Road Traffic Estimates

Methodology Note

An annual series of road traffic estimates are published by the Department for Transport, approximately 6 months after the end of the reference year.

Data Collection

There are three main data sources which are used to calculate annual traffic estimates. **Manual traffic counts** are carried out at a number of sites throughout the counting season which runs between March and October. This raw data is then combined with information from a network of **automatic traffic counters** (ATCs) to calculate a series of annual average daily flows[1] (average vehicles per day) for each count point. These daily flows are combined with **road lengths** to calculate the number of vehicle miles travelled each year by vehicle type, road category and region.

Manual Traffic Counts

Annual traffic estimates are mainly based on around 10,000 manual counts which are conducted each year, where trained enumerators count traffic by vehicle type over a 12 hour period.

Manual counts are held on both major and minor roads on days in the year which have been assigned the status: 'neutral day'. A neutral day is a weekday between March and October, excluding all public holidays and school holidays; this is because it is on any of these days that traffic is expected to behave similarly. There are usually 110 neutral counting days in a calendar year.

Major roads in Great Britain are represented by a series of links, which are unique sections of road which make up the entirety of the major roads network. These links are given a unique reference number called a count point number or CP; these links are referred to as CPs. It is not possible to count every single link every year; therefore the sections of road are surveyed on either an annual basis or on a cycle of every 2 years, every 4 years or every 8 years. This means not every link in the major road network has a 12 hour count in each year.

Minor road estimates are calculated differently to major road estimates. Due to the vast number of minor roads in Great Britain it is not possible to count them all, instead a representative sample of

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[1] Annual average daily flow (AADF) is the number of vehicles estimated to pass a given point on the road in a 24 hour period on an average day in the year

minor road sites are counted each year. Growth between the two years is then applied to overall minor road estimates to calculate estimates for the latest year.

Automatic Traffic Counters (ATCs)

Traffic data is also collected continuously from a national network of around 180 Automatic Traffic Counters (ATCs). In addition to counting traffic, the ATCs record some of the physical properties of passing vehicles which are used to classify traffic by type. The ATCs produce two outputs which are used in the production of annual estimates: expansion factors and growth factors.

Expansion factors

Expansion factors are used to convert the manual count 12 hour totals into flow figures that represent traffic in an average 24 hour period, or annual average daily flow (AADF). In order to do this, roads in Great Britain are split into 22 categories, based on the type of road, the location, and the estimated AADF. See Annex A for details of these categories. These 22 categories are called expansion factor categories and each ATC is placed into one of these categories.

Each ATC records a 12 hour day figure from 7 am to 7 pm, and a 12 hour night figure, from 7 pm to 7 am, and also a 24 hour figure which is just the sum of these two 12 hour figures, for each day in the year. Expansion factors for each individual ATC are created by calculating the average of the 24 hour totals over 365 days of the year: this is effectively calculating an AADF for each ATC. Then, for each neutral day (days on which manual counts are conducted), the ATC's AADF is divided by the 12 hour (7 am to 7 pm) total to give an expansion factor for every neutral day for each ATC.

To produce the final expansion factors a median of the individual ATC expansion factors in each of the 22 expansion factor categories for each neutral day is calculated. This is done for the different vehicles types. This results in 16,390 unique expansion factors (110 neutral days by 22 expansion factors by 7 different vehicle types, excluding any for pedal cycles on motorways).

HGVs: The data from the ATCs is grouped into rigid and articulated HGVs and expansion factors are created for these two vehicle types. When a manual count is carried out 6 different classifications of HGV are recorded: 3 rigid types and 3 articulated types. The same expansion factors are applied to all 3 rigid types, and the same expansion factor is applied to all 3 articulated types.

London: In London the ATCs only classify vehicles into two categories, Short and Long. The ATCs are then classified into 4 London expansion factor categories and then those traffic totals are split into the different vehicle types using proportions that have been calculated from a series of manual counts done in London. Short is split into car, vans, motorcycles and pedal cycles while Long is split into articulated HGVs, rigid HGVs and Bus. Expansion factors can then be calculated for these categories in the same way described above.

Converting the 12 hour raw totals into AADF figures is done by multiplying the 12 hour total by the relevant expansion factor depending on vehicle type, count date and expansion factor category

Growth factors

Where a manual count has not taken place in the reference year, growth factors are applied to the previous year's AADFs in order to bring them in line with growth at the national level. Growth factors are calculated from the change between the reference year and the previous year. They are calculated from data from every ATC in the 22 expansion factor categories and for the 7 vehicle types ATC data is grouped into.

Data from the Continuing Survey of Road Goods Transport (CSRGT) provides information on the proportions of the 6 classifications of HGV we publish our traffic data on; these proportions are applied to the rigid and articulated growth factors. This results in unique growth factors for 11 vehicle types and expansion factor categories.

By applying either expansion factors to manual counts or growth factors to the previous year's AADFs we get a full set of up-to-date AADFs for every link of road on the major road network, and for the minor roads on which counts have been carried out.

Creating AADFs

The expansion factors are applied to all CPs which have had a manual count. At this point major and minor road AADFs are separated as traffic volume is calculated differently for major and minor roads. The growth factors are then applied to the previous year's AADF of any remaining major road CPs. There are some CPs which are never counted, they are defined as either *dependent*, *derived* or *Scottish ATC* CPs.

CPs are defined as *dependent* if the road to which they're associated crosses through a local authority boundary. We do this because we publish our traffic estimates by local authority. When this happens the link is simply broken into two parts and the AADF is equal for each section. Therefore all the dependent CPs are calculated after all other AADFs to ensure all data is available.

CPs are defined as *derived* if the link that is to be counted is very small (less than 300m) or is considered too dangerous to count. In these situations, surrounding roads have been studied and a formula created to calculate the flow on the derived link using the flows of the other links.

Some roads in Scotland have automatic traffic counters on them; these are managed by Transport Scotland, who then supply DfT with the AADFs calculated from the ATCs on these roads.

Once an AADF for the latest year has been calculated for all of the links of the major road network, and for the sample of minor road sites counted each year, the figures are combined with road lengths to produce estimates for the amount of vehicle miles driven in the year.

Road Lengths

Methodology on the calculation of major and minor road length statistics is available at http://www.dft.gov.uk/pgr/statistics/datatablespublications/roads/condition/#technical.

Major road traffic

At this stage we have calculated AADFs for every link of road in the major road network. Traffic volume is measured in vehicle miles, where one vehicle mile is equal to one vehicle travelling one mile. For each CP in our database we have associated information, and one detail is the length of each link.

To convert the AADFs into traffic volume we multiply each AADF with its associated link length; we then multiply it by the number of days in the year to get an annual total.

$$\text{Traffic}_{CP} = \text{AADF}_{CP} \times \text{Length}_{link} \times 365$$

$$\text{Total traffic} = \sum \text{Traffic}_{CP}$$

As we have traffic volume figures for every link of the major road network, these figures can then be summed to create total major traffic volume figures for Great Britain, regions and local authorities.

Minor road traffic

Minor road traffic estimates are grown from a baseline which is periodically updated. In the base year, for each minor road class in each local authority, an AADF is estimated based on a sample of traffic counts, including those projected forward from counts done in earlier years. These AADFs are then multiplied by the total road length for the relevant minor road category to give an estimate of traffic for that road category.

The minor roads are made up of six road categories, 'B', 'C' and unclassified roads, further split into rural and urban areas. Minor road traffic estimates are split by the same 11 vehicle categories as the major road estimates.

Traffic for the latest year is obtained by calculating changes in traffic flows from a sample of minor road manual counts which are counted every year. Minor road AADFs are calculated as detailed above for all of the growth sample of minor road count points. AADF figures are used for all vehicle types other than pedal cycles, where the raw 12 hour count data is used.

For each region and road type, the median AADF is found for the current year and the previous year for the different vehicle types from the growth sample. All counts from the growth sample are included in this calculation where a valid count is available for both years. This gives a median AADF for all splits of data for the latest and the previous year for each region, for example, cars on rural B roads in London.

These medians are used to produce a series of growth factors for each split of data. To do this, the regional medians are first weighted by the length of road in each category in each region. These growth factors indicate how the average flow for different road and vehicle types has changed between the two years, and are weighted to show changes in traffic (flow x distance) rather than simply flow.

Growth factors for the road length in each category are also produced so that any changes in road length between years are reflected in the latest estimates.

These two sets of growth factors are then applied to the previous year's minor roads estimates to calculate the latest year's estimates. So for cars on rural B roads the latest year's traffic estimate is calculated using the following formula for each local authority:

Cars on rural B roads$_y$ = Cars on rural B roads$_{y-1}$ x Growth$_{traffic}$ x Growth$_{length}$

Where:

Growth$_{traffic}$ is the growth in the traffic (median AADF x road length) for cars on rural B roads in the relevant region between y-1 and y
Growth$_{length}$ is the growth in rural B road length in the relevant local authority between y-1 and y

The same formula is used to grow the traffic estimates from the previous year for the 6 road categories and 11 vehicle types which make up the minor road estimates.

For further information on these statistics please email roadtraff.stats@dft.gsi.gov.uk.

This methodology note relates to the "Annual Road Traffic Estimates" statistics (tables and charts) and statistical release published on the DfT website at:
http://www.dft.gov.uk/pgr/statistics/datatablespublications/roads/traffic

Annex A:

Road categories used in the calculation of expansion factors

Category	Description
01	Motorways in holiday areas
02	Motorways in other rural areas with an estimated AADF of of up to 59,999
03	Motorways in other rural areas with an estimated AADF of 60,000 or more
04	Motorways in part rural and part urban areas and conurbations
05	Motorways in mostly urban areas and Greater London
06	Rural A roads in holiday and very rural areas with an estimated AADF of up to 4,999
07	Rural A roads in holiday and very rural areas with an estimated AADF of between 5,000 and 7,999
08	Rural A roads in holiday and very rural areas with an estimated AADF of 8,000 or more
09	Rural A roads in all other areas with an estimated AADF of up to 13,999
10	Rural A roads in all other areas with an estimated AADF of 14,000 or more
11	Urban A roads in holiday areas
12	Urban A roads in all other areas except Greater London with an estimated AADF of up to 19,999
13	Urban A roads in all other areas except Greater London with an estimated AADF of 20,000 or more
14	Urban A roads in Outer London
15	Urban A roads in Inner London
16	Urban A roads in Central London
50	Minor rural roads in holiday areas with an estimated AADF of up to 399
51	Minor rural roads in holiday areas with an estimated AADF of 400 or more
52	Minor rural roads in all other areas with an estimated AADF of up to 2,499
53	Minor rural roads in all other areas with an estimated AADF of 2,500 or more
54	Minor urban roads in all areas except Greater London
55	Minor urban roads in Greater London