



STEPPING OFF THE GAS

*Achieving low carbon and sustainable
transport systems in Yorkshire and Humber*

**YORKSHIRE
AND
HUMBER
ASSEMBLY**

The Regional Strategic Partnership



Foreword

The Yorkshire and Humber Assembly plays an important role in helping deliver sustainable development for the region, through its role in dealing with issues such as housing, transport and spatial planning.

The transport sector is a major source of climate change emissions and it is vital that the region investigates and delivers ways of moving towards a low carbon transport system.

Research commissioned by the Assembly in 2007 showed the region is not on course to deliver existing targets on reductions to greenhouse gas emissions (particularly CO₂). The research also modelled some of the changes in transport behaviour that are indicative of the scale of change likely to be required to deliver significant CO₂ reductions. However, it was considered that a more detailed investigation into what could be achieved by interventions in transport was required.

This study, commissioned by the Sustainable Development and Regional Transport Boards, examines and evaluates measures to reduce CO₂ emissions from transport. It concentrates on what can be practically delivered through transport focused interventions by organisations within the region.

This Executive Summary highlights the study's key findings - findings not just relevant to Yorkshire and Humber but to other regions and other organisations responsible for transport policy and interventions.

'The transport sector is a major source of climate change emissions and it is vital that the region investigates and delivers ways of moving towards a low carbon transport system'



Cllr Arthur Barker

Chair of the Sustainable Development Board



Cllr Mark Kirk

Chair of the Regional Transport Board

Executive Summary

Research conclusion and implications

This research sought to identify **practical, deliverable measures within the scope of regional transport policy** that would be required to deliver a reduction in the levels of carbon dioxide emissions from the transport sector by a sufficient amount to meet the Stabilising Carbon Trends scenario identified within a previous study commissioned by the Yorkshire and Humber Assembly in 2007, 'Evaluating the contribution that key regional strategies make towards addressing climate change'. This was undertaken by modelling the carbon impact **of a far reaching programme of transport investment and interventions in the period from 2011 to 2020, way beyond the scale of current practice in the region.**

The research suggests that **even with significant large scale implementation of an uncompromising suite of current practical transport policy approaches to delivering low carbon transport in the Yorkshire and Humber region, this aim is unlikely to be achieved.**

Headline conclusions are that:

- The far reaching programme of modelled interventions, implemented on an unprecedented scale, representing a real step change, does not reduce carbon emissions from transport in line with the theoretical levels of reduction required to deliver transport's share of carbon reduction targets within the region
 - Much greater action still is required to make a real difference, and certainly to deliver transport's share of carbon reduction across the region
 - The programmes of transport interventions modelled, with accelerated implementation, do change the direction of travel of carbon emissions from land transport sources, and flatten out the growth in emissions from the Yorkshire and Humber region, demonstrating that transport can and does have a significant role in delivering a low carbon future for the region, and that with concerted action, the region can make a difference
 - Each individual transport intervention modelled has a broadly similar impact, and no one measure or intervention provides the answer to reducing carbon emissions from transport on its own - it is the sum of a combination of measures that makes a difference
- The transport measures modelled, regardless of the scale of change required, are unlikely to be deliverable within the current regional funding and resource context, emphasising the need at both national and regional level for a step change in delivery of transport measures that reduce carbon emissions
 - Without this step change in delivery through transport, other sectors may therefore be required to deliver greater shares of the required carbon reduction, faster
 - The policies modelled within the research accord with wider regional policies to deliver the RSS and RES and complement policies to support social and economic indicators. However, recognition needs to be made that education and reinforcement of the benefits of such measures will be needed with regard to public acceptability of such measures, at least in the short term
 - These wider implications must include consideration of locking in the benefits of reducing transport's impact on carbon, to guard against the rebound effect
 - Whilst the influence of the region and regional transport policy makers is significant for measures that influence land transport, the effect of transport that lies broadly outside the direct influence of regional policy, such as



aviation, must be considered, and approaches to influencing such policies developed

- Finally, and most immediately, this research should be used to raise awareness amongst professionals and decision makers of the scale of the challenge facing the region in terms of carbon emissions from transport.

The research

JMP Consultants Ltd and the Stockholm Environment Institute (SEI) York Centre at the University of York were commissioned by the Yorkshire and Humber Assembly to provide, examine and evaluate what measures would be needed to achieve a reduction in carbon dioxide emissions from transport in the Yorkshire and Humber region to meet regional targets. This level of reduction in carbon dioxide was initially outlined in the Yorkshire and Humber Assembly report *Evaluating the contribution that key regional strategies make towards addressing climate change* in what is known as the *Stabilising Carbon Trends (SCT) Scenario*.

This work has been undertaken by examining the changes in patterns of travel behaviour that can be achieved through the implementation of best practice transport interventions, and modelling the carbon impact of such changes in behaviour using the REAP (Resource and Energy Analysis Programme) model. The commission has focused on assembling a number of scenarios of practical, deliverable measures within the scope of regional transport policy that will deliver a reduction in the emissions of carbon dioxide from transport across the region. Crucial to an understanding of the level of change required within transport policy in the region to achieve low carbon transport systems is the scale and uncompromising nature of the suite of transport interventions modelled.

Climate Change in Yorkshire and the Humber

Climate Change is considered to be one of the greatest challenges that the world faces today.

The Intergovernmental Panel on Climate Change predict an increase in global temperatures of 1.8 - 4°C (3.2 - 7.2°F) by the end of the century. These temperature rises will affect the climate system and lead to an increase in the frequency and intensity of extreme weather as well as sea level rise, which is expected to have adverse effects on natural and human systems.

The recent United Nations Climate Change Conference in Bali in December 2007 highlighted the need for global action on climate change. This is encapsulated in the concluding remarks of the President of the Conference, His Excellency Mr. Rachmat Witoelar, in his closing address. Mr Witoelar noted that “the road from Bali to Poznan and Copenhagen must be paved not with good intentions but concrete actions and rigorous implementation”

This need for action at a global level, across all sectors, points the way for regions such as Yorkshire and Humber, to tackle specific issues, in this case transport, now, and with purpose.

An assessment of how climate change will affect the Yorkshire and Humber region, based on UK Climate Impacts Programme (UKCIP) future climate scenarios, suggests that the region will be 1°C to 2.3 °C warmer by the 2050s and 1.6°C to 3.9°C warmer by the 2080s. Changes in future climate will interact with future social and economic changes and other factors to shape the Yorkshire and Humber region over the next 50 years. The potential

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impacts of climate are likely to be a range of positive and negative impacts on flood risk, water resources, agriculture, forestry, the service sector, industry and commerce and transport.

A challenge for regional policy makers is to deliver a consistent and co-ordinated approach which not only addresses climate change now but one which yields results in the long term. A previous study commissioned by the Yorkshire and Humber Assembly in 2007, *Evaluating the contribution that key regional strategies make towards addressing climate change*, evaluated the impact of current regional strategies in tackling both production related GHG emissions (i.e. production and delivery of goods and services consumed in and outside the region) and consumption related GHG emissions associated with goods and services consumed in the region (including goods imported to the region). It evaluated the approaches that current regional strategies take towards the need to adapt to a changing climate.

Within the context of current regional strategies, consumption related emissions from housing, transport and food are set to continue increase up to 2021. To achieve the 80 per cent reduction in current emissions by 2050, significant reductions are required in each of the housing, transport and food sectors. In terms of the transport sector, effective measures include increasing vehicle occupancy rates, reducing GHG emissions from vehicles through technological advances, reducing the distance travelled per person, and achieving modal shift by transferring passengers from private car to public transport.

The importance of the transport sector identified in this earlier report, has led the Yorkshire and Humber Assembly wishing to understand the practical measures that can be taken in terms of regional transport policy that might help to reduce the level of carbon dioxide emissions resulting from the sector.

Modelling low carbon transport

This research and modelling undertaken by JMP and SEI seeks to identify practical, achievable transport policy interventions that can help deliver the SCT Scenario for transport, or at the very least close the diverging gap between the current rising levels of carbon emissions from transport, and a future scenario that stabilises carbon

emissions to a level that delivers regional and national target reductions in carbon emissions.

Having established the scale of the challenge for the transport sector within the region, the research and modelling undertaken within this commission has focused on assembling two packages of practical, deliverable measures within the scope of regional transport policy that will deliver a reduction in the emissions of carbon dioxide from transport across the region. In simplistic terms, this has been undertaken through the researching of best practice examples of the scale of change that can be delivered through transport policy interventions, as defined through the change of distance travelled by mode and the change in occupancy levels that can be achieved through particular measures. This data is then used to model the carbon impact of the interventions using the Resources and Energy Analysis Programme (REAP).

REAP is a software tool developed by SEI, and can be used for the assessment, development and appraisal of the implementation of policy as well as a tool to formulate strategies for local, regional and national government. As this research is looking at the impact which can be achieved through regional and local transport and land use policies, the inputs for vehicle efficiency and car ownership (which are outside the scope of regional and local policy), have been projected using the national average figures. For example, technological improvements in isolation, assuming the national average trend, result in a 14% reduction in carbon dioxide emissions from 2001 to 2020.

The two remaining variables crucial to transport's carbon impact, occupancy and distance travelled by mode, were the key inputs to REAP examined as part of this research. Distance travelled by mode is measured in annual person kilometres (PKM), namely the average number of kilometres travelled per person per year by mode. This is a function of average trip length, number of trips and population. Occupancy in REAP is a function of trips and capacity.

This ability to examine the impact on carbon emissions of variations in the distance travelled by mode and vehicle occupancy allows the modelling of the effect of interventions designed to reduce travel distance, shift mode of travel away from the private car, and increase vehicle occupancy levels. In this way, the identification of practical, deliverable measures within the scope of regional transport

policy to deliver a reduction in the emissions of carbon dioxide from transport across the region can be achieved.

Practical transport measures

A crucial element of the modelling process, and therefore of the interpretation of the results of this study, is the identification of practical transport interventions that are available to the Yorkshire and Humber region. The evidence used within the modelling has focused on measures that have a proven record within a context broadly similar to the Yorkshire and Humber region, that is to say, can be delivered within the UK or similar contexts. For this reason many best practice examples from outside the UK of delivering behavioural change through reducing distances travelled and promoting mode shift from the car have not been used unless a suitable UK source was not readily available to derive inputs to the modelling, as the effects in the UK context may be different.

The transport policy interventions, and their impact on carbon emissions from transport, are crucial to understanding the scale of the challenge in delivering low carbon transport systems in the future. In this sense, the transport interventions modelled conform to the stated aim of the study, namely to identify practical, deliverable measures within the scope of regional transport policy that will deliver a reduction in the emissions of carbon dioxide from transport across the region. The interventions are practical and deliverable in the sense that they are based on empirical evidence from best practice examples.

However, the scale of delivery of such measures that has been assumed within the modelling far exceeds the levels of delivery of such measures in Yorkshire and the Humber to date. No limits have been placed within the modelling on the availability of the levels of resources or funding required for delivering this unified programme of transport investment across the region. The scale of investment and change modelled is therefore unprecedented. Nor have the interventions modelled been subject to adjustment to account for political or public acceptability.

The modelling undertaken does account for practicality in terms of where, spatially, measures are likely to be delivered. The proportion of the population likely to be affected by a particular measure in each district within Yorkshire and Humber has been identified. This forms a fundamental

element of the modelling. Account has been taken of the different character of urban and rural areas.

Transport measures identified include the introduction or extension of bus rapid transit systems, light rail networks, rail electrification, public transport smartcards, workplace and school travel plans, home working and teleworking, travel awareness and education, personalised journey planning, grocery home shopping, car clubs and car sharing networks, high occupancy vehicle lanes, mileage based and urban congestion charging systems, car free zones and approaches to car free housing development.

Modelled scenarios

Two future scenarios were developed and modelled to demonstrate the impact of the practical transport interventions on carbon emissions, together with a *Business as Usual scenario* to represent the current “direction of travel” based on existing regional transport policy and investments.

Both the *Step Change scenario* and the *Accelerated scenario* have been developed by identifying a package of transport investments and interventions that would deliver a change in transport behaviour that will positively influence distance travelled by each mode and vehicle occupancy levels. That is to say, the scenarios include suites of interventions that aim to reduce the need to travel, reduce the distance travelled by private car, promote modal shift to more sustainable modes, and increase vehicle occupancy levels. Both can be regarded as a significant step change in the scale of transport investment and delivery over the period 2011 to 2021. The *Step Change scenario* adopts a phased approach to implementing transport measures. The *Accelerated scenario* includes a more rapid introduction of transport interventions.

This is crucial to understanding the outputs of the modelling. Both the *Step Change scenario* and the *Accelerated scenario*, whilst identifying transport interventions that are practical, deliverable and have the potential to deliver changed behaviour, include combinations of intervention that goes way beyond the scope of current investment levels, or indeed the capability of existing regional and local structures in terms of delivery. Therefore the scenarios are practical in the sense that they are based on empirical evidence from best practice examples, but represent a paradigm shift in the sense that

the scale of parallel delivery of initiatives or levels of resources required across the region in a unified programme of transport investment would be unprecedented.

The graph below shows all three scenarios modelled, together with the *Stabilising Carbon Trends scenario* from the Assembly's earlier 2007 commission. This demonstrates that even under the *Accelerated scenario* CO2 emissions are still higher than the 2001 baseline in 2020, and significantly higher than the *SCT scenario* represented by the pink line. It is important to stress here that the *SCT scenario* was developed based on the levels of carbon reduction required to achieve regional and national targets, and is thus a hypothetical projection of future carbon emissions. The carbon savings levels delivered in this scenario are not based upon any practical assessment of delivery, and therefore appear unrealistic when compared with the scenarios derived from practical transport measures in this commission.

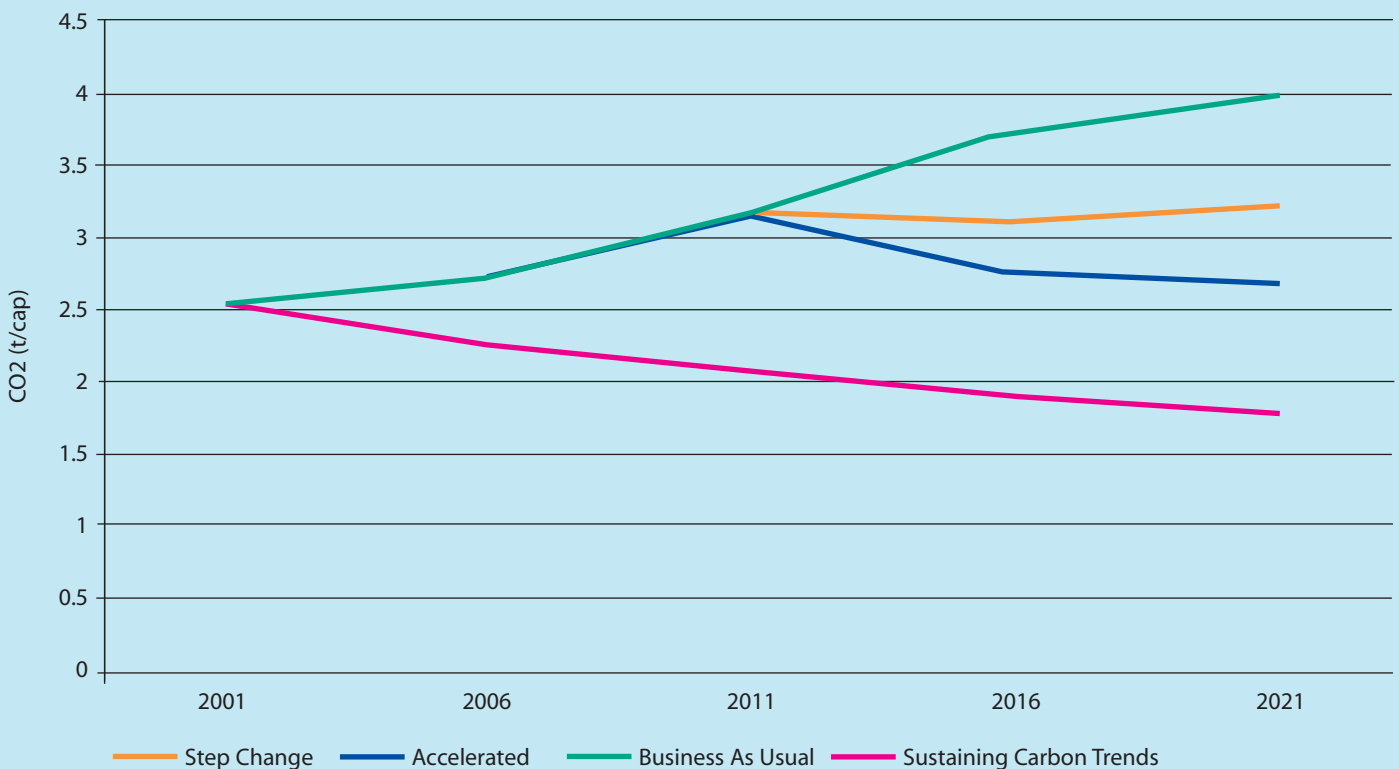
The evidence from this research and the modelled results suggests that the transport sector is consequently unlikely to achieve the levels of carbon emission reduction required to deliver a low carbon future in Yorkshire and Humber. Large scale extension of the implementation of existing transport policies in the region can make a difference, especially when supplemented by the adoption of more far

reaching albeit proven policies, but are unlikely to deliver transport's share of required reductions.

The impact of aviation on the modelled outputs is significant. It is the most challenging element of the transport sector in terms of carbon emissions. Aviation policy and planning is an area in which the influence of the region is limited. As a consequence, none of the interventions modelled in the future scenarios directly affect carbon emissions from aviation. The practical toolkit available to the region is essentially one that tackles land based transport. As a proportion of all transport emissions, aviation emissions over the next 20 years will therefore become an increasingly larger portion. Examining the modelled *Accelerated scenario*, by 2021 this shows CO2 emissions from aviation account for nearly 40 per cent of people's emissions.

Wider implications

Public acceptability of the range of measures used in the modelling of land transport interventions within this research is not at present universal. Nor are some additional measures that may be considered in addition to those modelled, that do not currently feature within the suite of tools available to the region likely to be acceptable to all. Measures such as forms of road user charging, increased



parking charges, higher taxation on travel and fuel, the introduction of personal carbon credits and other measures that help discourage travel are all likely to receive significant opposition in establishing public acceptability.

The suite of measures modelled is unlikely to be deliverable at the present time within current resource levels. This not only reflects the difficulty of achieving consensus over the acceptability of some of the more controversial elements, but also the fact that the resources required to implement the interventions modelled within this research far outstrips that available to the region at the present time. This is both in terms of the funding available, but also in terms of the capacity and human resources available to deliver such a large series of interventions within the timescale modelled.

Whilst there is a need for carbon emission reduction targets from transport to be delivered, this needs to be balanced with the need for transport policy to contribute to the delivery of a wide range of social, economic and environmental objectives across the region. Decision makers across the region need to consider a number of aspects, including public acceptability and the ongoing desire of the population for continuing economic prosperity.

The measures modelled are all likely to fit within and help deliver wider regional economic and social policy, but acceptability may be more of a challenge.

The region may therefore need to look to sectors other than transport, where remediation measures may be easier to implement, both in technical and political terms, to achieve significant carbon emission reductions, especially in the short term.

Finally, in addressing the results of policies that reduce carbon emissions from transport, the region must be wary of the “rebound” effect. Many of the potential carbon savings as a result of transport policies may be lost due to this rebound effect. Where transport policies make travel cheaper, quicker and require less essential travel the result is that individuals actually have more time and money to spend on other things including other non-essential travel. The rebound effect may actually have the consequence of increasing emissions. Therefore ensuring any carbon savings gained from low carbon transport systems are locked in is important.





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