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Carbon Pathways for transport in the city regions

July 2010

Carbon pathways for transport in the city regions – Introduction

This briefing paper aims to provide decision makers with advice on the best course of action to reduce carbon emissions from the transport sector in metropolitan areas outside London.

This document, supported by detailed appendices, considers the following key points:

- Government policies on carbon reduction in general; transport policy and other relevant policy areas;
- affordability and performance of low carbon technologies and interventions in the transport sphere;
- evidence on the relative costs and efficacy of the different policy options available to city region transport policy makers;
- consideration of carbon reduction initiatives in non-transport sectors; and
- consideration of resources and governance structures required to deliver low carbon transport in the city regions.

The analysis focuses on metropolitan areas in England (outside London), in the city regional context.

The study considers emissions from the transport sector only but excludes emissions from the aviation and shipping sectors. Other sectors are considered to enable a cross-sector comparison of possible emission reduction initiatives.

The study considers CO_2 emissions only as they make up about 99% of domestic transport emissions in the UK.

When considering transport emissions, only tailpipe emissions and the transfer of tailpipe emissions to the power sector (through the take up of electric vehicles and additional rail electrification) are considered.

The study does not consider whole life cycle emissions of vehicles or fuels and energy used or emissions resulting from electricity currently used by electric networks (tramway, metro) or electric trains.

Modelling work including business as usual trajectory and forecasting was undertaken for 2016 and 2022.

- 2016 marks the end of the first five year period of the third Local Transport Plan which Integrated Transport Authorities and local authorities are currently developing.
- 2022 marks the end of the UK's first three Carbon Budgets as set by the Government under the Climate Change Act 2008.

Our recommendations focus on the achievement of significant reductions in CO_2 emissions from the transport sector (excluding aviation and shipping) **in urban areas**.

Interventions designed to tackle congestion, improve local air quality or accessibility are not always synonymous with reduced CO_2 emissions. This is important to keep in mind as some interventions which score poorly here would potentially deliver significant benefits against other objectives such as tackling social inequalities or supporting economic growth.

This briefing paper is a summary of detailed analysis undertaken on behalf of *pteg* for the metropolitan areas of Greater Manchester, Merseyside, South Yorkshire, Tyne & Wear, West Midlands and West Yorkshire and should be read in conjunction with the detailed appendices document. The study was commissioned by *pteg* and undertaken by Atkins, with the support of Jillian Anable from the University of Aberdeen, and in liaison with the *pteg* team and the *pteg* Sustainability Group.

Section 1 – How to reduce transport sector emissions in the city regions?

"Every **big** helps"

David MacKay, Sustainable Energy Without the Hot Air

For the city regions to achieve significant cuts in transport sector CO_2 emissions, they will need to focus on interventions which target the largest amount of users and the least efficient behaviours

In terms of CO_2 emission reduction for the transport sector in the metropolitan areas, our analysis shows that the strongest abatement measures are:

- **support for the take up low carbon vehicles;**
- **stricter enforcement of speed limits;**
- **driver training programme (eco-driving);**
- **provision of improved cycling infrastructure;**
- **roll-out of Smarter Choices initiatives and campaigns in targeted areas;**
- **improvements in bus fleet efficiency; and**
- **the introduction of workplace parking levy or equivalent demand management schemes.**

These findings are consistent with the national priorities identified by the Committee on Climate Change (see below). They are also consistent with the priorities identified by the Department for Transport in Low Carbon Transport: A Greener Future – A Carbon Reduction Strategy for Transport published in July 2009.

Our analysis also identifies a number of lower impact but relatively low cost, or even revenue generating, interventions which should be considered, especially where they complement other high scoring measures or deliver wider benefits. This includes:

- public sector procurement of low carbon vehicles for own fleet (supporting early take up and infrastructure development);
- support taxi/private hire switch to more efficient vehicles;
- investigating the potential for road surfaces to reduce fuel consumption (through resurfacing programme);
- improved provision of express bus and coach services (medium to long distance trips);
- replacement of conventional bus services by smaller/flexible services (in more rural areas);
- improvement to freight and rail efficiency;
- introduction or increase in car parking charges;
- support and investment in local services and local community hubs (in more rural areas);
- changes to land use planning to reduce the need to travel, including higher densities (longer term impacts); and
- investigating the potential to use transport assets to produce renewable energy.

National priorities - Committee on Climate Change recommendations

In 2009, the CCC proposed the following key indicators to assist in monitoring carbon reductions in the transport sector:

• reduce carbon intensity of new cars to 130gCO_2/km in 2015 and 95 gCO_2/km in 2020;

• 240,000 electric cars and plug-in hybrids delivered through pilot projects by 2015, and 1.7 million by 2020; and

• 3.9 million drivers trained and practicing eco-driving techniques by 2020.

These would be supported by a package of transport policies which would include:

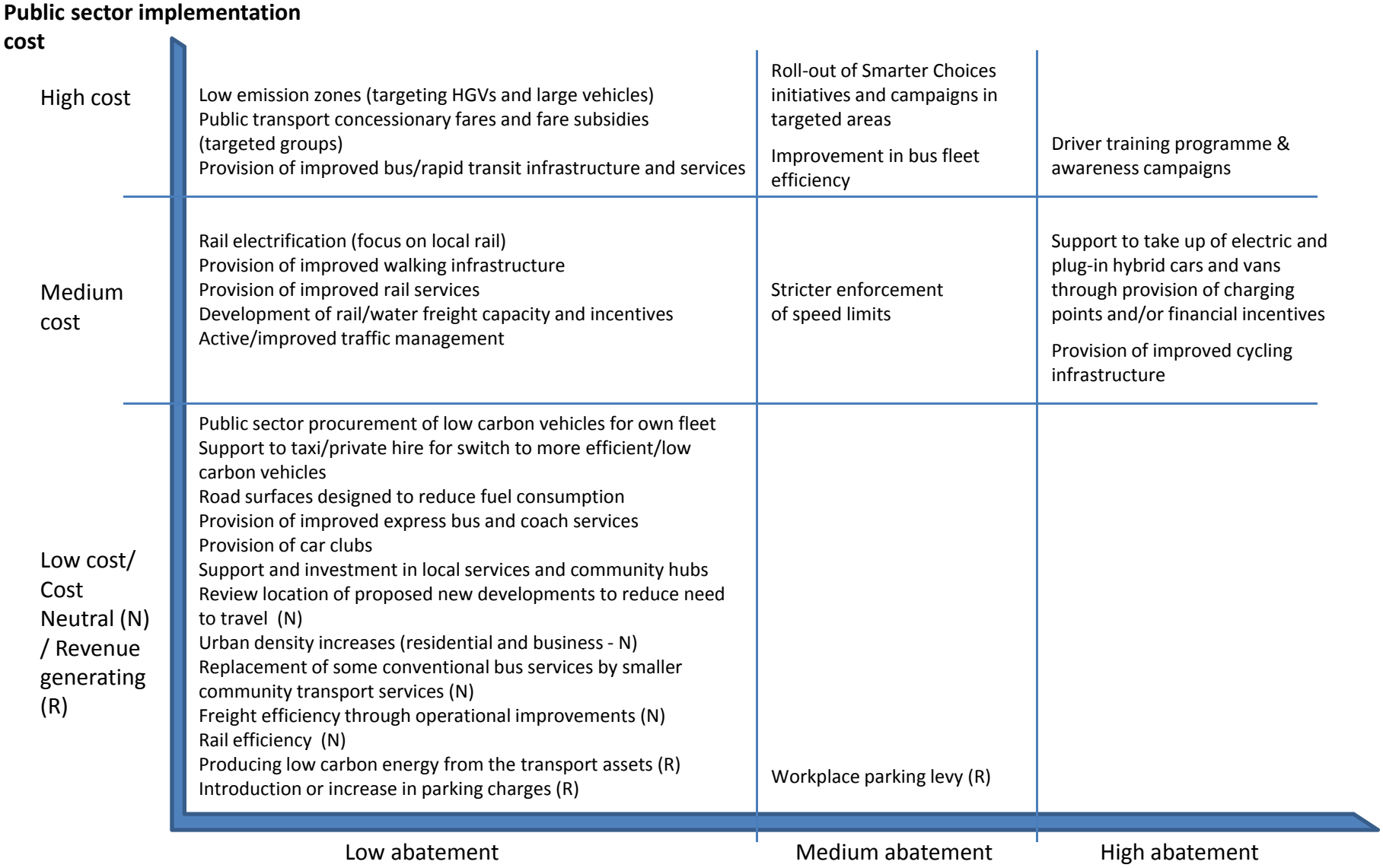
• a comprehensive strategy for rolling out electric cars and plug-in hybrids, including a funded plan for charging infrastructure, and large-scale pilots starting at the end of the first carbon budget period;

• the phased roll-out across the UK of Smarter Choices to encourage better journey planning and more use of public transport; and

• a new strategy to ensure that transport and land-use planning decisions fully reflect the implications for transport emissions.

The CCC also states that enforcing the existing 70mph speed limit will reduce carbon emissions, with further savings possible if the speed limit was reduced to 60mph on motorways.

Carbon emission reduction potential and implementation costs
Performance of potential options



Overview of top scoring carbon emission reduction measures – modelling assumptions

Support to low carbon vehicles
Local authorities and ITAs/PTEs in metropolitan areas support an earlier than average take up of electric and plug-in hybrid vehicles in their area through the provision of charging points (public car parks, support for installation at workplaces, etc) and financial incentives (such as cheaper/free car parking for electric/low emission vehicles and grants) to purchase low carbon vehicles. This could be supported through public sector procurement and incentives for taxis and private hire to invest in low carbon/most efficient vehicles.
Assumed impacts: *the proportion of small, more efficient, cars increases by 25% and the proportion of electric and plug-in hybrids doubles by 2022, when compared to the baseline .*
Note: *this results in an increase in vehicle km and potentially congestion due to the lower cost of driving (rebound effect)*

Stricter enforcement of speed limits
Local authorities and ITAs/PTEs work in partnership with the police to enforce existing speed limits more strictly, possibly through average speed cameras. No blanket reduction in maximum speed limits on main roads is proposed here as this would be the responsibility of central government.
Assumed impacts: *all roads in metropolitan areas with limits between 40 and 70 mph are assumed to be affected, resulting in 80% - 95% compliance*
Note: *possible rerouting and suppression effects are not accounted for here*

Improved cycling infrastructure
Local authorities and ITAs/PTEs deliver significant improvements in cycling infrastructure and facilities potentially supported by lower speed limits and car free zones.
Assumed impacts: *large urban areas achieve 15% mode share for cycling and smaller urban areas double their current cycle mode share by 2022.*
Note: *cycling investment achieves stronger reductions in emissions than walking infrastructure due to the length of trips targeted*

Workplace parking levy (demand management)
Local authorities and ITAs/PTEs implement workplace parking levy schemes in urban areas
Assumed impacts: *70% of commuting trips to large urban areas and 40% of trips to smaller urban areas affected by a £600 annual charge of which an average 75% is passed onto employees equating to nearly £2 per working day.*

Driver training programme (eco-driving)
Local authorities and ITAs/PTEs implement driver training programmes, mainly for car and van drivers, supplementing national campaigns and policies (including driver certificate) to achieve a higher level of training amongst drivers in the metropolitan areas.
This is complemented by awareness programmes.
Assumed impacts: *80% of car drivers and 40% of van drivers are trained in metropolitan areas by 2022 (retrained every 5 years), achieving **1**0% gain in efficiency for conventional cars, 5% for new cars, 2.5% for hybrids and 3% savings for vans*

Improvement in bus fleet efficiency
Improvements in bus fleet efficiency in the metropolitan areas, secured through financial incentives such as BSOG, supported services procurement criteria, Green Bus Fund, Quality Partnerships/Contracts, resulting in higher level of investment in low carbon vehicles. This is supported by the use of biofuels and driver training.
Assumed impacts: *based on 2009 TTR report for **pteg** - high ambition scenarios (3.2 and 3.4) assume a 16.5% vehicle replacement per annum , resulting in a 9% decrease in "life-cycle carbon emissions" in 2011/12 and a 25% decrease in 2015/16 (on 2007/08 levels)*

Roll out of Smarter Choices
Local authorities and ITAs/PTEs implement a comprehensive package of targeted Smarter Choices measures including travel planning, personalised/individualised marketing, car sharing, teleworking, flexible working practices and variable/adjusted opening times, cycle for work schemes, sustainable travel campaigns, public transport, walking and cycling information.
Assumed impacts: *car driver kilometres decrease by 5% for all trips of 50 km or less in/from urban areas.*
Note: *Mode shift to public transport is assumed to take place within current service provision*

Four key themes for transport sector emission reduction in the city regions

Low carbon vehicles have the potential to deliver significant cuts in transport sector emissions, including in the city regions. This is due to the following factors:

- gains in efficiency per unit of fuel/energy input driven by strong efficiency standards adopted by the EU (including for traditional petrol and diesel vehicles in the early years);
- the assumed decarbonisation of the power sector; and
- the assumption that cars, vans, buses and HGVs will still form an important part of our daily lives in the next 40 years, leading to emission savings in all areas if low carbon vehicles become more prevalent.

Users will be incentivised to make **more efficient use of their vehicles**. This assumes that traditional fuel costs (petrol and diesel) will continue to increase in the coming years and therefore provide a strong pricing signal across the UK. Efficiency improvements could potentially be implemented through:

- extensive eco-driving training programmes for all drivers through which drivers are trained again at regular intervals (the benefits of these programmes will reduce in later years when vehicles become more efficient and driver assistance ensure that efficient driving practices are adopted);
- stricter enforcement and possible reduction of speed limits on main roads (where current speed limits are 70 or 60 mph), potentially included in wider active traffic management type schemes, where technology enables most efficient use of available road network capacity;
- improved levels of vehicle occupancy and loading (freight); and
- complementary efficiency measures such as the use of low rolling resistance tyres and, potentially, road surfaces.

Transport emissions can also be significantly reduced through **mode shift**, where users shift **to less carbon intense modes**.

Smarter Choices interventions aiming to encourage further use of existing infrastructure and services score highly when considering carbon emissions in the city regions. This reflects the often well developed public transport network in the urban areas, although some Smarter Choices interventions would probably benefit from further improvements in infrastructure and services for public transport, walking and cycling.

In these areas, cycling infrastructure investment could potentially deliver significant reductions in emissions by addressing the need of a large proportion of trips undertaken daily in the city regions.

Significant reductions in carbon emissions from transport and other sectors will however also require **further behaviour change**, with residents having to reconsider their lifestyles, including their **need to travel and the destination** of their trips.

To support this change in behaviour, pricing signals will play an important role but will need to be supported by the availability of local services, ICT network and the land use planning framework.

Some transport interventions might not deliver as much in terms of carbon emission reduction but could be needed as part of a package approach

The modelling work undertaken for this study shows that some measures which could have been considered as potential strong achievers in terms of carbon emission reduction do not score as highly when modelled for the city regions.

These results have to be taken in the context of the assumptions made to model each measure: Who would they target? How would they impact on behaviours? Results are however consistent with analysis undertaken by the Department for Transport and the Committee on Climate Change.

It is important to note that although, when taken individually, these measures might not result in significant carbon emission reductions, they could be required to support other interventions and form part of a coherent package. They might also be important to deliver other objectives such as improved local air quality, accessibility to services and healthier lifestyles.

Low Emission Zones

- The work assumes that the zones would be implemented on the current London model, mainly targeting HGVs and other large vehicles and resulting in a stronger incentive for HGVs servicing the areas to be upgraded to more recent models.
- This would affect freight emissions for the vehicles accessing the area only, as through traffic is more likely to reroute to avoid the zone. We have assumed that it would be likely to result in more efficient vehicles being purchased as well as in a change in the fleet size mix.
- The impact of such zones could be higher if they were to target all vehicles although issues of rerouting would potentially become significant, resulting in high levels of displaced emissions.

Public transport investment and fares

- The number of people targeted by investment in public transport infrastructure is limited by accessibility to the new facilities/services (without too many interchanges which would make journey time much longer than by car).
- Taking into account existing networks in the city regions, we assumed that investment in public transport would deliver 5% journey time savings on selected corridors and the increase in passenger numbers was calculated using long term elasticities (as a result of the decrease in journey time).
- The possible reduction in fares would be difficult to implement in a targeted manner so that only current car drivers which have access to public transport for their journey would be encouraged to switch and we have therefore assumed that only a portion of those encouraged to use public transport would previously have driven a car for the same trip.

Walking infrastructure

- Our work assumes that this investment would result in strong increases in walking trips in urban areas but the majority of these trips might not have been undertaken by car previously (transfers from public transport and cycle would also take place).
- Walking trips also generally cover relatively short distances which represent a smaller proportion of emissions in the city regions.
- A 10% uplift on estimated abatement was however included to reflect the fact that the car trips saved are all short with engines therefore operating at below average efficiency (cold start).

Some interventions need to be planned carefully if they are to support a package of measures resulting in significant carbon savings

For some potential interventions, the impact on carbon emission would depend on how the intervention is designed and the timescales for emission reduction considered. This is especially true of the following types of interventions.

Public transport investment including Park & Ride

- Public transport investment generally aims to increase public transport use and most investment aims to target current car drivers to encourage mode shift, as well as providing enhanced accessibility for those who do not have access to a car.
- Potential unintended consequences in terms of carbon emissions need to be considered however, including:
  - the risk of attracting new public transport users who are currently walking, cycling or using existing public transport services,
  - the provision of bus priority measures could potentially result in slower traffic flows on these routes for the remaining private vehicle traffic (and higher emissions at least for traditional petrol and diesel vehicles).

Pricing signals including fares and user charges

- Incentives aiming to encourage mode shift, such as lower public transport fares, also need to be considered carefully to avoid attracting people who currently walk or cycle or additional public transport demand which might not result in significant mode shift (the existing concessionary fare scheme for the elderly might provide a good hindsight in the potential for additional demand).
- User charges such as cordon based congestion charging might also need careful consideration to avoid rerouting, potentially resulting in displaced rather than reduced CO_2 emissions.

Smarter Choices interventions

- The Smarter Choices umbrella comprises of a large number of potential interventions aiming to change behaviours. A package approach including a range of Smarter Choices and supporting interventions seems to be the most efficient approach as shown in the Sustainable Travel Towns (evaluation published in 2010).
- The component parts of such a package might however need careful prioritisation if the main objective is to reduce CO_2 emissions. Measures targeting long distance, highly car dependant behaviours (leisure, commuting and business travel) will result in more significant results in carbon terms, than measures targeting less carbon intensive behaviours (for example education trips).

Speed reduction in urban areas (e.g 20mph limits)

- The evidence on the impact of 20mph speed limits on CO_2 emissions is currently inconclusive. Traditional petrol and diesel vehicles are less efficient at lower speeds which means that speed limits reductions could result in higher levels of emissions but this could potentially be compensated by mode shift to lower carbon modes, encouraged by lower speeds.

Land use planning

- Our analysis does not show significant reductions in carbon emissions resulting from changes in land use planning. This is at least partially linked to the timescales for the modelling exercise (up to 2022) as the impacts of land use planning measures are long term.
- The analysis is also limited in its ability to consider changes in destination choices linked to changes in land use planning.

Section 2 – How much can the city regions achieve?

Land based transport emissions are set to decrease in the city regions under a business as usual scenario – but nowhere near as much as required

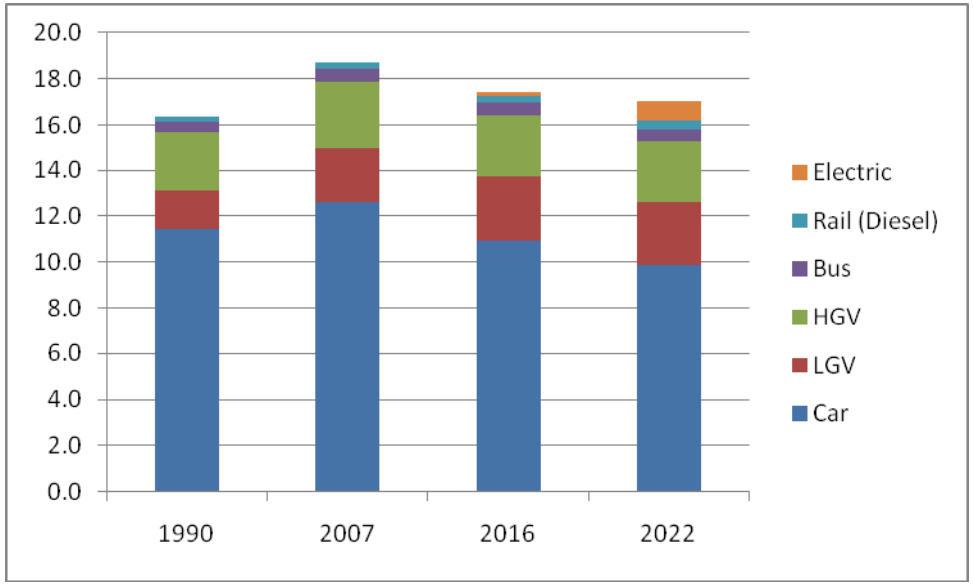
Our business as usual analysis for the metropolitan areas shows that emissions are set to decrease on 2007 levels in the period up to 2022: from 18.7 $MtCO_2$ in 2007 to 18.3 $MtCO_2$ in 2016 and 16.2 $MtCO_2$ in 2022 (tailpipe emissions only).

- This is mainly due to improvements in car efficiency over the period, resulting in reduced emissions from cars (although dampened by the rebound effect linked to the lower cost of driving).
- Emissions from vans (LGVs) are set to increase by approximately 20% over the period 2007-2022.
- Although less significant in absolute terms, emissions from diesel trains are also set to increase (by approximately 30%) due to the provision of additional services.
- Emissions associated with the production of the energy used to power electric vehicles, including trains and trams are traditionally not reported in the transport sector but rather in the power sector. Additional tailpipe emissions transferred to the power sector can however be estimated at 5% of total land based transport emissions in the city regions by 2022 (on the basis of the current carbon intensity of UK energy).

This analysis shows the importance of tackling emissions from cars, which still represent the largest contributor to land based transport emissions in the city regions in 2022 (over 60% of CO_2 emissions).

It also highlights the lack of progress in terms of overall emissions from HGVs, buses and diesel rail in the city regions under a business as usual scenario and identifies the **growing contribution to emissions made by the van fleet**.

Business as usual land transport emissions in metropolitan areas ($MtCO_2$ per annum)



What is business as usual?
Our business as usual trajectory takes measures included in the DfT's Carbon Reduction Strategy (CRS) baseline into account and is based on national data on road and rail traffic now and in the future.
CRS measures considered part of business as usual include: Voluntary Agreements to improve new car efficiency, Renewable Transport Fuel Obligation, existing Smarter Choices and sustainable distribution programmes, increases in fuel duty rates announced up to and including Budget 2009, and some rail efficiency measures.

The city regions can achieve significant reductions in land based transport emissions by implementing a comprehensive package of interventions

In reality, the interventions considered individually above would be implemented as packages of measures, with the mix of interventions devised to ensure that they support each other and manage any potential rebound effect. The packages could also include consideration of wider objectives.

We have therefore modelled the potential impact of a comprehensive package of interventions in the metropolitan areas.

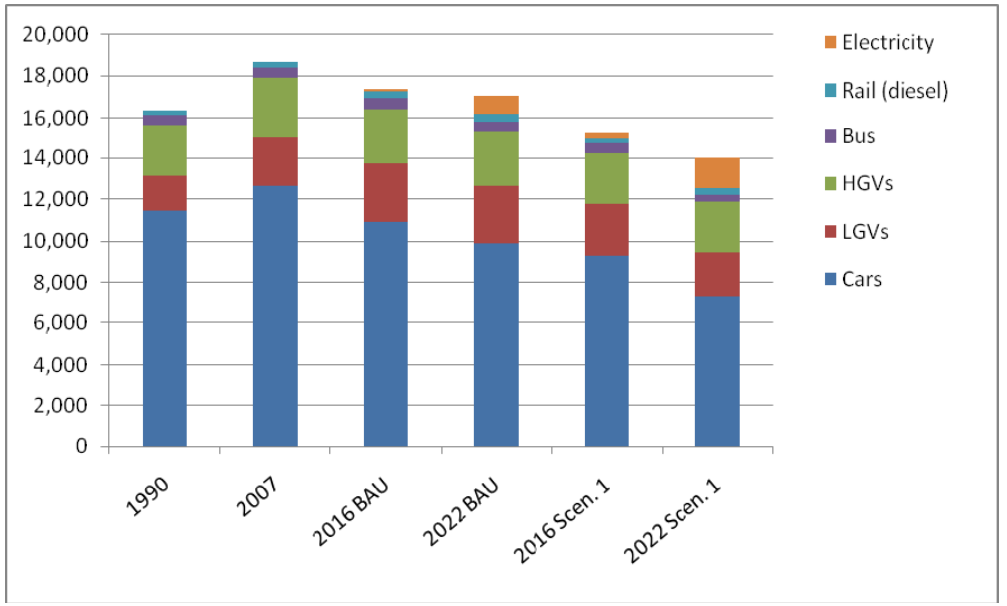
The mix of interventions modelled (Scenario 1) is shown to achieve a 23% reduction in land based tailpipe emissions in 2022, compared to the business as usual scenario for the city regions.

This includes:

- a 26% reduction in car emissions;
- a 20% reduction in LGV emissions, reverting the trend in growing LGV emissions noted under the business as usual scenario;
- a 10% reduction in HGV emissions;
- a 37% reduction in bus emissions; and
- a 20% reduction in diesel rail emissions, also reversing the business as usual trend.

When compared to 1990 levels, the scenario achieves a 24% reduction in tailpipe emissions in 2022.

Scenario 1 - land transport emissions in metropolitan areas ($ktCO_2$ per annum)



What is Scenario 1?
Scenario 1 includes all the measures listed in the "carbon emission reduction potential and implementation costs" table above. Some of these measures would be implemented by city region partners, through the work of local authorities, ITAs and PTEs and some would require interventions from central government (for examples where measures would need to be implemented on motorways and trunk roads).

City region partners working together have a key role to play to deliver low carbon transport in urban areas

City region partners (local authorities, ITAs and PTEs) can deliver almost 80% of these potential tailpipe emission reductions through interventions which they would be responsible for (modelled separately in Scenario 2).

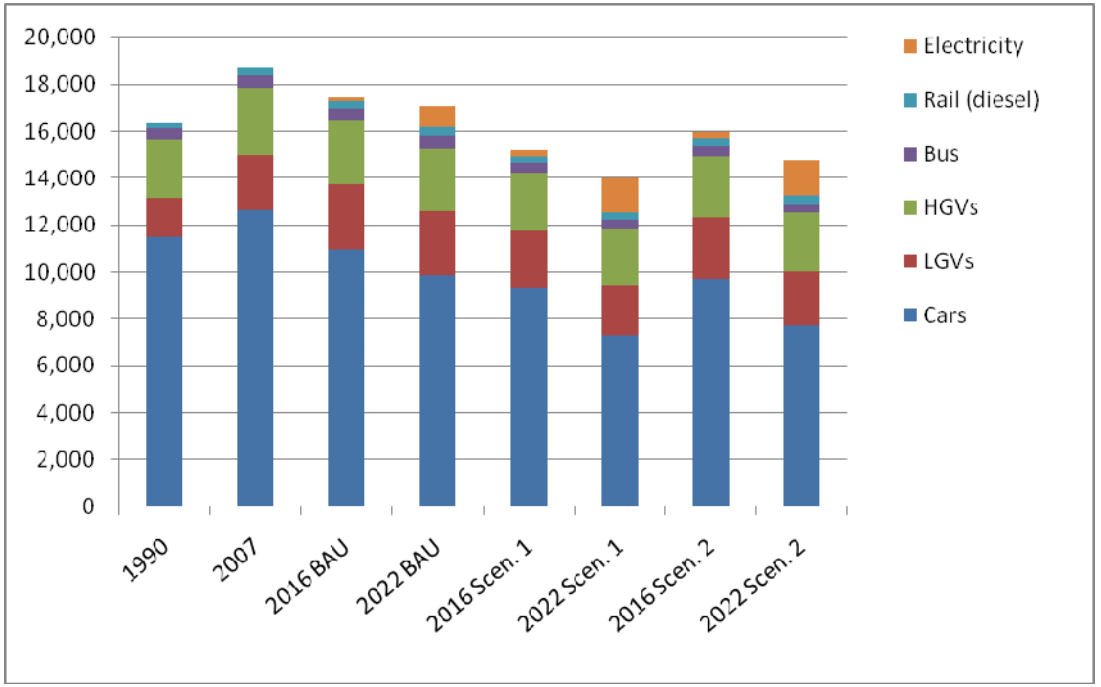
This shows the key role that city region partners (local authorities, ITAs and PTEs) can play in reducing land based transport sector emissions in the city regions.

When compared to the business as usual scenario for the city regions in 2022, Scenario 2 achieves an overall reduction in tailpipe emissions of 18%, including:

- a 22% reduction in car emissions;
- a 16% reduction in LGV emissions;
- a 5% reduction in HGV emissions; and
- a 37% reduction in bus emissions.

When compared to 1990 levels, the reduction in emissions is 19% in 2022 (tailpipe emissions only).

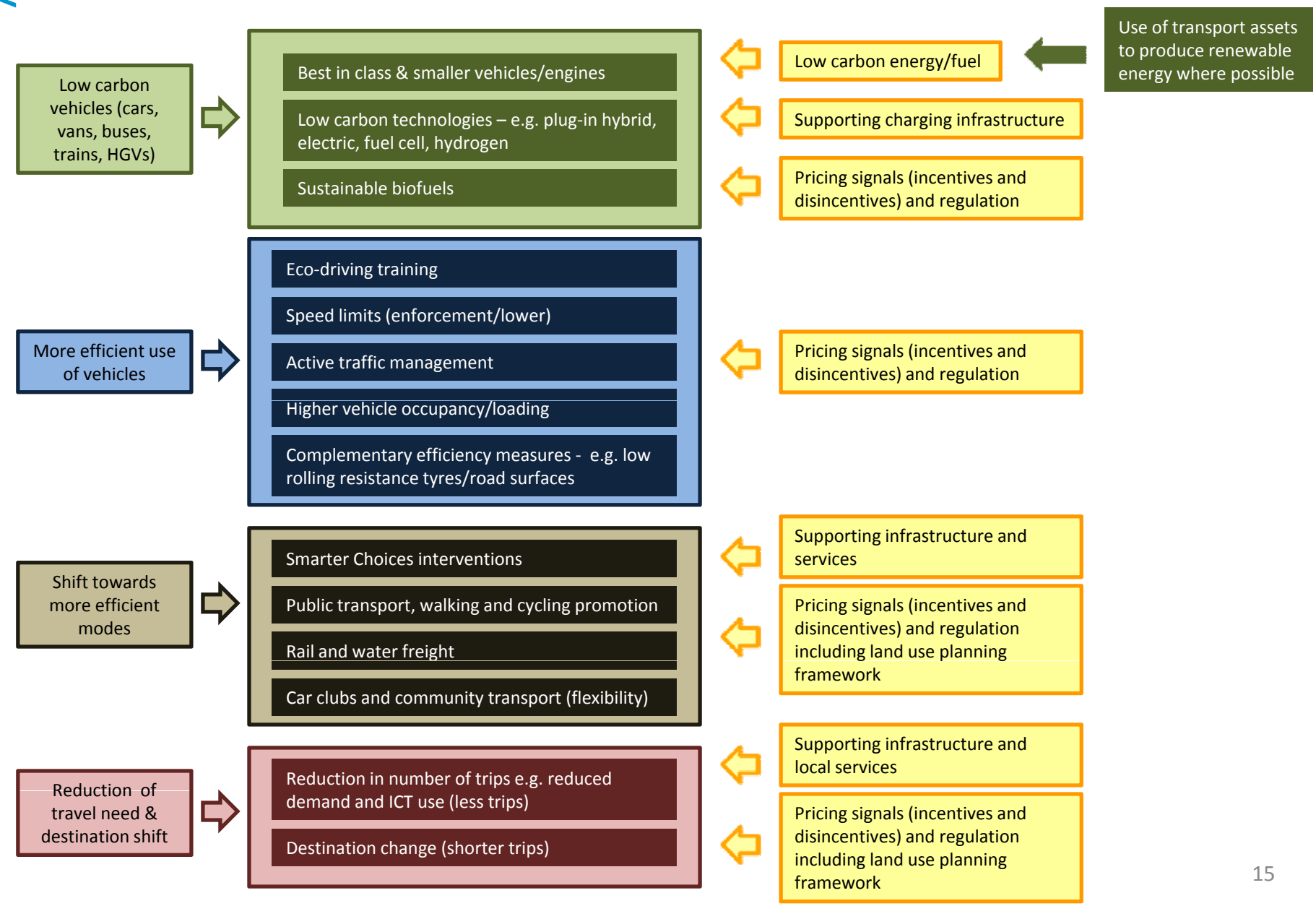
Scenario 2 - land transport emissions in metropolitan areas ($ktCO_2$ per annum)



What is Scenario 2?
Scenario 2 considers the same interventions as Scenario 1 but excludes interventions on motorways and trunk roads and most changes to rail infrastructure and services as these interventions would need to be implemented by the Highways Agency, Network Rail or the DfT.
It therefore focuses on interventions which city region partners are able to implement or influence directly.

Section 3 – How will city regions achieve significant cuts in transport sector emissions?

A low carbon transport framework for the city regions



CO_2 emission reduction requires the implementation of a coherent package of measures

In terms of CO_2 emission reduction, where emission cuts happen or in which sector is less important than ensuring that the overall level of emissions actually reduces, as soon as possible.

Analysis undertaken by the Committee on Climate Change shows that many transport sector interventions are at least as cost effective as interventions in other sectors. This reinforces the argument for action in the transport sector alongside other sectors to progress towards the challenging Climate Change Act targets.

As action is required across sectors, it is important to ensure the coherence of cross sector packages, for example linking renewable energy production with the use of electric vehicles but also energy efficiency at home and within the industry sector. Some cross sector interventions will also reinforce each other's impact and a coherent cross sector policy will bring more certainty for private sector investors.

When considering the transport sector, a **coherent package of measures is required** to address important issues.

- City regions need to **target the least efficient behaviours first**. For example, driver training and Smarter Choices will deliver higher levels of savings when targeting trips made by less efficient vehicles. Although still important, their impact will diminish as vehicles become more efficient.
- **Some measures will reinforce each other** and result in higher levels of emission cuts if implemented as a package. This is true of Smarter Choices and targeted investment in walking, cycling and public transport infrastructure and services for example, as shown recently in the Sustainable Travel Towns.
- **More efficient vehicles will result in lower costs of travel** (unless new taxes are introduced to replace or supplement fuel tax). This could in turn result in an increase in vehicle kilometres (rebound effect) and additional congestion unless **demand management** measures are implemented. Our analysis shows that the low carbon vehicle intervention modelled here could result in an increase of over 4% in car and van kilometres in 2022.
- **Some measures might result in higher levels of emissions if not implemented carefully and supported by complementary measures**. For example, the introduction of bus lanes might result in reduced capacity for remaining vehicles which could lead to higher emissions at least in the short term. This unintended impact will however reduce as take up of hybrid and electric vehicles increases.
- **Some carbon reduction measures could potentially have a negative impact on specific community groups or wider objectives (economy, air quality) and a package approach should help in balancing this**. For example, even with some financial support from the public sector, new hybrid and electric vehicles will remain out of reach for a large part of the population in lower income groups. Driver training to reduce the cost of driving less efficient vehicles and the provision of high quality alternatives should go some way in supporting these groups through the transition to low carbon transport.
- Some measures will be difficult to implement as they require high levels of investment or the implementation of strong pricing signals. **A package approach can help by providing the balance of revenue and investment** (for example where additional revenue from parking or user charges is invested in improved infrastructure and services).

Joint working at the city region level is key to the delivery of significant cuts in emissions

As stated above, when considering CO_2 emission reduction, the aim is to reduce overall emissions and this requires the implementation of a wide ranging package of interventions.

Joint working at the city region level will enable local authorities, ITAs and PTEs to deliver the required interventions and avoid or mitigate key risks.

- The risk of **emission displacement**, where a measure implemented in one part of the city region results in rerouting or a change of destination rather than more efficient behaviours. Only a city region wide approach reflecting actual travel patterns across the area can mitigate this risk.
- **Rebound effects**, where lower travel costs or released capacity on the road network result in more people travelling by car or additional trips. This can only be avoided if partners responsible for different aspects of transport in an area agree on a consistent strategy which includes demand management mechanisms.

- As highlighted in "An analysis of urban transport" published by the Cabinet Office in 2009 , *"part of the challenge for our largest cities outside London is that different bodies are responsible for public transport, spatial planning and the road network. (…) The current approach is often characterised by uncoordinated programmes and agencies working in isolation"*. This needs to be addressed to deliver low carbon transport in the city regions as **the package of measures needed to achieve significant cuts require authorities to make coordinated and consistent use of the range of transport, traffic, street and spatial planning powers available to city region partners**.
- **Many interventions also require revenue (rather than capital) funding** which is generally more difficult to secure for transport interventions within local authorities. This might be addressed at least partially through local authority prioritisation of investment, joint working and budget pooling approaches but could also require local authorities and their partners in the city regions to consider other potential sources of funding, including parking charges, workplace parking levy or road user charging/tolling schemes.
- It is anticipated that **central government will encourage local areas to come forward with proposals for ambitious carbon emission reduction strategies**, whether focused on a specific sector (Green Bus Fund for example) or open to cross sector initiatives (Green Investment Bank). City region partners working together will be able to submit ambitious proposals and ensure that challenging targets are delivered.

Transport should be part of the low carbon city region package

Transport sector activities can contribute to reductions in emissions from the energy sector.

Some transport infrastructure, existing or in development, could be suitable to support renewable energy generation.

- Some Park & Ride sites already include small scale wind power generation, often as required through the planning process in the local area.
- It is however possible to envisage Park & Ride sites being used to contribute more significantly to renewable energy generation by installing medium scale wind turbines if the location is suitable. For example, a 500kW wind turbine would typically generate from 800 to 1000 MWh per annum (dependant on the site, turbine location, tower height and local wind conditions).
- One 500kW wind turbine would produce enough energy per annum to run approximately 400 Nissan Leaf electric cars or provide electricity for around 230 typical UK households.

Electric vehicles could also help improve electricity grid management.

- Electric vehicle users could be encouraged to charge their vehicles in the off-peak period when there is spare capacity (through Smart Grid technology and smart-metering).
- Vehicle to grid technology (V2G) is also being considered, where the electric grid would be able to tap into power stored in the batteries of hybrid and electric vehicles to balance fluctuations in demand and supply.

Transport interventions, especially when targeting behaviour change, can be delivered as part of an integrated package encouraging low carbon behaviours across all sectors.

- Integrated approaches to emission reduction at the local level are currently being encouraged by Government.
- Some local communities are also developing their own cross-sector carbon reduction programmes, for example through the Transition Towns movement.

Key points to consider for the development of low carbon transport strategies in the city regions

Understanding the baseline and setting targets

- Understanding how various vehicle types and trips contribute to baseline emissions now and in the future is important for the city regions to develop successful mitigation strategies.
- The share of “leisure” trips and the growth in emissions from vans should be considered alongside more traditional targets such as travel to work patterns.
- The city regions also need to keep track of other emissions (air quality) as well as how the aviation and shipping sector can improve their performance.
- Understanding the baseline and business as usual trajectory should allow authorities to set challenging but achievable emission reduction targets for transport.

Investing to deliver low carbon city regions

- This analysis shows how packages of interventions could achieve significant reductions in land based transport sector emissions in the city regions. If the city region partners are to deliver these savings they will need to prioritise investment towards those measures which deliver the highest emission savings.
- This might require difficult decisions as interventions required for CO_2 reduction might conflict with other city region objectives. Investment in lower achieving initiatives might also need to be reduced.
- To decide on the best strategies for investment, city regions will need to be able to assess the impact of proposed measures and packages on emissions in their area.
- This can be done with the support of (transport) models but often requires additional analysis and the use of assumptions which are not currently consistent between local authorities and city regions in the UK.
- The DfT is considering how this could be improved but if no support is provided by Central Government , city region partners might need to agree a common approach across metropolitan areas.

Delivering low carbon transport in the city regions

- The significant reductions in emissions identified through scenario modelling will only be delivered through strong partnership working across the city regions.
- Such a partnership approach will also enable city regions to develop coordinated approaches to monitoring transport emissions across their area, supplementing NI 186 data.
- This bottom up approach should also enable improved monitoring of the impacts of local initiatives on local emissions through the development of more locally sensitive data sets.

Action is required now and city region partners are able to make a start on the implementation of many of the interventions considered as soon as 2010/11, for example through LTP3. Some interventions will require a longer lead time due to funding or statutory processes or need to tie in with rail or land use planning timescales but work should still start on these interventions as soon as possible.

Next steps for the city regions – First, do no harm, then take action!

First do no harm – The first step for the city regions is to ensure that partners understand transport sector emissions in their area and ensure that current and planned investment and policies do not result in increases in emissions.

Taking action	What can city regions influence?	What can city regions do now?
Low carbon vehicles (cars, vans, buses, trains, HGVs)	- Choice of vehicles and fuels in PTE and local authority fleets and grey fleet (staff vehicles) - Choice of vehicles and fuels by local organisations - Incentives to chose low carbon vehicles (all users) - Availability of infrastructure (charging) - Production of renewable energy/fuels	- Review own vehicle procurement and corporate strategies (including business travel and use of private cars by staff) - Work with local organisations through travel planning as well as other initiatives (e.g. Carbon Trust/Energy Saving Trust), including taxis and bus/rail operators - Prioritise investment (potentially making use of new funding mechanisms) and use the land use planning framework to deliver infrastructure and incentives
More efficient use of vehicles	- Driver behaviour for ITA/PTE and local authority staff - Driver behaviour in local area -Speed limits and traffic management on local road network - Road resurfacing programme for local roads	- Invest in driver training programmes (internal and in local area) - Improve enforcement of existing speed limits and use ITS capabilities to reduce CO_2 emissions (also considering local air quality) - Promotion of efficient behaviours (occupancy, loading, complementary measures) - Investigate potential for CO_2 savings through road resurfacing
Shift towards more efficient modes	- Mode choice by staff in PTEs and local authorities - Mode choice by residents and employees/visitors in local community - Availability and quality of infrastructure and services (public transport, walking and cycling) - Cost of travel by different modes (fares and user charges as well as journey time through road space allocation/priority)	- Prioritise investment in Smarter Choices programmes (designed to reduce CO_2 emissions) for own organisation as well as local community - Prioritise investment (potentially making use of new funding mechanisms) and use the land use planning framework to deliver low carbon modes infrastructure - Implement clear pricing signals (fares, road space reallocation, car parking availability and charges, workplace parking levy or equivalent demand management mechanism), reinvesting revenue into improved low carbon services and infrastructure - Use the land use planning framework to deliver infrastructure and incentives
Reduction of travel need & destination shift	- Location of new developments (all uses) - Availability (and sometimes quality) of opportunities available in local communities (employment, services, education, etc)	- Use the land use planning framework to reduce the need to travel and provide local opportunities - Prioritise investment into/support local services (for example through business rates)

Section 4 – Action is needed now

There is a strong imperative to reduce greenhouse gas emissions and fossil fuel consumption

Climate change will affect the city regions.

- This includes risks of significant changes in temperatures and precipitations, sudden shifts in weather patterns, rising sea levels, flooding events and decreases in water availability in some areas.
- In urban areas, higher temperatures will potentially enhance the urban heat island effect, raising temperatures in the cities even further in the summer.

The city regions also face significant energy challenges.

- The International Energy Agency predicts that, by 2030, global primary energy demand will be 40% higher than in 2007.
- The Agency estimates that *"the world's energy resources are adequate to meet the projected increase through to 2030 and well beyond"* but recognises that this will only be achieved at a high cost for the environment and will have significant impacts on energy security and economic development.
- The availability of sufficient energy resources is however disputed, with some experts warning that global oil production has already peaked or will peak before 2020.
- The UK Industry Task-Force on Peak Oil and Energy Security warns that oil shortages, insecurity of supply and price volatility will destabilise economic, political and social activity within five years and argues that the UK should not be caught out by the oil crunch in the same way it was with the credit crunch.

Significant reductions in greenhouse gases emissions and fossil fuel use are required to limit these risks

- An international consensus emerged from the United Nations Conference of Parties in Copenhagen, in December 2009, that global temperature rises should be limited in average to a maximum of 2°C. This will require very significant cuts in emissions across the world .

The UK has already adopted a legally binding target of an 80% cut in greenhouse gas emissions by 2050 (on 1990 levels).

- The 2008 Climate Change Act aims to set the UK on track to meet international and EU commitments. It introduces a carbon budgeting system which caps emissions over five-year periods, with three budgets set at a time. The first three budgets are set to achieve a 34% cut in greenhouse gases emissions by 2022.

The UK Low Carbon Transition Plan published in July 2009 sets out how the UK will meet this interim target.

- The Plan is supported by sector specific strategies including the UK Low Carbon Industrial Strategy, the Renewable Energy Strategy and the Carbon Reduction Strategy for Transport.

The Coalition Government has expressed its commitment to carbon emission reduction in its Programme for Government , proposing to *"implement a full programme of measures to fulfil (…) ambitions for a low carbon and eco-friendly economy"*.

The UK Government is setting out plans to reduce greenhouse gases emissions across sectors and local authorities in the city regions are responding to the challenge

The Energy Act 2008 and Renewable Energy Strategy 2009 set out the framework to enable **a shift to more sustainable energy**, with the headline target of 15% of energy to come from renewable sources by 2020, which represents an almost seven fold increase over a decade.

Policies to improve **energy efficiency in the building sector** include:

- Energy Certificates, grading the energy performance of buildings;
- Building Regulations Part L which set maximum CO_2 emissions for construction and renovation activities;
- The Code for Sustainable Homes for new residential buildings and BREEAM for non-residential buildings;
- The Climate Change Levy and Agreements and the Carbon Reduction Commitment (CRC) Energy Efficiency Scheme

The Carbon Reduction Strategy for Transport presents three main strands of action to:

- support a shift to new technologies and fuels;
- promote lower carbon choices; and
- make use of market mechanisms to encourage a shift to lower carbon transport.

Although these plans are subject to review following the May 2010 General Elections, the Coalition Government has identified carbon emission reduction as a key priority.

Local authorities in the city regions are committed to reducing greenhouse gas emissions, as shown through local area agreements, the development of climate change action plans and strategies and the adoption of the Nottingham Declaration and the European Covenant of Mayors.

OVERVIEW - Greenhouse gas trading mechanisms

Offsetting mechanisms allow emitters to pay another organisation to make an equivalent saving on emissions somewhere else.

Cap and trade schemes , such as the Carbon Reduction Commitment (CRC) Energy Efficiency Scheme, establish a capped overall amount of emissions, which is reduced over time. Organisations which are part of the scheme need to reduce their emissions or buy credits from other participating organisations if they plan to emit more. Participants who are successful in reducing their emissions can sell their allowances on the carbon market created by the scheme.

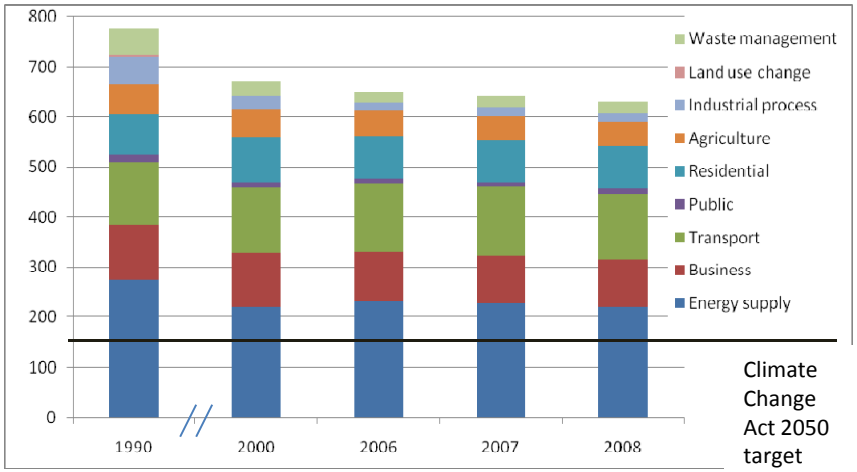
International trading mechanisms are offsetting schemes which include the Clean Development Mechanism (CDM), which allows developed countries to offset their emissions by supporting emission reduction projects in developing countries and the Joint Implementation scheme where developed countries can buy credits for emission saving investment in other developed countries.

The EU Emission Trading Scheme (ETS) is a mandatory cap and trade scheme which started in 2005. It covers industry sectors with high emission levels such as electricity generation, iron and steel production, cement manufacturers and pulp and paper processing plants. In the UK, this represents about 40% of all greenhouse gases emissions. The ETS will also include the aviation sector from 2012.

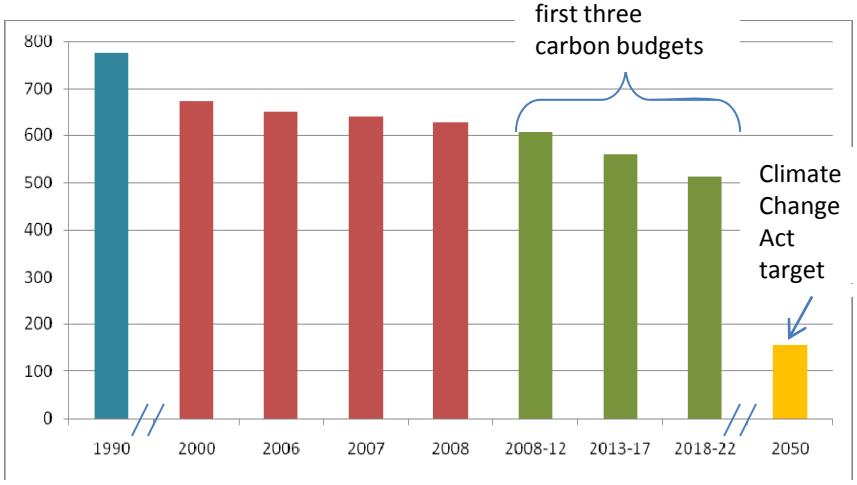
Greenhouse gases emission reduction targets require transport sector cuts

Reduction targets are very challenging

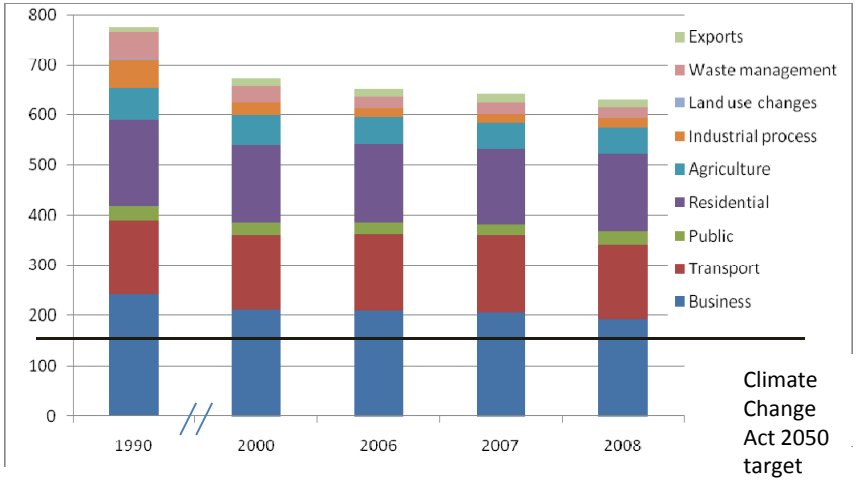
- The Climate Change Act 80% reduction target for 2050 means achieving a reduction from 776.2 $MtCO_2e$ emitted in 1990 to 155.24 $MtCO_2e$ in 2050.
- In 2008, the largest contributor by source was the energy sector (219.7 $MtCO_2e$ in 2008), followed by the transport sector (131.9 $MtCO_2e$ by source and 149.9 $MtCO_2e$ when emissions were considered by end user). This is the equivalent of 85% of the 2050 target for the UK (97% by end user sector).
- The decarbonisation of the power sector is key to achieving emissions reduction targets but very significant savings will be required across all sectors.



UK GHG emissions by source ($MtCO_2e$, source: DECC)



UK GHG emissions and carbon budgets ($MtCO_2e$, source: DECC)



UK GHG emissions by end user ($MtCO_2e$, source: DECC)

Transport contributes a quarter of UK domestic CO_2 emissions and transport sector emissions have grown in recent years

Domestic transport sector CO_2 emissions increased by 12.5% between 1990 and 2007, while overall UK domestic CO_2 emissions decreased by 8.5%.

- Road transport contributed 92.5% of all domestic transport CO_2 emissions in the UK in 2007 and emissions from road transport increased by 11% between 1990 and 2007. Vehicle efficiency improvements were not able to compensate for the increase in kilometres travelled.
- Other notable increases in emissions from the transport sector over the 1990-2007 period include:
  - 32% increase in railway sector CO_2 emissions (diesel trains only);
  - 20% increase in domestic shipping CO_2 emissions; and
  - 72% increase in domestic aviation CO_2 emissions.
- International aviation and shipping are excluded from these domestic emissions estimates. If included, emissions from domestic and international aviation would make up 6.3% of the UK total CO_2 emissions, and emissions from domestic and international shipping would represent 2% of the UK total CO_2 emissions.

The way we live and travel has significant impacts on transport sector emissions.

- The majority of trips undertaken are linked to shopping (20 to 22% of trips), visiting friends (16 to 18%) and commuting (15 to 16%).
- Car travel dominates with approximately 80% of miles travelled by car in the UK and almost ¾ of commuters getting to work by car in the city regions.
- The majority of trips undertaken in the UK are under 5 miles (66%), with 19% of trips being less than 1 mile but the majority of trips is undertaken by car, including over 50% of trips between one and two miles.
- The proportion of people driving to work is lower in the metropolitan areas when compared to the rest of their regions, as metropolitan areas have a higher proportion of commuters using buses and trains to travel to work (between 12 and 16% against 10 to 12% across the regions).
- The proportion of people cycling and walking to work is however generally lower in metropolitan areas (with the exception of South Yorkshire).
- Car ownership is still growing. The number of households with more than one car has significantly increased between 1996 and 2006, whereas the number of households with no car has significantly reduced.
- GB households spent £50/week in average on private transport in 2007 and only £5/week on bus and rail fares. When adjusted for inflation, motoring costs have declined by 10% between 2000 and 2007.
- Freight vehicles and light vans contribute 15% of urban traffic.
- The number of light vans in Great Britain has increased significantly over the 1998-2008 period, from 2.3 million to 3.2 million. Light vans represented 9.5% of all licensed motor vehicles in Great Britain in 2008 and accounted for approximately half of urban traffic growth between 1997 and 2008.

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Carbon Pathways for transport in the city regions

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