fuel efficient and thus generally emit fewer emissions per kilometre. Figure 13.3 shows the steady downward trend in average CO_2 emissions for newly registered cars in Scotland. Average CO_2 emissions in Scotland for new car registrations has fallen by 10 per cent over the last ten years. However, since a low of 120 for CO_2 in 2016 there has been a steady rise to 128.9 in 2020. (*Table 13.6a*)

2.17 The proportion of newly registered cars with emissions of 140g/km or lower has increased from 58 per cent in 2010 to 64 per cent in 2020. Cars with emissions of over 200g/km have decreased from 4.2 per cent of new cars to 4 per cent. These changes are at least in part the result of changes to vehicle excise duty bandings made by the UK Government in recent years.

Ultra low emission vehicles (ULEV)

2.18 The number of ultra-low emission vehicles registered in Scotland for the first time so far in 2021 is 91% up on the corresponding figure in 2020 (January – September). Almost all of these sales have been supported by Plug-in-Grant scheme for cars and vans. At the end of Q3 2021 there are 38,634 ULEVs registered in Scotland (*Table 13.7 and 13.8*)

Registrations by type of vehicle

2.19 The overwhelming majority (98 per cent) of vehicles licensed for use on the roads in Scotland are still powered by either petrol or diesel. Historically petrol powered vehicles have been outsold by diesel vehicles although in recent years petrol vehicles have been outselling diesel. Overall though there are more petrol vehicles on the road than diesel ones. While 30 per cent of all diesel vehicles are

body types other than cars only 6 per cent of petrol vehicles were not cars. (*Table 13.9 and 13.10*)

Electric Vehicle (EV) charge points

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2.20 The shift to electric vehicles is an important part of responding to the climate emergency and improving air quality in our cities. To help incentivise this shift, we have invested over £50 million in ChargePlace Scotland, Scotland's public charging network, which now has more than 2,100 publicly available charge points. Scotland is leading the way on electric vehicle charging infrastructure. The latest figures show that Scottish electric vehicle drivers benefit from almost 40 public charge points per one hundred thousand people, compared to fewer than 30 in England, just over 20 in Wales and less than 20 in Northern Ireland.

2.21 In 2021, the public EV charge points on the ChargePlace Scotland network (CPS) totalled 2,148, this equates to 1,446 (305%) more than in 2017. A map showing the locations of the charging points in Scotland is available here https://chargeplacescotland.org/cpmap/ (*Table 13.11)*

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