

## Appendix C: Transport Carbon Dioxide Reduction Strategy CO<sub>2</sub> reduction project: summary of methods and findings

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***“Although it is important that Derbyshire County Council leads by example, in order to generate significant reductions in carbon emissions to support Government targets, carbon reduction measures across the whole road transport network are required which represents a significant challenge.”***

***“Fully identifying the transport issues and requirements of the user is the only means of providing viable alternatives and to successfully achieve reductions in CO<sub>2</sub> emissions.”***

*Derbyshire Local Transport Plan 2011 - 2026*

## 1 Introduction

Transport policies and the carrying out of transport functions must take into account issues of climate change (Local Transport Act 2008).

The challenges we face fall into two groups:

- Reducing greenhouse gas emissions through new technologies and cleaner fuels, energy efficiency measures, reducing the need to travel, and encouraging 'smarter choices' of car sharing, using public transport, cycling and walking.
- Predicting and coping with the potential disruption of extreme weather events to the transport network.

This strategy is the summary of a project carried out during 2009/10 and focuses on the assessment and reduction of transport-related Carbon Dioxide (CO<sub>2</sub>) in Derbyshire. It is particularly important that, in the light of reduced levels of funding for LTP3, we ensure that we have assessed the best ways of investment to reduce CO<sub>2</sub>.

## 2 Overall aim and purpose of the strategy

The overall aim of this Strategy is to quantify the CO<sub>2</sub> emissions from each aspect of the Derbyshire road transport network and assess the possible emission reduction which could be achieved if various measures were implemented through the LTP 2011-2026 (LTP3) and DCC Corporate Policies.

The overall aim is to provide an indication as to the scale of the emission sources, identify potential CO<sub>2</sub> reduction measures which could be implemented and where possible quantify the CO<sub>2</sub> emission reduction which could be achieved. It aims to identify areas where efficiency in the use of the transport network and associated resources could be improved.

The intention is that this Strategy can be used as a tool to inform policies, plans and the decision making processes involved in the development and implementation of the LTP3. It provides a vehicle to assess progress in CO<sub>2</sub> reduction within the transport sector, identify gaps in data, and support projects to gather further information with the overall aim of reducing the sources of CO<sub>2</sub> from the transport network in the best way possible.

## 3 Calculations - traceable, transparent and replicable

In calculating the emissions, only 'tailpipe emissions' of CO<sub>2</sub> have been quantified i.e. those which are generated through combustion or energy consumption. 'Life cycle emissions' i.e. those which take into account indirect emissions such as the manufacture/disposal of a vehicle and the generation/distribution of fuel have not been quantified in this report.

The CO<sub>2</sub> emissions from the Derbyshire rail network have not been assessed as part of this Strategy. Currently, the national estimates of CO<sub>2</sub> emissions from rail, provided through NI 186, are associated with electricity and diesel use dependent on the type of train, which cannot be separated from industrial and commercial energy use. Therefore, emissions from the rail network will be reviewed as national data becomes available to allow comparison with local estimations. The impact of moving freight from road to rail has been considered, although data is not currently available to allow quantification of the associated CO<sub>2</sub> reduction.

This Strategy has been developed to also consider impacts on local air quality. Since many processes which generate CO<sub>2</sub> emissions also contribute to local air pollution, measures to reduce some of these emission sources for CO<sub>2</sub> reduction can also have a mutual benefit to improving local air quality. However, there are some areas where there can be a trade-off between the two, where an improvement made to reduce CO<sub>2</sub> emissions may have a negative impact on local air quality and where this is the case, these have been identified in this Strategy.

At the time of writing this Strategy, modelling software to accurately predict the sources and reductions of CO<sub>2</sub> was not available nor was the data which would be required to run such a model. Therefore, in comparison to analysis conducted at a national level, the calculations involve more simple mathematical functions based on traffic flows, vehicle types, emission factors and various estimates and assumptions to allow the calculations to be made. As such, the quantified outputs should be used as a reliable indication of the relative scale of CO<sub>2</sub> emissions and not as absolute quantities.

In order to ensure all local calculations are traceable, transparent and replicable and to allow calculations to be updated should new information and data become available, all emission factors, baseline data, estimates and assumptions used are disclosed.

The baseline year for this assessment and that used for the majority of data sources is 2008. A minority of data sources are unavailable for this year, and where this is the case, these have been clearly identified and where appropriate, projections using that data set have been employed.

The quantified outputs have been compared with national statistics produced by the Department of Energy and Climate Change, which showed that local calculations resulted in estimations which are higher by approximately 11%. However, since the objective of this Strategy is to provide an overview of the relative scale of the different transport CO<sub>2</sub> emission sources and their potential reduction, this difference is not as important as the comparative magnitude of the sources and the potential CO<sub>2</sub> reduction measures detailed.

## 4 Sources of emissions from the Derbyshire road transport network

**Table C1: Road Transport CO<sub>2</sub> emissions per source (2008)**

Transport Sector	Carbon Dioxide Emissions (kt CO <sub>2</sub> pa)	% Total emissions
Total car drivers	944.3	56.8
Car driver commuting to work	226.6	13.6
Single occupancy commuting car drivers	206.2	12.4
Derbyshire County Council (DCC) staff commute	26.6	1.6
Car drivers travelling on business	122.8	7.4
Car drivers travelling/escorting to education	37.8	2.3
Car drivers shopping	132.2	8.0
Car drivers in other escort and personal business	141.6	8.5
Car drivers visiting friends	151.1	9.1
Car drivers travelling for other leisure purposes	56.7	3.4
Car drivers travelling as part of a holiday	75.5	4.5
Articulated Heavy Goods Vehicles	260.3	15.7
Rigid Heavy Goods Vehicles	178.2	10.7
Light Goods Vehicles	223.4	13.4
Motorbikes	4.9	0.3
Public Transport: buses	33.2	2.0
DCC school transport	0.8	0.05
DCC contracted services	3.3	0.2
Commercial bus services	29.8	1.8
DCC business travel	4.3	0.3
DCC vehicle fleets	4.9	0.3
DCC street lights/bus shelter lighting/sign lights	17.1	1.0
<b>Total Traffic</b>	<b>1,644.4</b>	<b>99.0</b>
<b>Total Emissions from Transport Network</b>	<b>1,661.5</b>	<b>100.0</b>

Table C1 summarises the results of the assessment. This shows that cars account for 57% of CO<sub>2</sub> emissions, with commuting car drivers accounting for 14%. Goods vehicles account for 40% of emissions. Table C1 also shows that bus services, DCC school transport, escort to education, DCC contracted services, DCC business travel, vehicle fleets and street lighting account for small proportions of the total emissions.

## 5 Assessment of potential CO<sub>2</sub> reduction measures

Actions already being undertaken by DCC which can generate reductions in CO<sub>2</sub> emissions have been assessed, although data is not immediately available to quantify the impact for some measures. However, this provides a useful insight into how DCC can lead by example in CO<sub>2</sub> reduction from its estate.

The Strategy has assessed the level of influence that DCC LTP3 and corporate policies could have in delivering the CO<sub>2</sub> reduction measures:

- **High:** Direct influence through a variety of channels.
- **Medium:** An influential role, liaising with external organisations and leading by example.
- **Low:** Minimal, reduction measure largely dictated by national policies and strategies. Possible influence through awareness-raising and promotion.
- **TBC:** To be confirmed, data being collated or under review.

The Strategy has also assessed the approximate timescale to implementation of a potential CO<sub>2</sub> reduction measure:

- **Short:** Measure already underway or could be initiated early in LTP3 period, associated CO<sub>2</sub> reductions potentially being achieved relatively quickly (one to three years).
- **Medium:** Measure could be implemented within the life of LTP3, with CO<sub>2</sub> reductions requiring a slightly longer lead-in time (five years).
- **Long:** Measure outside scope of LTP3, requires considerable behavioural change, however support towards change to be provided through LTP3 (15 years).
- **TBC:** To be confirmed, data being collated or under review.

The cost of implementing a CO<sub>2</sub> reduction measure has been estimated using the following criteria:

- **Low:** Existing role with DCC, Corporate Policy, awareness raising initiative using existing channels.
- **Medium:** Moderate investment in infrastructure or marketing required.
- **High:** Substantial investment in infrastructure, comparable to a major scheme or requires large buy-in from wider population.
- **TBC:** To be confirmed, data being collated or under review.

The results of this work are presented in Table C2 at the end of the appendix. This table will be a useful summary to inform which actions are the best to pursue.

The Strategy also makes recommendations as to setting targets for CO<sub>2</sub> reduction in future phases of the report and proposes methods of monitoring the impacts of various CO<sub>2</sub> reduction measures both directly and indirectly.

## 6 Key findings, recommendations and conclusion

### Key findings

- 6.1 CO<sub>2</sub> calculations, tools and finding the best ways of reducing CO<sub>2</sub> is a 'jungle,' and the messages need to be simplified at a national level.
- 6.2 CO<sub>2</sub> emissions are directly related to fuel consumption; as fuel consumption increases, so do associated CO<sub>2</sub> emissions.
- 6.3 In terms of vehicle technology, at present, electric vehicles afford the greatest potential reduction in CO<sub>2</sub>.
- 6.4 Goods vehicles account for 40% of CO<sub>2</sub> emissions.
- 6.5 Car commuting journeys account for 14% of CO<sub>2</sub> emissions.
- 6.6 Bus services, school transport, contracted services, DCC business travel and streetlighting account for relatively small proportions of the total emissions.
- 6.7 A targeted area-based strategy needs to be adopted e.g. for commuting and shopping journeys in urban areas such as Chesterfield, and business trips on the wider network.
- 6.8 A personalised approach is likely to be most effective. Fully identifying the transport issues and requirements of the user is the only means of providing viable alternatives and to successfully achieve reductions in CO<sub>2</sub> emissions.
- 6.9 Due to reductions in spending, value for money will be an important characteristic of LTP3; we need to direct resources to areas of best effect.

### Recommendations

In addition to highlighting data gaps and providing a monitoring methodology for Derbyshire, potential CO<sub>2</sub> reduction projects have been identified as follows:

- 6.10 Sustainable Travel Town Initiatives including a full package of measures to promote and encourage more sustainable transport.
- 6.11 Business Travel Planning to include encouraging lower carbon HGV technologies.
- 6.12 Encouraging walking and cycling, creation of viable cycle networks which link to the wider Greenway network throughout Derbyshire, and promotion and marketing of networks, including production of maps. Provision of cycle training for adults if required.
- 6.13 Smarter driving campaign, potential for provision of discounted smarter driving training.
- 6.14 Vehicle type and fuel choice campaign – awareness raising campaign, including providing up-to-date information regarding outlets selling alternative fuels.
- 6.15 'Transport Choices' education campaign to be investigated.

### Conclusion

This project has presented a comprehensive analysis of CO<sub>2</sub> emissions and potential reductions in Derbyshire, and can continue to be used as a framework to assess the most effective measures for the LTP3 period.

The DfT has recently (February 2011) published a carbon tool which allows evaluation of the impacts of a proposed transport scheme in terms of the associated carbon emissions. As such, the tool does not appear to overlap with the DCC carbon tool as this is designed to evaluate the wider transport network. However, information contained within the DfT tool may be used to modify and improve the DCC tool, and this will be investigated.

**Table C2: Carbon reduction summary, including level of influence, timescales and costs(2008)**

Potential CO <sub>2</sub> reduction measure	Actions to implement measures	Potential CO <sub>2</sub> saving (kt pa)	Potential impact on Air Quality	Level of influence at local level	Timescales to results	Cost to implement measure
Replacing all cars with low emission vehicles (= <110g CO <sub>2</sub> /km)	National Policy supported by local awareness raising, and personalised travel planning	350.2	Positive	Low	Long	High
Replacing petrol fuel cars with hybrid petrol/ electric	National Policy supported by local awareness raising, and personalised travel planning	255.7	Positive	Low	Long	High
Replacing petrol fuel cars with Compressed Natural Gas/Liquid Petroleum Gas	National Policy supported by local awareness raising, and personalised travel planning	78.6	Positive	Low	Long	High
Replacing petrol fuel cars with diesel	National Policy supported by local awareness raising, and personalised travel planning	74.4	Negative	Low	Long	High
Replacing all current cars with electric vehicles	National Policy supported by local awareness raising, and personalised travel planning, provision of charging points	497.4	Positive	Low	Long	High
DCC Estate reductions (including energy use in buildings)	Corporate policy	4.6	Positive	High	Short	Low
Increasing use of car share for commuting journeys	Car Share Derbyshire available, promotion through awareness raising, and personalised travel planning	47.6	Positive	High	Short	Low
Increasing uptake of cycling to work: Those who live <5km from work to cycle in place of driving	Creation of viable cycle networks, awareness raising, and personalised travel planning	33.6	Positive	High	Medium	Medium
Increasing uptake of walking to work: Those who live <2km from work to walk in place of driving	Creation of viable walking networks, awareness raising, and personalised travel planning	9.1	Positive	High	Medium	Medium

**Table C2: Carbon reduction summary, including level of influence, timescales and costs(2008)**

Potential CO <sub>2</sub> reduction measure	Actions to implement measures	Potential CO <sub>2</sub> saving (kt pa)	Potential impact on Air Quality	Level of influence at local level	Timescales to results	Cost to implement measure
Sustainable Travel Towns Initiative (eg Chesterfield, Buxton, Long Eaton)	Personalised Travel Planning	8.1	Positive	High	Short	Medium
Using low carbon buses for all services	Awareness raising, and liaison with Operators	9.9	Positive	Low	Long	High
Using low carbon buses for contracted services only	Awareness raising, and liaison with Operators	1.0	Positive	High	Medium	TBC
Smarter Driving: Cars	Awareness raising, provision of training, and personalised travel planning	68.0	Positive	Medium	Short	Low
Smarter Driving: Buses	Awareness raising, liaison with Operators	2.4	Positive	Medium	Medium	Low
Smarter Driving: Freight	Awareness raising, liaison with Fleet Operators, and Business Travel Plans	47.7	Positive	Medium	Medium	Low
Freight: Selection Policy	Awareness raising, liaison with Fleet Operators, and Business Travel Plans	20.1	Positive	Medium	Medium	TBC
Freight: Aerodynamic Styling kits	Awareness raising, liaison with Fleet Operators, and Business Travel Plans	26.8	Positive	Medium	Medium	TBC
Freight: Fuel Management	Awareness raising, liaison with Fleet Operators, and Business Travel Plans	13.4	Positive	Medium	Medium	TBC
Freight: Route Planning	Awareness raising, liaison with Fleet Operators, and Business Travel Plans	10.7	Positive	Medium	Medium	TBC
Freight: Strategic Measures	Awareness raising, liaison with Fleet Operators, and Business Travel Plans	13.4	Positive	Medium	Medium	TBC
Increasing access to Derbyshire Tourist Events by sustainable transport	Awareness raising, provision of alternative transport and incentives	TBC	Positive	High	Short	Low

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Potential CO <sub>2</sub> reduction measure	Actions to implement measures	Potential CO <sub>2</sub> saving (kt pa)	Potential impact on Air Quality	Level of influence at local level	Timescales to results	Cost to implement measure
Encouraging and supporting sustainable tourism in Derbyshire	Awareness raising, and provision of alternative transport information and incentives	TBC	Positive	Medium	TBC	TBC
Reduction in energy consumption of DCC sign lights, streetlights and bus shelter lighting	Programme of bulb replacement and reduction in burning hours	TBC	Positive	Medium	Long	TBC
Reducing the need to travel	Land-use and accessibility planning	TBC	Positive	High	Short	Low
Reducing business travel mileage	Business Travel Plans	TBC	Positive	High	Short	Low
Reducing travel to school mileage	School Travel Plans	TBC	Positive	High	Short	Low
DCC Corporate Initiative: Changing the Way Derbyshire Works	Corporate policy	TBC	Positive	High	Medium	Low
Transfer freight from road to rail	Awareness raising, and liaison with Freight Companies	TBC	Positive	Medium	Long	TBC
Emission standards in conditions of contracted services	Contract Conditions	TBC	Positive	High	Short	TBC