

# The Road to a More Carbon Efficient Britain



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***“Climate change is one of the most pressing issues facing our society today. The best scientific projections indicate that we have very little time left – indeed less than 100 months – in which to alter our behaviour drastically. Although I wish it were otherwise, I fear we have reached the point when if we do too little, too late to tackle this problem, the consequences could be catastrophic”***

***HRH The Prince of Wales, May 2009***

## **Climate Change demands a different policy context for transport decisions**

- Transport is the only sector in the UK in which GHG emissions are still rising amounting to 21% of all UK domestic emissions<sup>1</sup>.
- Current focus of Government policy is on **technology and innovation**, but these benefits will only be felt in the long term and reliance on technology alone will not be sufficient to deliver on the carbon reduction targets and will make little contribution to tackling **congestion**.
- Moreover if reduction in carbon emissions is achieved through cleaner technology alone, the marginal cost of additional km traveled will fall leading to the danger of “**rebound effects**” with increases in km traveled offsetting some of emissions reduction from efficiency improvements.
- An essential part of the Government’s carbon reduction strategy needs to involve **behavioral change** and a key part of this will involve policies to encourage more intelligent car use and **modal switch** to public transport, walking and cycling.
- The Bus & Coach industry can make a major contribution to delivering on the Government’s CO2 reduction targets through modal shift from the car

## **The Bus & Coach Industry can deliver quickly and cost effectively on CO2 reduction targets**

- If car drivers switched from car to bus or coach for just one journey in 25 it would mean one billion less car journeys on our roads and a reduction of 2 Million Tonnes of CO2 [Appendices I & II].
- This could be achieved in three years and would result in 50% more CO2 savings from transport than planned for the same period under existing Government policies.
- Congestion on our roads is a major problem for the environment and for the economy. Electrification of the rail network and widespread roll out of electric cars will do nothing to tackle congestion
- As road space becomes ever scarcer buses and coaches have a key role to play – one double deck bus could take the place of 75 cars on the road!
- Buses and coaches run on existing infrastructure, provide real flexibility, and can deliver additional capacity very quickly with minimal additional costs

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<sup>1</sup> *Low Carbon Transport: A Greener Future 2009, Department for Transport*

### **Bus and Coaches are a very carbon efficient mode of transport**

- The CO<sub>2</sub> per car passenger kilometre is 130g CO<sub>2</sub>, per bus/coach passenger kilometre it is 69g CO<sub>2</sub><sup>2</sup>
- At 30g CO<sub>2</sub> per passenger kilometre the express coach is the most carbon efficient form of motorised transport resulting in less than a quarter of the emissions per passenger than equivalent journey by car<sup>3</sup>
- Average number of people in a car is 1.58, compared to 32 of a coach<sup>4</sup>
- The average number of passengers on a bus is 9.3<sup>5</sup>. In a city a journey by bus can result in half the CO<sub>2</sub> emissions per passenger compared to the car.
- This differential would become much greater with modal shift.

### **The Bus & Coach Industry is already making a substantial contribution to modal shift from the car**

- Through investing heavily in vehicles and people the Industry has reversed the previous decline in patronage and suggesting that the industry has the capacity to return to 1950 levels of patronage.
- Since 2005 there has been an average increase of 4% per annum for bus journeys across the UK
- **5.5 billion passenger journeys** are now made by bus and coach per annum
- These gains have been achieved by a combination of substantial investment on the part of the industry in fleet renewals, in extensive marketing and promotion and in the simplification of fares and ticketing
- But an essential ingredient to success also involve good partnership with local authorities who adopt policies favourable to bus travel

### **Good partnership between operators and local authorities can deliver excellent modal shift and huge benefits to the traveling public. Here are some examples:**

- In Brighton bus patronage has grown by around **5% per year since 1993** contributing to a 3% reduction in city centre traffic in the last 3 years
- In York there has been a **56% growth** in bus patronage over the past 5 years
- Kent Fastrack has seen passenger numbers **up 50%** on forecasts. 20% of Fastrack passengers previously used their car for the same journey.
- In the past decade, London has seen a **40% increase** in bus patronage and a **5% decline in the car** share of total passenger journeys, encouraged by congestion charging.
- In Cambridgeshire there has been **100% growth** in bus patronage from over the past 7 years

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<sup>2</sup> NAEI, Carbon Pathways Analysis

<sup>3</sup> ECCM, Defra, DfT 2006

<sup>4</sup> Carbon Pathways Analysis, National Travel Survey

<sup>5</sup> National Travel Survey

### Research indicates that more people would be prepared to use their car less

- **18% of motorists** find driving increasingly stressful and feel a responsibility to reduce their car use but they see big problems with other modes. A further 16% of motorists have already reduced their car use and could be encouraged to use bus and coach more if conditions can be made easier<sup>6</sup>.
- There is a **growing awareness of the need to change travel behaviour**. A recent poll for The Times has revealed that more than two thirds of environmentally aware people have already cut the number of trips they make by car.
- A public opinion survey for Department for Transport (2008) found **3 out of 4 adults would change their behaviour** to help limit climate change<sup>7</sup>.
- Recent YouGov surveys indicate the **overwhelming majority of people support greater investment in public transport** and would put taking public transport second after recycling as a realistic measure to help the environment<sup>8</sup>
- **Customer satisfaction on buses and coaches is extraordinarily high at 89%**. Evidence suggests that once people start using buses and coaches they are very satisfied with the experience of reliability, comfort and convenience and they go on to travel by bus and coach more frequently.

### Government can help the Industry deliver further modal shift from the car

- **By setting targets for Local Authorities that encourage modal shift** to bus and coach through measures such as bus priority, park and ride, parking policy and other measures to encourage more intelligent car use.
- **By implementing a fairer tax regime for bus and coach passengers** Fuel duty was increased in April 2009 and increases are planned for September and 2010. The Industry will be paying an additional £70 million more tax per annum after 2010 changes than it was in 2007. This will inevitably increase fares.
- Commuting and business trips account for over a third of car emissions<sup>9</sup>, a figure made higher by the high proportion of single occupancy drivers. A very significant proportion of these could be persuaded to use the bus if businesses were encouraged to adopt **Green Travel Plans**. Workers in the public sector account for the greatest proportion of commuting / business trips<sup>10</sup>. Green Travel Plans should be a requirement for every public sector organisation.
- **Integration of sustainable transport policies with land use planning**, rather than developments that encourage high car dependency, along with bus priority measures and parking policy, would encourage more people to travel by bus to do many of their shopping trips
- The Yellow School Bus Commission has identified that **national roll out of yellow buses** to primary schools would remove 3% of all car traffic between 0845 and 0900, and take 130 million car journeys off the road<sup>11</sup>.
- Only 7% of journeys are over 25 miles but they account for 38% of emissions<sup>12</sup>, making a compelling case for **priority measures for coaches on motorways**.

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<sup>6</sup> Dr Jillian Anable, *The Centre for Transport Research Aberdeen*

<sup>7</sup> *Department for Transport, 2008*

<sup>8</sup> *YouGov poll conducted by First*

<sup>9</sup> *Low Carbon Transport: A Greener Future 2009, Department for Transport*

<sup>10</sup> *Low Carbon Transport: A Greener Future 2009, Department for Transport*

<sup>11</sup> *Yellow School Bus Commission Report and Recommendations, September 2008*

<sup>12</sup> *Carbon Pathways Analysis*

### **“The One Billion Challenge”**

- In just 3 years the Bus & Coach Industry could take **one billion car journeys** off the road through increasing average loadings, with the help of bus priority and other policy measures to make it easier for people to travel by bus and coach, and with low carbon technologies. [See Appendices I & II]
- This would amount to a reduction of **2 Million Tonnes of CO2**<sup>13</sup>
- And would deliver an **additional 50% reduction in CO2** from domestic transport to the reductions planned over the same period by current Government policies<sup>14</sup>.
- These measures would make a huge difference to existing passengers and would create a virtuous circle, whereby both existing and new passengers would choose to travel more often by bus or coach instead of car – attracted by the added comfort, reliability and convenience.
- **And this is just the beginning.** With the widespread application of policies conducive to bus and coach travel the Industry could go much further, taking **billions more car journeys** off the road and making a huge contribution to delivering on the Government’s carbon reduction targets.

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<sup>13</sup> Defra 2008 Guidelines GHG conversion factors Annex 6

<sup>14</sup> Low Carbon Transport: A Greener Future 2009, Department for Transport

Journey Purpose	No. car journeys (million)	Policy Solutions	% shift from car to bus	Car trips Saved (million)	<b><i>Car drivers changing their travel behaviour</i></b>
Commuting /Business	7,083	Parking Park & Ride Bus Priority Fairer tax regime Green Travel Plans Integration with land use planning	6	425	<b><i>One extra commute by bus a month...</i></b>
Education /Escort Education	1,320	Bus Priority Fairer tax regime School Travel Plans Yellow School Bus Integration with land use planning	3	40	<b><i>3 out of every hundred parents letting their children travel to school by bus...</i></b>
Shopping	4,671	Parking Park & Ride Bus Priority Fairer tax regime Integration with land use planning	4	187	<b><i>Every couple of months taking the bus to town centre instead of the car...</i></b>
Other personal business / escort	5,750	Parking Park & Ride Bus Priority Priority measures for coaches Fairer tax regime Integration with land use planning	3	173	<b><i>Every so often instead of driving to the bank, or the doctor or the hairdresser for example, just taking the bus instead...</i></b>
Leisure	5,037	Parking Park & Ride Bus Priority Priority measures for coaches Fairer tax regime	4	201	<b><i>Once a month doing one leisure trip by bus – such as taking the bus to the cinema, or for a day out, or to visit friends...</i></b>
TOTAL	23,861	ALL OF THE ABOVE	4	1026	<b><i>One in 25 of journeys they previously made by car by bus instead</i></b>

**In addition to a reduction of CO2 achieving modal shift from the car to bus and coach would bring many other wider benefits to society**

- The Bus & Coach industry directly employs some 220,000 people
- The UK bus and coach manufacturing sector employs 4000 and supports a further 4000 jobs
- In total the Bus & Coach industry is responsible directly and indirectly for over a million jobs
- Achieving modal shift from car to bus / coach would **support these key industries** and create **new jobs**.
- By helping to relieve congestion the Bus & Coach industry can generate further **benefits to the UK economy**

**Congestion is one of the major causes of increase in CO2 from transport and is damaging to the UK Economy**

- Car traffic is 87% greater than in 1980 and still rising<sup>15</sup>. The UK is the most car dependent country in Europe. Passenger cars produce **58.3%** of UK domestic transport emissions<sup>16</sup>.
- Congestion dramatically increases CO2 emissions from road vehicles. Under heavily congested conditions tail pipe emissions can be increased by as much as 3 or 4 times<sup>17</sup>
- Eliminating existing congestion on road network would be worth £7-8 billion of GDP per annum.<sup>18</sup> If left unchecked, 13% of traffic will be at stop-start travel conditions by 2025. Rising cost of congestion will waste an extra £22 billion worth of time in England alone by 2025.<sup>19</sup>
- Over the past decade congestion has caused speed of bus travel to fall by between 10 and 20% causing operators to have to run extra services just to maintain time-tables.
- Electrification of the road network and widespread roll out of electric cars will do nothing to tackle congestion. The Eddington Study notes that the key economic strategic challenges is to make use of existing infrastructure advocates a stronger role for buses which provide real flexibility and can deliver additional capacity very quickly and with no new roads<sup>20</sup>.

**Achieving modal shift from the car to bus and coach contributes to all key targets highlighted in *Delivering a Sustainable Transport System*:**

- Making bus and coach more readily and easily available creates more **equal opportunity** for all;
- **Safety** a passenger is 6 times more likely to be fatally injured in a car than in a bus or coach;
- Improved local air quality would lead to an improvement in **health** by reducing respiratory problems like asthma;
- Better provision of buses and coaches and controlling car demand is fundamental to sustaining the **attractiveness of town and city centres**.
- Make a positive contribution to **economic growth** by tackling congestion

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<sup>15</sup> *The Eddington Transport Study 2006*

<sup>16</sup> *Low Carbon Strategy, Department for Transport*

<sup>17</sup> *Bell M.C. Environmental Factors in Intelligent Transport Systems, IEE Proceedings 2006*

<sup>18</sup> *The Eddington Transport Study 2006*

<sup>19</sup> *The Eddington Transport Study 2006*

<sup>20</sup> *The Eddington Transport Study 2006*

**As well as working to achieve modal shift from the car and thereby reduce overall emissions from the transport sector, the Bus & Coach Industry is working hard to reduce its own carbon footprint.**

- **Fuel efficient driving** – the Industry is working hard to achieve savings in fuel consumption with driver training, but the key to making real savings is creating a situation where it is possible for the bus to travel at a relatively constant speed. Bus priority and other measures to assist the bus in achieving this are essential if maximum savings are to be achieved.
- **Alternative fuels** – achieving savings of up to 80% from biofuels made from recycled waste
- **Improved site efficiency** – achieving savings in energy consumption at depots and other premises of up to 20%.
- **Renewable energy** – at some premises 70% of the energy consumed is from renewable sources like wind-power, hydro-power and bio mass
- **Cleaner Vehicles** – the industry has already achieved a dramatic reduction in local air pollution. One effect of achieving this has been that vehicles have been forced to become heavier and this has led to higher fuel consumptions.
- The industry is working hard to combat this through investigations into a variety of **low carbon technologies**, including: hybrid buses (parallel / series), hydrogen and hydrogen cell, lighter vehicles and electric vehicles. [APPENDIX III]
- The Industry welcomes the Government's recent announcement for a £30 million fund for low carbon buses. There are many issues to consider in terms of whole life costing and reliability. **The Industry will need further support in its transition to a fully low carbon bus and coach fleet**

**The Road to a more Carbon Efficient Britain**

- The key conclusions of the Stern Review<sup>21</sup> were that urgent action is needed to tackle climate change through carbon pricing, technology and innovation and promoting behavioural change.
- A key aspect of that behavioural change will involve more intelligent car use.
- The Bus & Coach Industry has a very significant role to play in delivering on the Government's CO2 reduction targets by modal shift from the car.

***“Transport policy has no choice but to respond to the challenge of climate change, for both environmental and economic reasons. Transport policies must fully reflect environmental externalities, and transport planning must take account of likely carbon prices.”<sup>22</sup>***

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<sup>21</sup> *The Stern Review (2006), The Economics of Climate Change*

<sup>22</sup> *The Eddington Transport Study 2006*



## APPENDIX I

1. JOURNEY PURPOSE: ALL MODES, CAR AND BUS COMPARISON
2. CO2 EMISSIONS FOR CAR BY JOURNEY PURPOSE
3. INITIAL ASSESSMENT OF SCOPE FOR CO2 REDUCTIONS BY MODAL SHIFT FROM CAR TO BUS BY JOURNEY PURPOSE

### 1. JOURNEY PURPOSE: ALL MODES, CAR AND BUS COMPARISON

#### Distance travelled per person per year for car and local bus (Miles)

	all modes	car	car as % of all modes	local bus	bus as % of all modes
Commuting /Business	2073	1609	77.6	68	3.3
Education /Escort Education	306	163	53.3	56	18.3
Shopping	926	764	82.5	76	8.2
Other personal business / escort	976	875	89.7	32	3.3
Leisure	2852	2264	79.4	62	2.2
<b>TOTAL</b>	<b>7133</b>	<b>5674</b>	<b>79.5</b>	<b>292</b>	<b>4.1</b>

#### Trips per person per year for car and local bus

	all modes	car	car as % of all modes	local bus	bus as % of all modes	% shift from car to bus
Commuting /Business	195	136	69.7	13	6.7	6
Education /Escort Education	106	45	42.5	11	10.4	3
Shopping	219	136	62.1	19	8.7	4
Other personal business / escort	202	150	74.3	8	4.0	3
Leisure	316	190	60.2	13	4.1	4
<b>TOTAL</b>	<b>1,037</b>	<b>657</b>	<b>63.4</b>	<b>65</b>	<b>6.3</b>	<b>4</b>

*Source National Travel Survey 2006, Carbon Pathways Analysis*

## 2. CO2 EMISSIONS FOR CAR BY JOURNEY PURPOSE

**Estimated CO2 emissions from all modes and household car journeys by journey purpose & car passenger distance by journey purpose and average occupancy**

	% all modes	Million Tonnes CO2	% car journey	Million Tonnes CO2	Est. Car Passenger Distance - million km	% pkm	Ave Occupancy
Commuting	24	31.44	25	14	96,990	19	1.1
Business	13	17.03	12	6.72	51,046	10	1.2
Education /Escort Education	4	5.24	3	1.68	15,314	3	2.0
Shopping	14	18.34	14	7.84	71,467	14	1.7
Other personal business / escort	15	19.65	16	8.96	91,886	18	1.7
Visit friends at private home	13	17.03	13	7.28	81,676	16	1.7
Visit friends elsewhere	3	3.93	3	1.68	20,419	4	2.1
Holiday / day trip	8	10.48	7	3.92	51,046	10	2.1
Other leisure	6	7.86	7	3.92	30,629	6	1.7
TOTAL	100	131	100	56	510,475	100	Ave 1.6

### Car trips by journey purpose, CO2, distance, number of trips, occupancy

	% car journey	Million Tonnes CO2	Est. car passenger distance – million km	% pkm	Ave trip length km	No. car passenger journeys (million)	Ave Occup.	No. car journeys (million)
Commuting /Business	37	20.72	148,036	29	19.0	7,791	1.1	7,083
Education /Escort Education	3	1.68	15,314	3	5.8	2,640	2.0	1,320
Shopping	14	7.84	71,467	14	9.0	7,941	1.7	4,671
Other personal business / escort	16	8.96	91,886	18	9.4	9,775	1.7	5,750
Leisure	30	16.8	183,770	36	19.2	9,571	1.9	5,037

Source National Travel Survey 2006, Carbon Pathways Analysis

### 3. INITIAL ASSESSMENT OF SCOPE FOR CO2 REDUCTIONS BY MODAL SHIFT FROM CAR TO BUS BY JOURNEY PURPOSE

#### A. Potential Shift from Car to Bus

Journey Purpose	No. car passenger journeys million	No. car journeys million	Policy Solutions	% car	% bus	% shift from car to bus	Car trips Saved million
Commuting /Business	7,791	7,083	Parking Park & Ride Bus Priority Fairer tax regime Green Travel Plans Integration with land use planning	69.7	6.7	6	425
Education /Escort Education	2,640	1,320	Bus Priority Fairer tax regime School Travel Plans Yellow School Bus Integration with land use planning	42.5	10.4	3	40
Shopping	7,941	4,671	Parking Park & Ride Bus Priority Fairer tax regime Integration with land use planning	62.1	8.7	4	187
Other personal business / escort	9,775	5,750	Parking Park & Ride Bus Priority Priority measures for coaches Fairer tax regime Integration with land use planning	74.3	4.0	3	173
Leisure	9,571	5,037	Parking Park & Ride Bus Priority Priority measures for coaches Fairer tax regime	60.2	4.1	4	201
<b>TOTAL</b>	<b>37,718</b>	<b>23,861</b>	<b>ALL OF THE ABOVE</b>	<b>63.4</b>	<b>6.3</b>	<b>4</b>	<b>1026</b>

## B. Current and projected trips per person for Car and Bus

Journey Purpose	All Modes	Car per Year	Reduction in Car per year	Car per Month	Reduction in Car per Month	Car per Week	Reduction in Car per week
Commuting / Business	195	136	8.2	11.3	0.7	2.6	0.2
Education / Escort Educ	106	45	1.4	3.8	0.1	0.9	0.0
Shopping	219	136	5.4	11.3	0.5	2.6	0.1
Other Personal Business	202	150	4.5	12.5	0.4	2.9	0.1
Leisure	316	190	7.6	15.8	0.6	3.7	0.1
<b>Total</b>	<b>1,038</b>	<b>657</b>	<b>27.1</b>	<b>54.8</b>	<b>2.3</b>	<b>12.6</b>	<b>0.5</b>

Journey Purpose	% Shift to bus	Bus per Year	Adjusted Total Bus per Year	Bus per Month	Adjusted Total Bus per Month	Bus Per Week	Adjusted Total Bus per Week
Commuting Business	6	13	21.2	1.1	1.8	0.25	0.41
Education / Escort Educ	3	11	12.4	0.9	1.0	0.21	0.24
Shopping	4	19	24.4	1.6	2.0	0.37	0.47
Other Personal Business	3	8	12.5	0.7	1.0	0.15	0.24
Leisure	4	13	20.6	1.1	1.7	0.25	0.40
<b>Total</b>	<b>4</b>	<b>64.0</b>	<b>91.1</b>	<b>5.3</b>	<b>7.6</b>	<b>1.23</b>	<b>1.75</b>

## APPENDIX II

### CO2 SAVINGS BY MODE SHIFT FROM CAR TO BUS/COACH

#### 2011-2014

Average (petrol and diesel) Car	– 204g CO2 per vehicle km <sup>23</sup>
Average Car occupancy	– 1.58
Private / Household car produces	– 56 Mt CO2 in GB per annum <sup>24</sup>
Average Bus/Coach	– 1000g CO2 per vehicle km <sup>25</sup>
Average Bus Loading	– 9.3
Bus/Coach produces	– 4.3 Mt CO2 <sup>26</sup>
Bus/coach vehicle distance travelled	– 4.3 Billion km <sup>27</sup>
Bus/coach passenger journeys	– 5.5 Billion <sup>28</sup>
Average bus trip length	– 9.1km <sup>29</sup>

Trials have shown that fuel efficient driving can achieve up to 5-7% saving in fuel consumption under very favourable conditions but much greater bus priority would be needed to achieve this widely <sup>30</sup>

Hybrid vehicles can achieve approximately 30% saving in fuel consumption<sup>31</sup>

[See Excel Spreadsheet for – CO2 Reduction Calculations]

<u>Increasing average bus Loadings from</u>	9.3	to	12
Number of Extra Bus Passenger Journeys	1.60		Billion
Equivalent number of Car Vehicle Journeys	1.01		Billion
CO2 Reduction	1.88		MtCO2
<u>Percentage Improvement in Fuel efficient driving for Bus and Coach</u>			2.00%
Adjusted Bus / Coach CO2 Production	0.06		MtCO2
Adjusted CO2 Reduction	1.96		MtCO2
<u>Plus hybrid vehicles on % of fleet.</u>			10.00%
Adjusted Bus / Coach CO2 Production	0.13		MtCO2
Adjusted CO2 Reduction	2.09		MtCO2

<sup>23</sup> Defra 2008 Guidelines GHG conversion factors Annex 6

<sup>24</sup> Carbon Pathways Analysis, 2006

<sup>25</sup> Defra 2008 Guidelines

<sup>26</sup> Defra 2008 Guidelines, Transport Statistics 2008

<sup>27</sup> Transport Statistics 2008

<sup>28</sup> Transport Statistics 2008, National Travel Survey

<sup>29</sup> Transport Statistics 2008, National Travel Survey

<sup>30</sup> Trials conducted by Go-Ahead, FirstGroup. Note the key to achieving maximum savings is bus priority and other measures to make it possible for the bus to travel at a relatively constant speed.

<sup>31</sup> Average of estimates: ADL 40%, Wrightbus 34%, FirstGroup Go-Ahead 15-20%, TfL 30%

## **APPENDIX III**

### **LOW CARBON VEHICLES**

All new buses meet Euro4 benchmark offering steep reductions in carbon monoxide, nitrogen oxides, hydrocarbons and particulate matter.

One effect of meeting local pollution targets and conforming to latest Euro specifications has been that bus and coach vehicles have been forced to become heavier and this has led to higher fuel consumptions.

Another factor leading to heavier buses has been the need to conform to DDA requirement for ramps, low floors and other passenger enhancements like air conditioning.

The Bus & Coach Industry is working hard to combat this through investigations into a variety of low carbon technologies, including: hybrid buses (parallel / series), hydrogen and hydrogen cell, lighter vehicles and electric vehicles.

There are many issues to consider in particular in terms of whole life costing and reliability.

- At this stage it does not seem likely that electric solutions will work for buses, but there is a strong case for further R&D into electric vehicles especially as the Government has longer term plans for electrification of the road network.
- The performance of hydrogen buses surpassed expectations but the logistics of capture and storage of hydrogen needs further investigation as it is currently very expensive.
- Trials of hybrid buses are underway in London but the technology is at an early stage and economies of scale mean that purchase price of a hybrid vehicle is twice as expensive as a conventional diesel vehicle, and that doesn't include additional maintenance costs.