Carbon Footprinting of Policies, Programmes and Projects
AEA Final report to *pteg*

Executive Summary

pteg, which represents the six English Passenger Transport Executives (PTEs), with Strathclyde Partnership for Transport (SPT) and Transport for London (TfL) as associate members, commissioned AEA to undertake this study to examine how the PTEs and SPT might carbon footprint their activities and journeys within their areas. The aim of the study was to establish a common basis for estimating the carbon emissions from the range of PTE/SPT activities and, where appropriate, the emissions saved compared with an alternative course of action. Key stages and outcomes of the study are summarised below.

Firstly, **AEA undertook a review of existing assumptions, guidelines and models** that are used to calculate the carbon footprint of public transport operations. This found that there are two types of approach: a 'top down' approach based on fuel use and a 'bottom up' approach based on vehicle km and vehicle types. The private sector tends to use a 'top down' approach primarily because they can easily access the fuel use data of their operations. The public sector uses a mixture of 'top down' and 'bottom up' approaches. There is overlap between the approaches and both are valid. Currently, the availability of data would be the most important determinant of the approach that the PTEs might take.

Secondly, **AEA and the PTEs undertook the data collection required for the carbon footprint analysis** (i.e. information on passenger km, fuel use, vehicle km and vehicle types). Gaps in the data were identified these included, for bus and train, limited information on passenger km and passenger load factors. With bus there was also limited data on fuel use. A further issue was that train data was at the aggregate rather than PTE level and assumptions therefore had to be made in order to allocate this data to the individual PTEs. Going forward, AEA recommends that a data request form (template) should be used to help facilitate data gathering; and that it may be appropriate for the PTEs to consider how changes within the current data collection process could help facilitate data collection.

Thirdly, AEA used the outcomes of the above two stages to inform **potential carbon footprint approaches for each of the modes (bus, rail, light rail).** The use of a 'top down' approach is more appropriate for light rail, while a 'bottom up' and 'top down' approach is better for bus and rail. These approaches were then used to provide information for each mode and PTE for the following metrics - **g CO_2 per vehicle km, g CO_2 per passenger km and g CO_2 per passenger journey**. The results for passenger km and passenger journey are shown in the below table. Information on vehicle km was available for bus, however since train and light rail both operate in units, aggregate rather than vehicle km information was provided for these modes. The results are single factors and are based on a weighted average for passenger journey and vehicle km, with the weighting reflecting the number of passenger journeys and vehicle km undertaken in each PTE. Passenger km data was not available and so an unweighted average (mean) was used.

Mode of transport	CO_2 per passenger km (g)	CO_2 per passenger journey (g)	CO_2 per bus vehicle/train/ light rail km(g)	Transport Direct / DEFRA figures
Bus	107.3 *118.6*	481.9 *533.4*	919.6 *1015.4*	115.8 (local bus)
Light rail	70.3	445.2	2371.2	78.0
Rail	66.4	1144.2	2870.2	60.2

For **bus two CO_2 emission figures** are provided in the above table. The first (in normal font) is based on UK Greenhouse Gas Inventory (GHGI) data on different bus emission classes,

this approach was used because fuel use data from the bus operators was not available. The GHGI data, however, suggests that fuel consumption, and therefore CO_2 emissions decreases over time, and this conflicts with statements by bus operators, which suggest that the use of Euro Standard III buses results in an increase in fuel consumption, and therefore CO_2 emissions. Explanations for this include that GHGI data does not refer to Euro III with PM traps and though it involves extensive testing this is on a small number of vehicles. A sensitivity analysis which takes this difference into account was undertaken and the results are shown in *italics*.

The **outcomes of this analysis tied in well, overall, with Government (including the Transport Direct Calculator) and private sector figures.** Going forward there is the potential for ***pteg*** to use the PTEs rail carbon figures as a basis for discussion with the Department for Transport on the Transport Direct calculator.

When looking at these figures it is important to recognise that **gaps in the data and the resulting use of assumptions impacts on the reliability of the results**. Going forward this could be improved through the provision of more consistent and more comprehensive data from the PTEs, in particular, data on passenger kilometres and passengers journeys, by vehicle type, and data on peak and off peak trips.

Single factors (based on a weighted average) are shown in the table, however, individual, PTE-specific emissions factors are also of value for benchmarking purposes and provide a greater degree of specificity.

A comparison of the carbon emissions from public and private transport was also made. However, it is important to remember that carbon emissions are not the only factor in any decision, and the contribution of public transport to wider sustainable development principles should also be considered. We, therefore, recommend that if such a comparison is undertaken it should be part of a wider appraisal.

Fourthly, **AEA considered Life Cycle carbon emissions.** The analysis suggested that the majority of the carbon generated by public transport vehicles is from their use rather than from their construction, maintenance and disposal. Furthermore, the carbon footprinting of public transport carried out by other public sector and private sector bodies does not take into account the emissions from the full life cycle instead it considers vehicle use only. For these reasons AEA suggests that either 1) the carbon footprinting figures used by PTEs should be for vehicle use only rather than the full life cycle 2) A full life cycle approach is used but the contribution from vehicle use emissions clearly stated to enable a fair comparison with other public sector and private sector bodies. AEA recommends that if the latter option is chosen this should be kept under review as carbon footprinting based on full life cycle analysis will become more common over time.

Finally, **AEA examined approaches to the Carbon Footprinting of PTE projects**. The analysis suggested that there is limited 'off the shelf' guidance or best practice for carbon footprinting the overall plans, policies and programmes of PTEs – in particular on the construction of the public transport infrastucture. AEA identified a number of ways in which the PTEs could contribute to this area: the use of a carbon calculator to assess the potential impact of schemes; the undertaking of real life case studies and procuring in a low carbon way – placing an onus on suppliers to provide information on their lower carbon activities.