

Food Transport Indicators: Method and Assumptions

10 January 2012

This is a methodological note accompanying the food transport indicators statistics notice. <http://www.defra.gov.uk/statistics/foodfarm/food/transport/>

This methodological note describes the way data is combined and the assumptions that are made in forming the indicators. Most of the data is sourced from National Statistics published by the Department for Transport and HM Revenue and Customs. The resulting indicators are also classed as National Statistics. Data flow charts showing the new and old methods are included at the end of this note.

The food transport indicators and a methodology were originally proposed in the report "The Validity of Food Miles as an Indicator of Sustainable Development" by AEA Technology Environment, published on the Defra website in July 2005. <http://www.defra.gov.uk/statistics/files/defra-stats-foodfarm-food-transport-foodmiles-050715.pdf>

The indicators focus on the impacts of food consumed in the UK and so exclude transport relating to exports of food from the UK.

1. The Indicators

Indicator 1. UK Urban food transport

UK urban food transport is built from the transport of food in all areas by car, HGV and van scaled down to represent urban areas only. The proportion of transport that is classed as urban is based on fixed percentages from the Department for Transport's National Transport Model (NTM) that apply to all travel in the UK. These figures have been adjusted to reflect the transportation of food; in particular, to reflect the dominance of food delivery vans in urban areas.

The fixed percentages apply to transport of all goods, not just food. The original study by AEA Technology argued that van transport of food was more likely to be in urban areas than van transport of other goods and adjusted the percentages. Their study does not provide a method or justification for choosing 63% to 2002 and 65% from 2003. Because vans make up a relatively small component of the indicator this is fit-for-purpose when using the indicators but makes the van statistics on their own unreliable.

Urban roads are major and minor roads within an urban area with a population of 10,000 or more. The definition is based on the 2001 Communities and Local Government definition of Urban Settlements.

This definition is consistent with most other government statistics providing an urban/rural analysis. The Urban Settlement boundaries can be used in conjunction with any other geographically referenced data, such as postcodes and any digitised boundaries.

Percentage urban (up to 2002):	NTM 2000	Food transport indicators
Car	49%	49%
Van	45%	63%
HGV rigid	37%	37%
HGV artic	25%	25%

Percentage urban (2003 onwards):	NTM 2003	Food transport indicators
Car	50%	51%
Van	47%	65%
HGV rigid	39%	39%
HGV artic	26%	26%

Urban food kilometres for each mode are calculated by applying the fixed percentages in the table to the total food kilometres for each mode. In the case of HGV, total food kilometres are first split into rigid and articulated using the percentage of HGV food vehicle kilometres attributed to each type of HGV, published in the Department of Transport's Continuing Survey of Road Goods Transport (CSRGT) – see Indicator 2 for this data.

Splitting HGV in this way improves the quality of the estimates. To split further by size bands is not considered practical because estimates are not available from the National Transport Model of the urban area split.

(a) UK transport of food by car

The data comes from the National Travel Survey run by the Department for Transport. This is a continuous survey with results published annually and it conforms to National Statistics standards.

Estimates of food transport by car are based on distance travelled for food shopping per person per year by car drivers. This is combined with population data to produce an estimate of total vehicle kilometres transporting food by car.

Car journeys are classified as either “food” or “non food” depending on the main purpose of the trip, therefore some food shopping may be missed and some non-food shopping may be included. Data for food shopping separate from all shopping has only been available since 1998; for 1992 and 1997 it was assumed that the proportion of all shopping that is food shopping, in terms of distance travelled, is the average of the proportion in years 1998, 1999, 2000, 2001, 2005 and 2006. An average based on all data points to 2006 was preferred over using 1998 alone or 1998 and 1999 because the level was relatively stable over that period.

Drops in 2002 and 2007 estimates of UK transport of food by car coincide with changes to the way the National Travel Survey was run. The direction of the change is considered to be reliable, however the scale of the change may be less reliable. In 2002 there was a change of contractor to run the survey. In 2007 there was a redesign of the survey diary.

The National Travel Survey results are weighted to adjust for non-response bias, the drop-off in the number of trips recorded by respondents during the course of the travel week and also includes calibration weighting by government office region, age and sex. They provide an accurate representation of the population.

Results for 1992 are not weighted. For 1992, we adjust the estimate for all shopping, including non-food shopping, using the average increase due to weighting in later years. The average increase over a wide range of years is used because there is no evidence of a trend and in the absence of trend this approach gives a more reliable estimate of the effect.

Miles per person per year by car driver for food shopping			
	Un-weighted	Weighted	% increase
1992*	145	156	8%
1997*	166	181	9%
2002	158	167	6%
2003	152	165	9%
2004	148	160	8%
2005	171	182	6%
2006	178	197	11%
2007	157	166	6%
2008	154	169	10%
2009	157	168	7%

* Due to a smaller sample size in the National Travel Survey prior to 2002, figures for 1992 and 1997 are 3 year averages of the years 1991, 1992, 1993 and 1996, 1997, 1998 respectively.

Further information about the National Travel Survey and its weighting methodology can be found at <http://www.dft.gov.uk/pgr/statistics/datatablespublications/personal/>. The 2009 NTS Technical Report can be found at: <http://www.dft.gov.uk/pgr/statistics/datatablespublications/nts/technical/nts2009technical.pdf>

(b) UK transport of food by HGV

Estimates are based on data from the Continuing Survey of Road Goods Transport Great Britain (CSRGT GB) and the Continuing Survey of Road Goods Transport Northern Ireland (CSRGT NI) which are run by the Department for Transport, and both are National Statistics. These two surveys combined provide road freight information by UK-registered HGVs. They provides estimates of tonne kilometres, loaded vehicle kilometres and percentage empty running for 'All Food'. To include empty running, HGV vehicle kilometres are calculated as loaded vehicle kilometres divided by the percentage non-empty running.

Empty running journeys are not associated with commodities, such as food, in these data sources. However, they must be included to give the complete effect of food transport. The percentages we attribute to food are based on point to point trips excluding multi-stage drop offs.

Year	All Food % HGV empty running
1992	25%
1997	28%
2002	25%
2003	25%
2004	28%
2005	29%

2006	28%
2007	28%
2008	30%
2009	29%

The method to estimate transport of food in the UK by foreign registered vehicle is detailed in section indicator 2

It is assumed that 9 per cent of HGV transport of food relates to exports from the UK and this percentage is deducted from total HGV vehicle and tonne kilometres. This rationale for this percentage is described in Annex 1 of the report by AEA

Technology Environment,

<http://www.defra.gov.uk/statistics/files/defra-stats-foodfarm-food-transport-foodmiles-050715.pdf>

Rather than estimate export journeys as the same proportion as exported food we make a range of crude assumptions. Although this is an unreliable figure (no better data source is available), it should have little effect on trends which are the main importance with indicators.

(c) UK transport of food by van

Loaded food vehicle kilometres for vans for 2003, 2004 and 2005 are based on the Survey of Company Van Activity and the Survey of Privately Owned Vans, both run by the Department for Transport. The Survey of Company Van Activity was an annual survey carried out in 2003, 2004 and 2005. The Survey of Privately Owned Vans was a one-off survey run in 2003. For 2004 onwards it is assumed that for every company van there are 0.518 private vans, the same as in 2003. The Survey of Van Activity was not run in 2006 and so 2006 data onwards is estimated based on 2005 data and the increase in the van population during the year. This is considered a fit-for-purpose method for vans given that vans make up a relatively small proportion of the indicator, and it is based on National Statistics and therefore unbiased.

Data for food transport by van is not available for years prior to 2003. An estimation for these years is based on a 1992/93 study by the Department for Transport. For more information see Annex 1 of the report by AEA Technology Environment, <http://www.defra.gov.uk/statistics/files/defra-stats-foodfarm-food-transport-foodmiles-050715.pdf> .

	Loaded vehicle kilometres for company owned vans (millions)	Loaded vehicle kilometres for all vans (millions)
1992	-	2,988
1997	-	2,988
2002	-	2,988
2003	1,968	2,987
2004	2,202	3,343
2005	2,118	3,216
2006	2,201	3,342

2007	2,288	3,474
2008	2,317	3,519
2009	2,305	3,499

To convert from loaded van vehicle kilometres to vehicle kilometres it is assumed that 17 per cent of van kilometres are empty running. There is not a reliable data source for empty running by vans. Effectively we assume no trend in levels of empty running by vans.

It is assumed that 1 per cent of LGV transport of food relates to exports from the UK and this percentage is deducted from total vehicle and tonne kilometres. The rationale for these percentages is described in Annex 1 of the report by AEA Technology Environment,
<http://www.defra.gov.uk/statistics/files/defra-stats-foodfarm-food-transport-foodmiles-050715.pdf>

Indicator 2. HGV transport of food for UK consumption

This covers HGV transport in the UK and HGV transport in foreign countries. There are a range of data sources to pick up UK and foreign journeys and to pick up UK registered and foreign registered vehicles.

Data Sources

	In the UK	In the EU	Not in the EU
UK registered	CSRG T & CSRG T NI	IRHS & CSRG T NI	Zero
EU registered	DfT's Foreign Vehicle Survey & Eurostat (modelled)	FVS & Eurostat (modelled)	Zero
Non-EU registered	FVS modelled	Zero	HMRC modelled

The methodology differs depending on the source of data because this is the way to make best use of the data available.

UK registered vehicles transporting food in the UK

The method for UK registered HGVs in the UK was described above in Indicator 1(b). This is entirely survey data (CSRG T GB and CSRG T NI) collected by DfT and accounts for on average 69 per cent of HGV vehicle kilometres. More information on the CSRG T survey can be found on the DfT website:

For published statistics including information on sample sizes and sampling errors (Table 6.4 of Road Freight Statistics) see

<http://www.dft.gov.uk/pgr/statistics/datatablespublications/freight/goodsbyroad/>

For forms and notes see

<http://www.dft.gov.uk/pgr/statistics/datatablespublications/freight/surveyformsnotes/>

For FAQ see

<http://www.dft.gov.uk/pgr/statistics/datatablespublications/freight/roadfreightfaqs.pdf>

Total vehicle kilometres include an estimate of 'empty running'. Empty running by commodity is not available from DfT surveys, and instead it is assumed that empty running is distributed according to levels of kilometres that each commodity is moved. For example, if a commodity has 20 per cent of all vehicle kilometres, it will have 20 per cent of empty running kilometres. This method is used for data from 2004 onwards. There is a break in the series from 2003 to 2004, though the levels of empty running are of a similar order.

UK registered vehicles transporting food in the EU destined for the UK

The data for UK registered vehicles in the EU comes from the International Road Haulage Survey and Continuing Survey of Roads Goods Transport Northern Ireland run by DfT. These surveys combined cover international journeys by UK registered vehicles. Only consignments of food coming into the UK are used. This is high quality survey data. Data on tonnes, kilometres and tonne-kilometres are all available and have been split by domestic and international legs (this is applicable to kilometres and tonne-kilometres). With respect to UK vehicles carrying out activity in the EU only international legs which are loaded in the EU and unloaded in the UK are included.

Survey data are available from 2004 onwards. Prior to 2004, kilometres and tonne-kilometres are estimated based on trends in total imports of food (based on HMRC data)

EU registered vehicles transporting food in the EU and the UK destined for the UK

Estimates of tonnes and tonne-kilometres for EU registered vehicles carrying out activity in the EU destined for the UK is available from the Eurostat website (<http://epp.eurostat.ec.europa.eu/portal/page/portal/transport/data/database>) for years 2006 and 2007. Information on non-UK registered vehicles entering the UK is available from the DfT Foreign Vehicle Survey 2009 (<http://www.dft.gov.uk/pgr/statistics/datatablespublications/freight/foreignvehicle/>). Estimates for tonnes, kilometres and tonne-kilometres over the full series 1992 to 2009 are derived from a model based on this Eurostat and FVS data combined with HMRC trade data. This ensures that harmonised Eurostat data for EU food transport is used where available which provides consistency and accuracy to the indicators.

Within the model, trends based on HMRC import data by country are applied to the Eurostat estimates, trending forward from 2007 and back from 2006. Tonne-kilometres are derived by applying an average length of haul (domestic and international legs separately) to tonnes. Total vehicle kilometres are derived by dividing through tonne-kilometres by an 'average load'. Here average load includes estimates of empty running. Estimates of average load are estimated from the FVS for all commodities to ensure a robust estimate. Data from the Foreign Vehicles Survey are only available for 2009, so average load estimates from 2009 are applied across the entire series. Estimates for average loads in the UK (based on CSRGT data) for the heaviest vehicles (artics over 33 tonnes gross vehicle weight) over the last 15 years have stayed at a consistent level. Given that foreign vehicles carrying out international trips will tend to be larger vehicles it has been assumed that average loads have also stayed at a consistent level. Note also that Eurostat data from 2009 indicate that average loads are significantly larger for international trips compared with domestic ones for activity across the EU (for EU registered vehicles carrying out activity in other EU countries).

Separate estimates are obtained for the international and domestic legs of international journeys. This enables us to present statistics on UK HGV and overseas HGV food transport separately.

Handling within EU countries for food destined for the UK (either by UK or non-UK registered vehicles) is not available from survey data. Instead estimates of handling are applied, and the methodology here is consistent with the approach for non-EU countries. The handling factors build in an adjustment to include transport from pre-export stages of production. Broad brush estimates are considered acceptable

because of the large amount of work in obtaining better estimates for all main countries where we source food. Only indicator 2 is affected and only the overseas leg of indicator 2.

DfT and HMRC estimates of food imports from the EU

HMRC trade data covers food entering the UK by all modes from the EU, whilst DfT survey data here is just that entering the UK by HGV. The remainder between these two estimates is assumed to be food entering the UK by means other than HGV. On arrival in the UK, this food is assumed to be transported by UK-registered HGVs and will be captured via the CSRGT survey. Activity for handling in the EU is estimated using the same approach detailed in the ‘Non-UK registered vehicles transporting food outside the EU destined for the UK’ section which follows.

Commodities included in the definition of ‘food’ for each data source

HMRC data is based on the ‘Harmonised System’ (HS) coding system. The table below shows the HS categories included under the definition of ‘food’ for the purpose of these indicators:

HMRC codes (Harmonised System)	
HS2 code	HS2 Description
01	Live Animals
02	Meat And Edible Meat Offal
03	Fish And Crustaceans, Molluscs And Other Aquatic Invertebrates
04	Dairy Produce; Birds' Eggs; Natural Honey; Edible Products Of Animal Origin, Not Elsewhere Specified Or Included
07	Edible Vegetables And Certain Roots And Tubers
08	Edible Fruit And Nuts; Peel Of Citrus Fruit Or Melons
09	Coffee, Tea, Maté And Spices
10	Cereals (unmilled)
11	Products Of The Milling Industry; Malt; Starches; Inulin; Wheat Gluten
12	Oil Seeds And Oleaginous Fruits; Miscellaneous Grains, Seeds And Fruit; Industrial Or Medicinal Plants; Straw And Fodder
13	Lac; Gums, Resins And Other Vegetable Saps And Extracts
15	Animal Or Vegetable Fats And Oils And Their Cleavage Products; Prepared Edible Fats; Animal Or Vegetable Waxes
16	Preparations Of Meat, Of Fish Or Of Crustaceans, Molluscs Or Other Aquatic Invertebrates
17	Sugars And Sugar Confectionery
18	Cocoa And Cocoa Preparations
19	Preparations Of Cereals, Flour, Starch Or Milk; Pastrycooks' Products
20	Preparations Of Vegetables, Fruit, Nuts Or Other Parts Of Plants
21	Miscellaneous Edible Preparations
22	Beverages, Spirits And Vinegar
23	Residues And Waste From The Food Industries; Prepared Animal Fodder

Data from the CSRGT and IRHS surveys are based on the old NST coding system. Codes relating to food are selected from within two aggregate level groupings and are shown in the table below:

CSRGT and IHRS codes (old NST)	
NST	Commodities included

Chapter	
01	Cereals
02	Potatoes; Fresh fruit and vegetables
03	Sugar beet; Live animals
06	Sugars; Beverages exc. tea & coffee; Stimulants & spices; Perishable foodstuffs; Household shopping; Other non perishable foodstuffs; Animal fodder & foodstuff & waste
07	Oil, seeds & oleaginous fruit & fat

Data from Eurostat is based on a new NST coding system which is not directly comparable with the old NST system.

Figures are available only at the aggregate level, and so with the codes relating to food being again split over two of the groups, some commodities could not be included. 'Chapter 1 – Foodstuffs and Animal Fodder' was used as it contains the majority of food commodities and contains no non-food commodities.

The table below shows which commodities are included and excluded from the Eurostat food figures:

Eurostat (new NST)	
NST code	Commodities included
11	Sugars
12	Beverages
13	Stimulants and spices
14	Perishable foodstuffs
16	Non-perishable foodstuffs and hops
17	Animal feedingstuffs and foodstuff waste
18	Oil, seeds & oleaginous fruit & fat
	Commodities excluded from Eurostat data
	Cereals
	Potatoes; Fresh fruit and vegetables
	Frozen vegetables
	Sugar beet; Live animals

The excluded commodities are contained within 'Chapter 0 - Agricultural Products And Live Animals'. This chapter contains, in addition to the commodities mentioned above, items such as textiles, wool, charcoal, wood and rubber, and was therefore not suitable for inclusion.

There is also a category within the NST coded data known as 'groupage'. These are mixed loads that cannot be disaggregated into commodity. We assume that the amount of food included in this category is small and therefore no estimates have been included for this aspect.

Non-UK registered vehicles transporting food outside the EU destined for the UK
Overseas transport of food imported to the UK by HGV from outside the EU is described here. Data is only available for country of despatch, which is mainly the same as country of origin. Estimates are produced by combining international trade data with distances based on the size of the country, generally about half the radius of the country. This accounts for transport between overseas producer and main city. This is a broad brush approach in line with that used for the handling factors in general.

Examples of estimated average distances from producer to main city are:

Australia	1000 km
Russia	1000 km

Additional journeys associated with processing and logistics are taken into account by multiplying by a handling factor which is based on the level of development of the country. A handling factor of 2 is given to developed countries and a handling factor of 1.5 is given to developing countries. The following countries are given a handling factor of 2; all others are given a handling factor of 1.5.

Austria	Canada
Denmark	New Zealand
Finland	U.S.A.
Sweden	

For example for Russia:

Quantity of imports from Russia (tonnes)	68,339
Distance between producer and main city (km)	1,000
Handling factor	1.5
Millions of tonne kilometres	$(68,339 \times 1,000 \times 1.5) / 1,000,000 = 103$

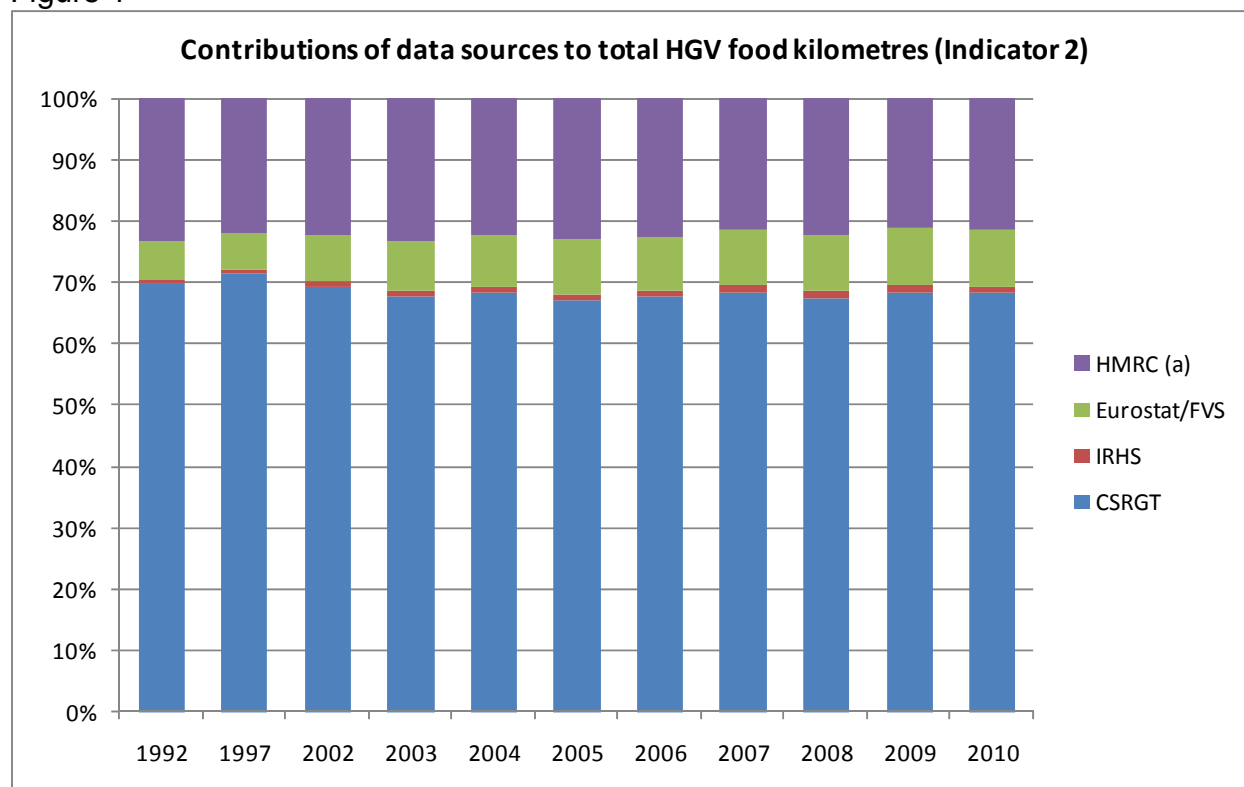
To convert into vehicle kilometres it is assumed that the average HGV pay load in overseas countries is the same as in the UK.

Implied average HGV pay load including empty running* (tonnes)	1992	1997	2002	2003	2004	2005	2006	2007	2008	2009
	6.80	7.31	8.15	8.27	7.73	7.87	8.02	8.33	8.34	8.60

* derived from tonne kilometres, loaded vehicle kilometres and percentage empty running for UK HGVs.

The contributions from each of the data sources are illustrated in figure 1 below. This can be used to assess data quality: CSRGT and IRHS are high quality survey data; Eurostat/FVS are high quality survey estimates which are combined with HMRC trend data to model estimates over the full series – this is less reliable from year to year; HMRC volume imports is high quality, these are combined with fixed factors to give modelled estimates – the fixed factors mean these estimates are not sensitive to changes in handling in the country of origin.

Figure 1



(a) Refers to the method using HMRC food import tonnages with fixed factors to calculate tonne kilometres, and CSRGT-derived average loads to calculate food kilometres.

Indicator 3. Air freight of food

The method for estimating air freight of food is to combine volumes of imports by air with distance between country of despatch and the UK and to use an average factor for payload. Note that it is assumed that the country of despatch is the country of origin.

Estimates of air freight of food are based on international trade data for food and drink. Trade data split by transport mode is not available for EU countries. It is assumed that air freight of food from other EU countries and within the UK is negligible.

For non-EU countries, the volume of imports by air is combined with distances between the importing country and the UK to produce estimates of tonne kilometres for air transport. The distance by air between an importing country and the UK is approximated by the straight line distance between London and the main city of the country.

It is assumed that the average payload of food and drink on an air freight flight is 49 tonnes. The rationale for this percentage is described in Annex 1 of the report by AEA Technology Environment, <http://www.defra.gov.uk/statistics/files/defra-stats-foodfarm-food-transport-foodmiles-050715.pdf>. Air food kilometres are calculated by dividing the estimated tonne kilometres by this average load.

Indicator 4. Total CO₂ emissions from food transport

Estimates of CO₂ emissions from food transport by road are calculated using emissions factors from the National Atmospheric Emissions Inventory (NAEI) and proportions of vehicle kilometres on different types of roads from the National Transport Model (NTM). Estimates of CO₂ emissions from food transport by forms other than road are calculated using emissions factors from the National Atmospheric Emissions Inventory (NAEI) and from estimates of vehicle kilometres using methods like that described above for air kilometres.

There have been significant improvements to the NAEI resulting in revisions to the emissions factors used for 2005 and 2006 and new factors for 2007 and 2008.

Some of the main changes include:

- the use of new sets of emission factor-speed relationships for different pollutants including NO_x, PM₁₀, CO and NMVOCs, following research carried out by TRL on behalf of DfT and published in 2009 (<http://www.dft.gov.uk/pgr/roads/environment/emissions/>).

- changes to vehicle speed data (affecting emission factors) following a review of more up-to-date speed data from various DfT sources.

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- the use of more detailed activity data showing annual variations in car fleet by engine size and travel survey information indicating variations in mileage done by cars of different engine size and fuel type on different types of road.

- Major changes in the assumptions made about the proportion of petrol vehicles with failed catalyst systems in the fleet, based on new evidence obtained from DfT suggesting a higher rate of failure than had previously been assumed

- Changes in the methodology for estimating cold start emissions following the recommendations of the study by TRL published in 2009.

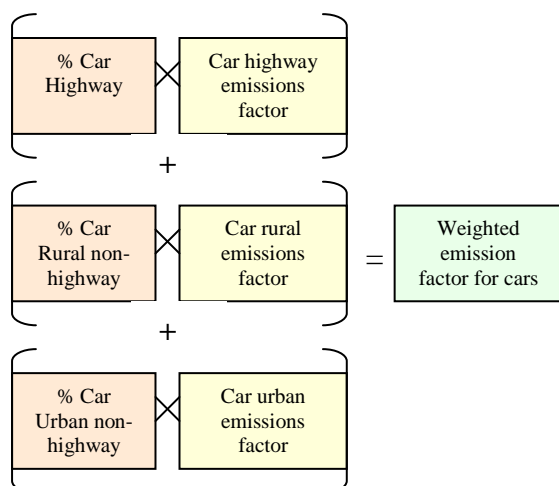
The revisions to the 2005 and 2006 emissions factors are responsible for around a quarter of the total revision to Indicator 4 (CO₂ emissions), with revisions to HGV data accounting for the majority of the change.

The NTM gives all road transport split by road type and vehicle type. The road types are: urban highway, urban non-highway, rural highway and rural non-highway. Highway covers motorways in large urban areas and dual carriageways in rural areas. Vehicle types are: car, van, rigid HGV and articulated HGV. See section 1 for details of the adjustments made to the NTM car and van data.

The NAEI gives grams of CO₂ emissions per vehicle kilometre also split by road type and vehicle type. In this case, road types are: urban, rural and highway. Vehicle types are: petrol car, diesel car, petrol van, diesel van, rigid HGV and articulated HGV. Emissions factors for all cars and all vans are derived using the percentage of cars and vans that are diesel, published in the Department of Transport's 'Vehicle Licensing Statistics' and the 'Survey of Van Activity' – see table below.

The emissions factors are combined with data from the NTM to give grams of CO₂ emissions per vehicle kilometre for cars, vans, rigid and articulated HGVs. The NTM and the NAEI road categories differ. The urban emissions factor is applied to urban non-highway kilometres and the rural emissions factor is applied to rural non-highway kilometres. The highway emissions factor is applied to all highway, including urban highway and rural highway, kilometres.

The diagram shows the calculation of weighted emissions factor for cars. The same is done for vans, rigid HGVs and articulated HGVs.



Rigid and articulated HGV figures are combined using the percentage of HGV food vehicle kilometres attributed to each type of HGV, published in the Department of Transport's Continuing Survey of Road Goods Transport (CSRGT).

		1992	1997	2002	2003	2004	2005	2006	2007	2008	2009
HGV food vkm	Artic	59%	59%	59%	60%	58%	59%	61%	62%	61%	61%
	Rigid	41%	41%	41%	40%	42%	41%	39%	38%	39%	39%
% vehicles diesel	Car	14%	14%	14%	17%	19%	21%	22%	24%	25%	27%
	Van	84%	84%	84%	88%	90%	90%	91%	92%	93%	94%

The emissions factors for overseas HGV are assumed equal to the UK HGV factors. As an approximation, it is assumed that all overseas HGV transport of food is in articulated vehicles travelling on highways. Overseas HGV kilometres are calculated based on the radius of country and the road component of imports that arrive by sea – see section 2

The emissions factors for overseas van are assumed equal to the UK van factors. The kilometres travelled by overseas vans carrying food is based on the ratio of UK van to UK HGV kilometres. The UK NTM is used to estimate the split of overseas van kilometres into urban, rural and highway.

Emission factors for air, sea and rail are taken from the AEA Technology report. For the rationale behind these figures see Annex 3 of the report by AEA Technology Environment, <http://www.defra.gov.uk/statistics/files/defra-stats-foodfarm-food-transport-foodmiles-050715.pdf>

	CO ₂ g/tkm
Air long haul	570.000
Air short haul (EU)	1580.000
Deep sea	15.335
Short sea & domestic sea	29.381
Inland waterway	0.017
Rail	30.000

Inland waterway transport is the transport of goods carried by both barges and seagoing vessels along inland waters. Domestic sea transport is the transport of goods around the UK coast. See section 2 for descriptions of short sea and deep sea transport.

The volume of imports is combined with distances between the importing country and the UK to produce estimates of tonne kilometres for each of air, deep sea and rail. Note it is assumed for most countries (other than EU and nearby places) that air, deep sea and rail distances are equal. The road component of sea imports is covered by overseas HGV.

Data on tonne kilometres of food transported by inland waterway and domestic sea is obtained from 'Waterborne Freight in the United Kingdom', an annual publication by the Department for Transport. For further information about this publication see <http://www.dft.gov.uk/pgr/statistics/datatablespublications/maritime/waterborne/>.

Data on tonne kilometres of food transported by rail is assumed to be negligible for the UK and EU. Estimates for non-EU countries are provided by HM Customs and Revenue trade data.

To convert from tonne kilometres to vehicle kilometres the following load factors are used for each mode.

	Tonnes per trip (pay load)
Air	49
Sea (long haul) i.e. deep sea	11403
Sea (short haul) i.e. short sea & domestic sea	3246
Rail	150
Inland Waterway	35

The CO₂ emissions factors for air, sea and rail are applied to the food vehicle kilometres for each mode to calculate the total CO₂ emissions for each mode. For air a radiative forcing factor of 2.7 is applied to account for the warming effect of non-CO₂ emissions from aircraft, such as NO_x and water vapour. This factor is recommended by the Intergovernmental Panel on Climate Change (IPCC).

2. Reliability of the indicators

In general the trends revealed by the indicators are reliable but individual year on year changes are subject to sampling errors. Sampling errors may be as much as 5 per cent, therefore we can only detect year on year changes above 10 per cent. Non-sampling errors occur as well but are difficult to quantify. A summary of sampling and non-sampling errors for each of the indicators is given in the methodological note which accompanies this notice.

Two cases of non-sampling errors are visible in the indicators:

- a. Indicator 1, food shopping trips by car. The drops in 2002 and 2007 coincide with changes to the way the National Travel Survey was run. In 2002 there was a change of contractor to run the survey and a substantial increase in the sample size. In 2007 a redesigned survey diary was introduced for respondents to record their car journeys resulting in a drop in short shopping trips by car, although it is likely that some of the decrease is genuine.
- b. Indicator 2, HGV kilometres. There is a small spike apparent in 2004 which coincides with and is partly explained by an improved method to estimate the amount of empty running. For both 2003 and 2004 the estimates are the best available, although the reliability of the apparent rise in HGV kilometres between 2003 and 2004 is low.

Although there are both sampling errors and non-sampling errors in the data the trends revealed by the indicators detailed in this notice are considered reliable.

Indicator 1 reliability – UK Urban food kilometres

A combined measure of statistical uncertainty for the full indicator is not available. However, considering all the sources and available information on sampling errors, the change in indicator 1 from 2009 to 2010 is overall not expected to be statistically significant; there is no clear trend since 2005.

Sources of data and discussion on sampling and non-sampling errors

- a. UK transport of food by car from the Dept for Transport's National Travel Survey

Contribution to indicator 1: These data account for around 70% of indicator 1. Around 90% of the increase in indicator 1 from 2009 to 2010 can be attributed to cars. The reported increase of transport of food by car from 2009 to 2010 is 8%.

Sampling errors for the distance travelled for food by car is not available, though estimates based on similar sample sizes typically can detect changes above 10% year on year at the 95% level. Therefore we would not expect the increase from 2009 to 2010 of 8% to be statistically significant. Further information on sampling errors in the NTS is available at:

<http://www.dft.gov.uk/statistics/series/national-travel-survey/>

Note, the NTS is primarily designed to track long-term development of trends and so care should be taken when drawing conclusions from short-term changes, in particular year-on-year changes.

Non-sampling errors arising from non-response bias are corrected through calibration weighting in the NTS. The response rate for the NTS in 2010 was 60%. Further information on the weighting methodology is given on the national travel survey web pages.

- b. UK transport of food by HGV from the DfT Continuing Survey of Road Goods Transport GB and NI

Contribution to indicator 1: These data account for around 10% of indicator 1. Around 10% of the increase in indicator 1 from 2009 to 2010 can be attributed to HGVs. The reported increase in transport of food by HGV from 2009 to 2010 is 6.5%.

Sampling errors for food kilometres by UK HGVs can detect changes of 6% and above year on year at the 95% level. Therefore the increase of 6.5% is statistically significant.

Non-sampling errors - the suite of road freight surveys were confirmed as national statistics in 2010 following UKSA assessment. Information on data quality, possible sources of bias and inconsistencies with other data sources are available from the DfT website:

<http://www.dft.gov.uk/statistics/series/road-freight/>

- c. UK transport of food by vans from the surveys of company and privately owned vans

Contribution to indicator 1: These data account for around 20% of indicator 1. Around 2% of the increase in indicator 1 from 2009 to 2010 can be attributed to vans.

Limited years of data are available for vans, and in accordance with methods used by DfT, estimates for years where information is not available are modelled. No information is available on the error this may induce in the estimates.

Sampling errors for years where the survey was run are provided on the DfT website.

Non-sampling errors – as is the case for HGVs, the van surveys were part of the suite of road freight surveys confirmed as national statistics in 2010 following UKSA assessment.

Indicator 2 reliability – HGV transport of food for UK consumption

A combined measure of uncertainty for the full indicator is not available. However, considering all the sources and available information on sampling errors, the increase in indicator 2 from 2009 to 2010 is overall expected to be statistically significant; the downward trend over the period 2006 to 2010 is also expected to be genuine.

Major sources of data and discussion on sampling and non-sampling errors

- a. Transport of food by HGV from the DfT Continuing Survey of Road Goods Transport GB and NI

Contribution to indicator 2: These data account for around 70% of indicator 2. Around 50% of the increase in indicator 2 from 2009 to 2010 can be attributed to UK HGVs. The reported increase in transport of food by HGV from 2009 to 2010 is 6.5%.

See text on sampling and non-sampling errors under indicator 1. Changes above 6% year on year are statistically significant at the 95% level. Therefore the increase of 6.5% is statistically significant.

- b. Transport of food by HGV from the DfT surveys – Foreign Vehicle Survey, International Road Haulage Survey and data from Eurostat on EU HGVs

Contribution to indicator 2: These data account for around 10% of indicator 2. Around 30% of the increase in indicator 2 from 2009 to 2010 can be attributed to these sources.

Limited years of data are available for these data, and in accordance with methods agreed by DfT, estimates for years where information is not available are modelled. No information is available on the error this may induce in the estimates.

Sampling errors for years where the DfT surveys FVS and IRHS were run are provided on the DfT website.

Non-sampling errors – as is the case for HGVs, the DfT surveys FVS and IRHS were part of the suite of road freight surveys confirmed as national statistics in 2010 following UKSA assessment.

c. Transport of food by HGV from non-EU countries modelled estimates

Contribution to indicator 2: These data account for around 20% of indicator 2. Around 25% of the increase in indicator 2 from 2009 to 2010 can be attributed to these sources.

The estimates for the distance travelled in non-EU countries is modelled and within the model the distance travelled within the country of origin is fixed, though the amount of food transported varies according to HMRC trade data. No information is available on the error this may induce in the estimates.

Sampling errors – HMRC trade data are based on administrative data and provides full coverage of imports of food therefore there are no sampling errors.

Non-sampling errors – HMRC trade data are subject to recording errors, however, at the aggregate level for all food, these are small. HMRC run credibility checks on the data specifically relating to food, and this does result in corrections to the data.

Indicator 3 reliability – Air freight of food

Air freight of food is based on HMRC trade data (administrative data which provides full coverage of imports of food from non-EU countries) therefore there are no sampling errors on these estimates. These data are subject to recording errors, however, at the aggregate level for all food, these are small. HMRC run credibility checks on the data specifically relating to food, and this does result in corrections to the data. The fall in indicator 3 from 2009 to 2010 is expected to be subject to relatively small error and therefore is expected to be genuine, as is the case for the downward trend over the period 2006 to 2010.

Indicator 4 reliability – Total CO2 emissions from food transport

Carbon Dioxide emissions from all food transport combine data on activity of all modes with emissions factors. The sampling and non-sampling errors in the activity data are as described in the above indicators. An indication of the relative contribution each mode of transport makes is given in a pie chart in the statistical notice under indicator 4. Information on uncertainty in emissions from transport is given on the DECC website at:

http://www.decc.gov.uk/en/content/cms/statistics/climate_stats/gg_emissions/uk_emissions/uk_emissions.aspx

3. Other statistics

The indicators cover the main impact of food transport. There are also supporting statistics which breakdown the indicators and cover aspects of food transport not within the indicators.

Sea transport of food is only covered in the indicators in terms of its CO₂ emissions. There are also estimates of vehicle kilometres and tonne kilometres for both deep sea and short seas imports of food. Short sea imports are usually dominated by an HGV component which is covered in indicator 2.

Tonne kilometres are not the focus of the indicators because emissions are more closely correlated with vehicle kilometres. However they can show if the amount of food transport is increasing or decreasing by various modes of transport.

The indicators only cover CO₂ emissions. Emissions of PM₁₀, NO_x and SO₂ are estimated in the same way using emissions factors from the NAEI.

HGV vehicle and tonne kilometres are initially estimated at UK level (for all vehicles, UK and non-UK registered operating in the UK). For indicator 1 these estimates are broken down to give the urban component. For indicator 2 these estimates are extended to include estimates of vehicle kilometres overseas HGV (for all vehicles, UK and non-UK registered destined for the UK).

4. Data Revisions since the 2007 Publication

(1) Revisions to HGV tonne-kilometres and vehicle kilometres for food imports which are transported by HGV overseas

Improvements have been made to the methodology for calculating HGV tonne kilometres and kilometres in the EU by making direct use of Department for Transport Surveys (International Road Haulage Survey, Continuing Survey of Roads Goods Vehicles Northern Ireland, and the Foreign Vehicle Survey 2009) and data from the Eurostat transport database where possible. Previously, the method used was based on fixed factors applied to HMRC estimates of tonnes imported.

HGV tonne-kilometres have been revised down as a consequence of DfT survey estimates reporting overall lower average length of haul for the overseas leg of international journeys than the fixed factors under the previous methodology, though with some variability across countries. This is illustrated in the table below for a subset of countries. This has revised tonne-kilometres overseas down by on average 25 per cent over the full series.

Average length of haul of the international leg of food destined for the UK (km)

	Fixed factors under 2007 methodology	Distances based on DfTs Foreign Vehicle Survey and Eurostat data
France	308	109
Belgium	21	97
Germany	708	481
Italy	1,568	1,266

Overseas HGV kilometres have been revised down by around 40 per cent over the entire series. A significant factor behind this reduction is a move from average loads (which are used to calculate vehicle kilometres from tonne-kilometres) calculated from domestic trips by UK-registered HGVs, to average loads by foreign-registered HGVs calculated from the 2009 Foreign Vehicle Survey. This increased average loads (and consequently reduced average kilometres) by between 7 and 69 per cent across countries. The fact that tonne-kilometres have also reduced also contributes to the downwards revision on HGV kilometres.

(2) Revisions to HGV kilometres and tonne-kilometres for food imports which are transported by non-UK registered HGVs in the UK

As in revision (1), similar improvements, drawing upon Department for Transport Surveys, have been made to the method for calculating HGV kilometres and tonne-kilometres for food imports which are transported by non-UK registered HGVs in the UK. Previously, the method used was based on fixed factors applied to HMRC estimates of tonnes imported. DfT survey data suggests that both HGV kilometres and tonne-kilometres for non-UK registered vehicles in the UK are lower than under the previous methodology (reducing by around a half and a third respectively). This revision accounts for all the change in HGV food kilometres within the UK up to 2003 and between 2 and 4 percentage points of the change from 2004.

(3) Revisions to HGV empty running from 2004 to 2006

Empty running by UK registered HGVs in the UK has been revised from 31, 35 and 32 per cent to 28, 29 and 28 per cent for 2004, 2005 and 2006 respectively. These lower estimates are consistent with the approach taken for the earlier part of the series. This revision accounts for between 1 and 3 percentage points of the change in HGV food kilometres within the UK from 2004.

(4) Revisions to emission estimates

There have been significant improvements to the National Atmospheric Emissions Inventory resulting in revisions to the emissions factors used for 2005 and 2006. These revisions account for around a quarter of the change to Carbon Dioxide emissions in 2005 and 2006. The remainder of the changes in 2005 and 2006 and over the full series are due to changes in the HGV kilometres outlined in revisions (1) to (3).

Indicators of the External Impact of Food Transport for UK Consumers		1992	1997	2002	2003	2004	2005	2006
Indicator 1								
UK Urban food kilometres	2007 publication	10,677	12,058	11,470	11,903	12,130	13,162	14,039
	Revised	10,620	12,009	11,438	11,862	12,043	13,040	13,939
	Change	-0.5%	-0.4%	-0.3%	-0.3%	-0.7%	-0.9%	-0.7%
Indicator 2								
HGV food kilometres	2007 publication	7,862	8,412	8,121	8,066	9,104	9,209	8,965
	Revised	6,465	7,089	6,924	6,815	7,330	7,135	7,136
	Change	-18%	-16%	-15%	-16%	-19%	-23%	-20%
of which within UK	2007 publication	4,820	5,339	5,044	4,909	5,451	5,349	5,358
	Revised	4,631	5,174	4,940	4,776	5,171	4,954	5,033
	Change	-4%	-3%	-2%	-3%	-5%	-7%	-6%
of which overseas	2007 publication	3,042	3,073	3,077	3,156	3,653	3,860	3,607
	Revised	1,834	1,915	1,984	2,039	2,160	2,180	2,103
	Change	-40%	-38%	-36%	-35%	-41%	-44%	-42%
Indicator 3								
Air food kilometres	No revisions							
Indicator 4								
CO ₂ emissions	2007 publication	15,044	16,494	16,747	16,369	17,839	17,948	18,444
	Revised	13,356	14,890	15,077	15,023	15,697	15,556	16,299
	Change	-11%	-10%	-10%	-8%	-12%	-13%	-12%

Impact of revisions on the indicators

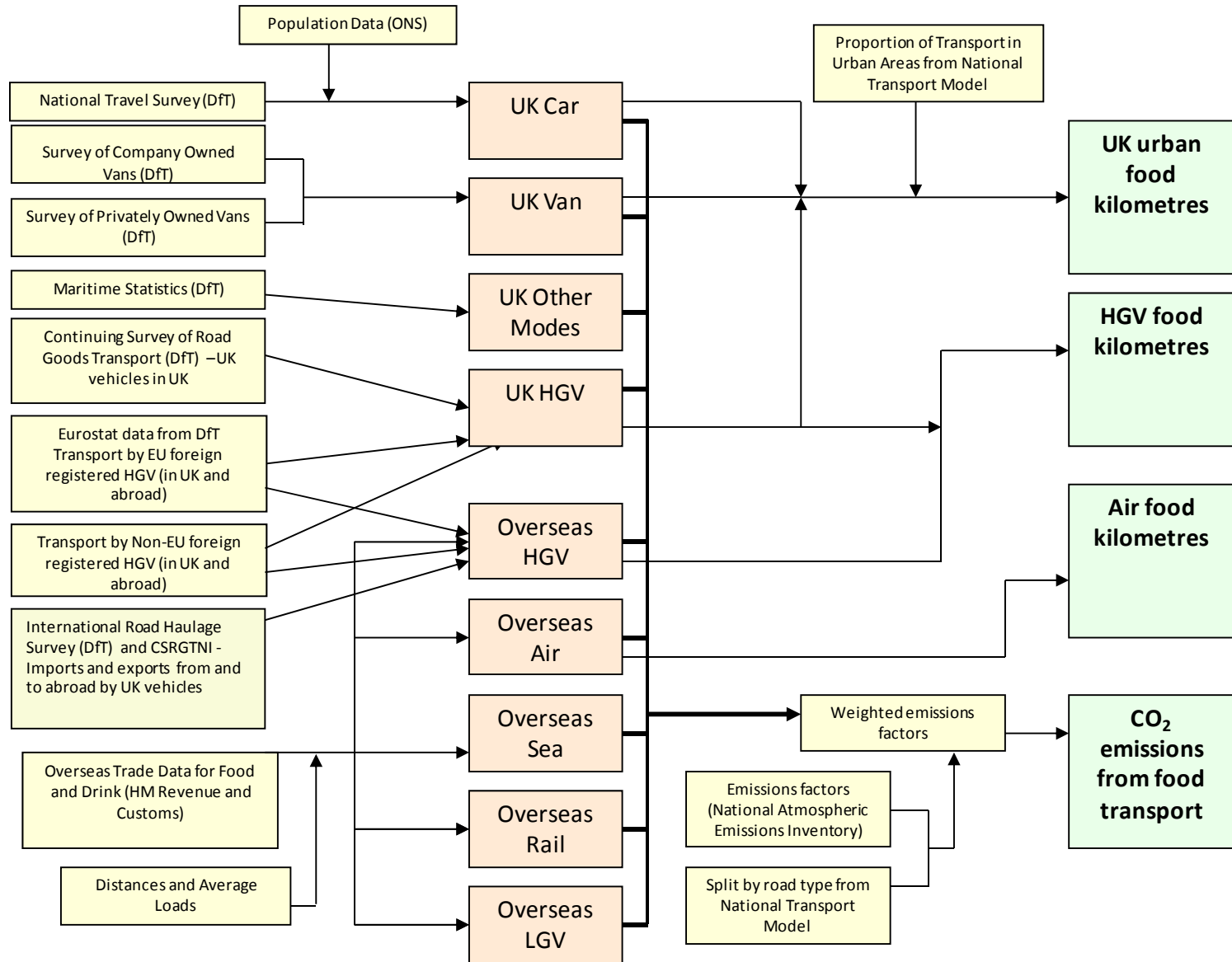
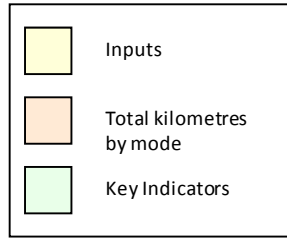
- Indicator 1 has been revised downwards due to changes to HGV kilometres for foreign vehicles in the UK and changes to estimates of empty running by UK registered HGVs in 2004 to 2006 which are consistent with the approach for earlier years. Foreign HGVs accounted for only 3 per cent of HGV food kilometres in the UK¹, hence the changes as a result of this are small. Around half of the change from 2004 onwards is due to the changes to empty running.
- Indicator 2 has been revised downwards due to improvements in the methodology for calculating HGV kilometres in the EU, making direct use of DfT surveys and Eurostat data. Overseas HGV kilometres have been revised down by around 40 per cent over the entire series. A significant factor behind this reduction is a move from average loads (which are used to calculate vehicle kilometres from tonne-kilometres) calculated from all UK HGVs, to average loads calculated from the Foreign Vehicle Survey. This increased average loads by between 7 and 69 per cent across countries. A downward revision in tonne-kilometres (from which vehicle kilometres are in part derived) also contributed to the downward revision – overseas HGV tonne-kilometres were revised down by on average 25 per cent over the full series. The revisions described above for Indicator 1 also impact upon the UK HGV kilometres in Indicator 2.
- Indicator 4 has been revised downwards due mainly to reductions in HGV kilometres as mentioned above but also the use of higher quality emissions factors for 2005 and 2006. Revisions to the emissions factors account for around a quarter of the change in 2005 and 2006.

¹ With respect to all commodities, the latest estimate of foreign vehicle kilometres in GB is 3.9%

Glossary

Tonne kilometres	The distance travelled in kilometres multiplied by the weight in tonnes for each foodstuff. For example, a load of 12 tonnes transported 100 kilometres represents 1200 tonne kilometres.
Vehicle kilometres	The sum of the distances travelled by each vehicle carrying food regardless of the amount carried.
HGV	Heavy Goods Vehicle. In the Continuing Survey of Road Goods Transport for Great Britain and Northern Ireland, these are defined as vehicles of more than 3.5 tonnes gross plated weight, but excluding certain special categories such as recovery vehicles and mobile cranes that are heavy vehicles but do not carry freight.
LGV	Light goods vehicle. These are defined as vehicles not exceeding 3.5 tonnes gross vehicle weight in the light goods taxation class with van body types according to DVLA records
Urban roads	Urban roads are major and minor roads within an urban area with a population of 10,000 or more.
Overseas	Ireland is counted as overseas.

New method



Old Method

