

Revised version submitted to AREA, July 2007

Priorities, policies and (time)scales: the delivery of emissions reductions in the UK transport sector

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Abstract

The transport sector is consistently responsible for around 30% of carbon dioxide emissions in developed countries and is one of few sectors where emissions continue to increase as a result of apparently insatiable demand for road and air travel. This paper examines how the formulation of transport policy fits into the exposition of UK climate policy, focusing on three principal areas of tension: policy priority (congestion and carbon reduction); strategies to reduce emissions (technological and behavioural solutions) and timescale (short- and long-term vision). We suggest that in overcoming such tensions government ministers will need to devolve significant policy formulation and implementation powers to an appropriate scale of governance – in this case the city-region – to fashion a ‘convergence space’ capable of promoting meaningful action with regard to transport’s climate impact.

Keywords: UK, transport policy, climate policy, behaviour change, scale.

Introduction

The contribution of transport activities to climate change is increasingly attracting political attention due to their share of overall greenhouse-gas emissions and their relentlessly strong growth (Chapman 2007). The absolute and relative share of greenhouse gases attributable to transport is expanding in all regions of the world as demand for surface and air travel increases and sectors such as industry and power generation become more energy efficient (International Energy Agency (IEA) 2005; European Conference of Ministers of Transport (ECMT) 2007). Whatever the eventual shape of international approaches to addressing emissions, individual nations are forging ahead with measures to meet domestic greenhouse-gas targets (Bailey and Rupp 2005). To an extent this is true of transport, although to date politicians have shown a general unwillingness to implement strong measures to accelerate the development and uptake of low carbon technology or to manage total travel demand (Anable and Boardman 2005).

This paper develops an overview and critique of how the formulation and delivery of transport policy fits into the exposition of climate policy in the UK, one country whose government has seemingly sought to sidestep these difficult policy decisions (Docherty and Shaw 2003). We firstly set the context for carbon emissions from transport and then examine three key areas of tension in policy formulation and the delivery of carbon reductions. As well as revisiting familiar arguments that carbon reduction strategies for transport should contain a balanced range of measures and that ministers will need to demonstrate greater willingness to take unpopular policy decisions, we draw upon notions of governance scales and ‘convergence space’ (Routledge 2003) to suggest that central government will need to devolve significant policy formulation and implementation powers to city-regions in order to better address transport’s climate impact.

Carbon emissions from the UK transport sector

The share of UK transport-related emissions of CO₂ depends on how emissions are apportioned across sectors and whether international aviation and shipping are included in the figures. The first distinction is between ‘end-user’ or ‘source’ figures where the former include a share of upstream emissions from power stations and refineries reallocated back to the sectors that use the electricity or fuel, and the latter do not. Total UK emissions in both cases were the same (151.7 Million tonnes Carbon (MtC) in 2005, excluding international aviation and shipping) (Department for Environment, Food and Rural Affairs (DEFRA) 2007a) but transport sector figures increase from 35.2 to 41.6MtC (23% to 27%) of total domestic CO₂ once upstream emissions are reallocated. The second distinction is between domestic and international emissions (Table 1). Government targets usually exclude international aviation and shipping, as there is no agreed convention for allocating these emissions to countries. A truer picture of the UK’s emissions would include some element of these: estimations based on fuel used in international bunkers (one way of accounting for international departures) would add 11MtC

to these figures, increasing transport's share to 28% (46.3MtC) as source or 32% (52.7MtC) as end user of an expanded UK carbon footprint.

TABLE 1 HERE

Even without international aviation, transport is the only UK economic sector where emissions have consistently increased year on year and were higher in 2005 than the Kyoto baseline year of 1990. Government projections for CO₂ from transport and its position relative to other sectors are dependent on several assumptions about changes in traffic demand, fuel prices and income growth. They are also crucially dependent on estimates of carbon savings allocated to individual policy instruments in its Climate Change Programme (CCP) (Department of the Environment, Transport and the Regions (DETR) 2000a, DEFRA 2004, 2006a). Together, current transport policies in the CCP are set to save 6.67MtC annually by 2010. Forecasting emissions is, however, highly problematic and the government has regularly revised its projections, usually because previous estimates have proven to be optimistic (Anable and Boardman 2005; Environmental Audit Committee (EAC) 2006): at past progress rates the UK is currently around 12 years behind target for average European new car fuel efficiency, for example (Figure 1). In addition, the CCP package has several potentially serious omissions. Most significantly, the package does not include the two fastest growing sources of emissions from transport, namely from light goods vehicles (vans) and international aviation. A recent review of aviation forecasts revealed that, by 2050, the sector could have 4-10 times its 1990 emissions, resulting in aviation accounting for 27-68% of the government's whole economy emissions target of 65MtC that year (Cairns and Newson 2006).

FIGURE 1 HERE

Even if projected CO₂ savings are realised for domestic transport, without new measures total transport emissions are unlikely to fall below 1990 levels by 2050 (Figure 2). The UK Kyoto commitment, excluding international aviation and shipping, is a 12.5% reduction in greenhouse gases from 1990 levels and the draft Climate Change Bill published in March 2007 proposes statutory targets to reduce CO₂ by 26-32% by 2020 and 60% by 2050 (HM Government 2007). By the government's own admission, it needs to achieve the upper end of savings from all its policies in the recent Energy White Paper, including EU Emissions Trading, to achieve the 2020 targets (Department of Trade and Industry (DTI) 2007a).

FIGURE 2 HERE

Tensions in delivery

Policies to reduce energy use and emissions from transport generally fall into three categories: those promoting technical advances in fuel carbon coefficients and engine efficiency; those targeting modal switch; and those attempting to reduce distance travelled. Achieving greater sustainability in transport requires actions in all three areas, particularly to negate the tendency for efficiency savings to be eroded by increases in distances travelled or the uptake of larger, higher carbon vehicles. But current UK policy relies heavily on the first approach, with less emphasis placed on the other two goals. Furthermore, a number of these technical solutions are largely beyond the jurisdiction of the UK government, for example the voluntary agreements signed between the European Commission and car manufacturers on carbon emissions from new passenger vehicles (ECMT 2007). There also appears to be no long term strategy to identify the combination of strategies required to return road transport emissions to their 1990 level by 2050.

Carbon and congestion

In 1998, the government published *A New Deal for Transport: Better for Everyone*, which set out an ‘integrated’ policy to tackle congestion and pollution (DETR 1998). The document appeared to reflect a ‘new realist’ approach of restricting car use and optimising existing infrastructure use (Goodwin *et al.* 1991) but over the next a couple of years subsequent policy documents abandoned any ambition of traffic reduction and instead prioritised only congestion (Begg and Gray 2004; DETR 2000b; Department for Transport (DfT) 2004; Docherty and Shaw 2003). Even after climate change began to rise up the policy agenda from 2000 onwards and the DfT became a signatory to a joint Public Service Agreement to reduce carbon emissions (HM Treasury 2004), neither the most recent Transport White Paper (DfT 2004) nor the ‘Energy Review’ (DTI 2006) contained explicit commitments to reduce car or freight journeys.

The question nevertheless remains regarding the extent to which congestion reduction goals are compatible with emissions reduction. Whilst higher congestion runs counter to improvements in fuel efficiency, the goal of congestion reduction is not to deter car use but to reduce delays by optimising utilisation of capacity, which may simply encourage the spatial and temporal redistribution of problems rather than their resolution. Thus the implication is that government believes traffic can grow whilst still achieving emissions goals, but for this to be achieved would require reductions in carbon intensity which history suggests are improbable (Banister and Stead 2002, European Environment Agency (EEA) 2006). Although improvements in engine technology have stabilised emissions from passenger vehicles in the UK despite traffic increases (DfT 2006), total carbon emissions from this mode are still greater than they were before 1990 and emissions from other motorised modes are increasing in absolute terms. Furthermore, the government has admitted that attempts to reduce congestion are failing (DfT 2004), offering the prospect of unsustainability and unpopularity (Goodwin 2003).

National road-user charging is currently being touted by government as the best hope for congestion relief. If implemented – this remains a big ‘if’ (Shaw *et al.* 2006) – vehicles will most likely be charged per vehicle-mile based on the marginal congestion cost imposed, with people travelling on congested roads at peak times paying more than those using quieter roads at off-peak times. Politically, it may also be necessary for national congestion charging to begin revenue neutral with the option of an ‘environmental premium’ at a later date. Unfortunately, the relationship between this and target emissions reductions is unclear. Judging by evidence from the London Congestion Charge (Figure 3), it seems reasonable to suggest that road-user charging in designated urban zones is likely to realise emissions savings provided traffic does not divert around the zone or to alternative destinations and travel further (see Beeves and Carslaw 2005, Richardson *et al.* 2004, Santos and Fraser 2006, Transport for London (TfL) 2006). Replicating this effect with national road-user charging, however, is highly dependent on the implementation path chosen. Current policy discourse and modelling assumes that fiscal neutrality will be derived from scaling down taxes on motoring. Recent modelling work conducted as part of the Eddington review of UK transport policy imposes marginal social cost pricing which reduced congestion by 52%, leading to increased average speeds of 14% and a reduction in both overall traffic and CO₂ emissions of 7% by 2025 (HM Treasury 2006). This forecast, however, assumes a 1.3% increase in vehicle efficiency annually as a result of existing agreements between motor manufacturers, but sensitivity analysis reveals that halving this improvement rate leads to emissions 11.3% higher than the 2025 baseline. Other modelling also based on revenue neutrality leads to increased traffic and CO₂ emissions of 7% and 5% respectively, whereas a revenue-raising charge is estimated to increase revenues by 57% and reduce emissions by 8.2% (Graham and Glaister 2004).

FIGURE 3 HERE

Given the potential redistribution of traffic to lower charged routes, the likely carbon increases from higher speeds and falls in motoring costs on less congested roads, revenue neutral national road-user charging may at best produce carbon neutrality. The London scheme nevertheless suggests that local congestion charging can be successful and the government is half-heartedly promoting such schemes through the Transport Innovation Fund (TIF) (DfT 2005). But guidance on road-user charging schemes makes it clear that their primary target is congestion (DfT 2007a) and differential charges on environmental grounds are only likely to be approved where they do not reduce estimated net scheme benefits, thus depriving local authorities of a tool which could maximise carbon and congestion benefits through discounts to incentivise motorists to purchase cleaner vehicles. At a time when popular opinion is increasingly viewing climate change as a Trojan horse for general tax increases

(Anable *et al.* 2006), reducing local authority powers to tailor measures towards local air quality and climate targets risks further jeopardising the already fragile acceptability of this policy.

Technology and behaviour

Another way the government has sought to promote fuel (and, hence, emissions) efficiency is through restructuring of company car tax and annual car circulation tax (Vehicle Excise Duty, or VED) to broadly reflect vehicle CO₂ emissions. These changes are making some difference at the margin, although the general view is that taxation band differentials are insufficiently steep to have a significant effect (Commission for Integrated Transport (CfIT) 2007; Sustainable Development Commission (SDC) 2006). A further response has been to embark on a campaign of eco-driving to at least optimise the fuel economy of the existing vehicle fleet (DfT 2007b). In reality, however, total travel per capita and modal share contribute far more to overall differences in emissions per capita than fuel economy differentials (Brand 2006, Bristow *et al.* 2004; Schipper 2001), making it impossible to separate technological and behavioural considerations. At the very least, behaviour has to be realigned towards purchasing more efficient vehicles and fuels or fuel mixes. Equally, it is important that gains in these areas are not eroded by increasing speed and journey distances. Over the medium term, hybrid and battery technology may deliver modest absolute emissions reductions, but as with hydrogen use in transport, these technologies are only zero-emission at the tailpipe and their real climate change benefit is inseparable from the way the electricity or fuel is produced. Similarly, biofuels have substantial energy penalties due to land take, production and transportation issues (United Nations (UN) 2007). Also, even if technology can create near zero emission vehicles, this does not address the considerable energy tied up with their production and maintenance, resulting urban sprawl, land consumption for transport and more material consumption overall (Banister 2005).

Any move towards significantly more sustainable transport thus requires a combination of low technology alternatives and measures to incentivise reduced mechanised travel. In the UK, the main mechanism for suppressing demand through fuel duty was abandoned in 2000 after nationwide fuel protests. Even in the absence of national supportive fiscal policy, however, bespoke 'soft' or 'smart' measures at the local level – such as workplace and school travel plans, individualised journey planning, car clubs, public transport information, marketing, teleworking and video conferencing – are having some success in reducing single car occupancy, particularly where multiple measures are introduced. By facilitating these attractive, uncontroversial and relatively cheap alternatives, such initiatives seek to give better information and opportunities which affect the free choices made by individuals. A recent UK-wide study analysing case-study evidence of these measures highlighted their potential traffic, emissions and cost benefits (Cairns *et al.* 2004). It concluded that voluntary changes in car use arising from soft measures could reduce traffic in the UK by around 11% nationally (high intensity scenario) and 3% in the low intensity scenario. Projections for local peak period traffic

reduction ranged between 5% and 21% in urban areas. This study has been corroborated by results from three ‘demonstration towns’ which were allocated £10 million in 2004 to become showcases of smart measures packages. In those participating in experiments of individualised marketing campaigns, car trips reduced by between 11% and 13%, whilst public transport trips increased 4-22%, walking 17-29% and cycling 25-79% (Merron 2007). Even using conservative estimates of traffic savings, UK government analysis of savings from smart measures highlights cost effectiveness but also estimates national carbon savings of 0.6MtC by 2010, 9% over current planned savings of 6.67MtC from transport policies in the UK Climate Change Programme (Figure 2) (DEFRA 2007b; Anable 2005a).

Given their potential for early implementation and focus on travel volume, smart measures strike an important balance between technological and behavioural solutions. As yet, however, they do not enjoy ‘mainstream’ policy status, not least because significant behaviour shifts are seen as difficult to attain. This seems curious as evidence indicates a willingness amongst the general population to become less car dependent: a 15-20% reduction in individual car journeys could, it seems, be secured relatively easily and quickly in a supportive policy environment (Anable 2005b, Cairns *et al.* 2002; 2004; Dudleston *et al.* 2005; RAC Foundation 1995; Rye 2002). In the light of this evidence, the current lack of policy emphasis on behavioural change appears to be a clear missed opportunity.

With regard to air travel, there are three main ways to reduce emissions without reducing flight volumes: improved air traffic management; improved operational efficiency (loading factors, weight reduction, aircraft speed, lower use of auxiliary power, reducing taxiing); and technological improvements (e.g. new airframe and engine designs and alternative fuels). The Intergovernmental Panel on Climate Change (IPCC) (1999) estimates that traffic management could potentially achieve a global saving of 6-12% in fuel consumption by 2050, while operational improvements could save a further 2-6%; practical alternatives to kerosene-based fuels were, however, unlikely to emerge in the coming decades. With respect to technological change, Cairns and Newson (2006: 19) argue that:

while there are considerable opportunities for incremental improvements in the environmental performance of individual aircraft, these will not offset the effects of the growth in aviation. Moreover, whilst a non-incremental change could result from radically new airframe designs, these were not expected to affect the industry for decades and even then, would only apply to large long-haul aircraft.

The need to effect behaviour change by reducing flights – for example by further rises in the recently-doubled Air Passenger Duty (APD) or the promotion of ‘smart’ measures such as videoconferencing – is clearly evident in this context.

Short term and long term

Previous sections have already hinted at tensions within UK transport policy between short-term congestion mitigation measures and reliance on long-term technical solutions for carbon abatement. Worryingly, this reliance is not being matched by the concurrent development of route-maps to enact technical solutions within target periods. As Kohler (2006) observes, although long-term thinking is commonplace in transport analysis, there is little attempt to change infrastructure investment, vehicles and behaviour in any other direction than towards activity using the latest technologies. This is especially important given the sector's 99% dependence on oil, the sunk capital investment in these fuels and existing vehicle fleets, and the lead times to change policies and affect outcomes. Even current debates on 'Peak Oil' and energy security have not apparently concentrated thinking towards more radical action. If the government's projections of conventional reserves extending to 2030 are correct, this is a short time to address these structural issues (EAC 2006). If ready for mass production today, at least 20 years would be needed before a significant proportion of the vehicle fleet could run on non-carbon fuels or electricity generated from renewable resources (Banister 2005). The essential challenge, therefore, is planning that allows a focus on securing quick results as well as pursuing longer-term goals.

Another issue is the apparent disproportionate focus on end-point emissions targets compared with the rate of attainment. Although this applies to all sectors with the possible exception of energy-intensive manufacturing, there seems general agreement that transport is particularly difficult and costly sector to decarbonise. Given the residence times of many greenhouse gases in the atmosphere, the rate of progress towards the target for 2050 may be crucial (Buchan, 2007). Figure 4 depicts three indicative scenarios, each delivering an end date target of a 60% reduction in carbon emissions along different reduction trajectories. The 'slow start' is based on actual UK projections for transport. The 'straight reduction' assumes an equal annual rate of carbon reduction to 2050. The 'rapid start' involves a radical policy shift combining demand management with technological improvement. For the slow start to achieve the same overall emissions as the rapid start or the linear trajectory would require exceptionally high future annual reduction rates. From this, Buchan (2007) argues that delay is the equivalent of not achieving the target. As well as illustrating the critical nature of making early progress, this analysis points to the validity of interim targets to promote the merit of short-term as well as longer-term gains and to allow early policy adjustment. Moreover, given that the 60% target may be inadequate to prevent serious climate disruptions, there is clear merit, from a risk management perspective, in achieving this target significantly sooner than planned (IPCC 2007; Hickman and Banister 2006).

FIGURE 4 HERE

Scale in transport policy delivery

Our discussion so far has indicated that transport and climate policy are misaligned in terms of addressing the sector's carbon emissions. A greater and more explicit commitment to tackling CO₂ emissions is obviously necessary despite the political difficulties which apparently brought about retreat from the principles advocated in *A New Deal for Transport* (Docherty and Shaw 2003). Alongside strategic realignment, however, 'on-the-ground' policy delivery also warrants serious reappraisal. More support for 'smart' measures is clearly a priority. Another is tackling what might be described as the ideological hangover of deregulation and privatisation in the public transport sector – inherited from the Conservative administrations of the 1980s and 1990s but left largely unchanged by Labour – and the ability of the restructured industries to deliver services capable of accommodating significant modal shift (Foster 1994, Preston 2003, Wolmar, 2005). Railway passenger numbers are around 40% higher than in the final years of the nationally-owned British Rail (BR), although how far this reflects private sector dynamism is contested. Certainly the network is more expensive to run (around £5 billion in annual subsidy compared to less than half that under BR) and is operating at capacity on many main routes with major schemes to increase capacity some years away. Bus patronage has fallen in most English regions (Table 2) and both bus and rail fares have increased in absolute terms while the cost of motoring has fallen relative to GDP (DfT 2006). Only London and Northern Ireland escaped complete bus deregulation, and the reintroduction of measures to improve coordination of services and fare-setting in the regions (Davison and Knowles 2006, Preston 2003) and a re-evaluation of the rail industry's role and structure (Shaw *et al.* 2003) are probably necessary to address the peripherality of public transport on a national scale.

TABLE 2 HERE

Indeed, the notion of scale, as in many other environmental governance debates (Bulkeley 2005, Hulme and Turnpenny 2004, Liverman 1999, 2004, McCarthy 2005, Neumayer 2004), is vital to considerations of how to reduce transport emissions.¹ Admittedly, rigid conceptualisations of discrete and hierarchical 'scalar' organisation and the fixity of the state have been increasingly questioned in recent geographical writings on governance, globalisation and glocalisation (Collinge 2006, Herod 2003, Hoefle 2006, Jonas 2006, Marston *et al.* 2005, Shepherd and McMaster 2004). Nonetheless, it is important to recognise that certain elements of a strategy to address the climate impacts of transport are (and need to be) developed and implemented at particular scales. Climate change transcends national boundaries – although its effects are unevenly distributed around the globe – making supranational agreements on high-level concerns undoubtedly necessary. The Kyoto Protocol is the most obvious, although the EU-negotiated voluntary agreements with car manufacturers constitute a

¹ The *Eddington Report* (HM Treasury 2006) on the role played by transport in the UK's economic performance contained quite specific geographical references, although really not in the sense we convey in this paper.

good transport-specific example. At the other end of the spectrum, ‘smart’ measures show how generally agreed principles can be operationalised at the local/regional scale. Such approaches are hardly novel, of course, as LA21 exemplifies, but are frequently limited in their success at transposing high-level agreements into on-the-ground action.

In this arena it is important to look beyond scalar extremes in order to free ‘narratives from the singular and limiting preoccupations of locality on the one hand, and of globality on the other’ (Jonas, 2006, 400). Equally important is negotiating and promoting linkages between scales to allow policy and other networks to facilitate genuine transfers of knowledge, expertise and power: Allen (2003) points out the importance of associational forms of ‘power to’ achieve certain goals and aspirations which develop as people or groups work together. To borrow – in a somewhat different context – from Routledge (2003), what is needed is ‘convergence space’, both literally (as we argue below) and metaphorically. Convergence space is simultaneously diverse, uneven, multi-scalar and contested but can harness associational power because it promotes a ‘heterogeneous affinity... between various social transformations’ (Routledge 2003, 345). In this discussion, this implies working towards linking different scales of science (as the provenance of knowledge about climate change), policy (as the fora where decisions on action are made), activism (as a means of mobilisation for and against these decisions) and individual travel behaviour to achieve meaningful reductions in transport emissions (Goodwin and Barr 2007). Re-emphasising the regional scale in UK transport governance might provide such a way forward.

Jonas (2006, 402) notes that the ‘region’ (in all its guises) represents an ‘inbetweenness’ of “processes, sites, agencies, flows, etc., many of which work at scales which are neither simply ‘local’ nor ‘global’.” Traditionally, regions have been viewed as bounded territorial units (the ‘uniform’ and ‘functional’ regions referred to by Taaffe and Gauthier (1973)) but, recently, such spatial simplification has been questioned as authors have emphasised connections with other spaces and flows in a network society (Castells 1996, Sheller and Urry 2006). In transport terms we can think of the ‘city-region’, the principal concept on which we shall focus, geographically defined as a travel-to-work area but containing wider connections in its environmental, economic and social functions. Existing transport patterns display a clear local/regional dimension, especially in their amenability to modal shift: most journeys are short (average trip length is 6.9 miles and 69% of business trips are under 15 miles (DfT 2006)); Banister and Gallant (1998: 340-341) found ‘a great deal of scope’ for increasing the number of people who walk to work and ‘scope to increase substantially the number of people cycling’ to work in England and Wales; and 37% of people questioned agreed that many short car journeys they now make could just as easily be made by walking or cycling (DfT 2007c). Developing and implementing transport policy at the scale of the city-region thus offers the opportunity to develop flexible, spatially sensitive approaches (e.g. ‘smart’ measures), mobilise

community action and promote meaningful engagement by citizens and activist groups in decisions affecting transport patterns and behaviour in their regions (McEvoy *et al.* 1998, Soussan 2004). Crucially, in harnessing this ‘power to’ (Allen 2003) seek change, the city-region offers economies of scale in transport provision and, provided there is sufficient ‘strategic capacity’ (an issue to which we return), the opportunity to develop integrated transport strategies across an area large enough that most journeys begin and end within the same administrative authority.

Devolution and city regions

Throughout much of the last two decades, the UK’s institutional landscape has been singularly incompatible with effective regional transport governance. Already in control of a highly centralised state (Morgan 2001), the Conservative administrations of Margaret Thatcher and John Major abolished the metropolitan councils in the 1980s and 1990s in favour of smaller sub-metropolitan authorities (Begg and Docherty 2003). The powers of the resultantly weakened Passenger Transport Authorities (PTAs) were further undermined through deregulation initiatives which removed the ability to plan integrated timetables and determine fares (Figure 5). Recent developments have, however, provided scope for more meaningful decentralisation. The Labour government’s decision to devolve selective powers to the Scottish Parliament and the Welsh and Northern Irish Assemblies appears to have kick-started a return to regional transport policy – albeit at this stage in rather weak functional terms and only partially based on city-regions – with the formation of statutory Regional Transport Partnerships in Scotland and voluntary Regional Transport Consortia in Wales (Cole 2005, Docherty *et al.* 2007, MacKinnon *et al.* forthcoming). In both Scotland and Wales, the devolved governments have also stopped short of introducing London-style bus regulation (Hendy 2005).

FIGURE 5 HERE

In the absence of devolved government in most of England, London – which was granted partial devolution in the form of the Greater London Authority (GLA) in 2000 – provides the clearest example of city-regional transport governance. The GLA has substantial transport powers over a range of modes including strategic roads, the Underground, London Buses, taxis, river boat services and light rail, while some heavy rail commuter services passed to the GLA’s control in November 2007. The GLA can also raise bond finance to support its £10 billion capital investment plan. This level of authority and financial position, combined with strong political leadership from Mayor Ken Livingstone, has created favourable conditions for the pursuit of a speedily introduced and apparently successful ‘sustainable’ transport strategy (MacKinnon *et al.* forthcoming). At the time, national ministers regarded this strategy – which centres on the Congestion Charge and significant public transport improvements – as politically dangerous and publicly distanced themselves from its more controversial elements, although Livingstone was easily re-elected to office. One reason why

Livingstone's electoral chances were not harmed by the congestion charge is geographical: few Londoners have been negatively affected by the charge because most do not drive into central London, whereas many people from across the city have benefited from improved public transport. This has created, literally, a 'space of convergence' in which there is agreement to promote radical change in transport policy across a wide range of constituencies, and is in some contrast to a national scheme where most people, especially in non-metropolitan areas, think they will be adversely affected because public transport alternatives are less well developed. Indeed, over 1.7 million people recently signed a petition on the Prime Minister's website against national road-user charging, voicing concern over its financial implications and the potential employment of 'big brother' satellite tracking devices (BBC 2007).

London is clearly atypical and whether city-scale congestion charging schemes would be capable of relatively trouble-free introduction elsewhere in the country remains uncertain. Edinburgh's failed attempt to introduce a scheme in 2005 provides a salutary lesson (Gaunt *et al.* 2007), although the council made clear errors in its approach and the city is considerably smaller than the major English city-regions (although it does have higher than average bus use). London does demonstrate, however, that addressing transport's climate impacts requires more than top down framework-setting, new vehicle technologies, and poorly supported, ill-equipped and fragmented local authorities unable to promote effective modal shift strategies across transport-intensive city regions. Indeed, other English local authorities are unable to determine transport outcomes in critical policy areas largely because, having seen their power-base diminish following successive local-government reforms, they are generally dependent on central government for both sanction and funding of plans. *Local Transport Plans* or TIF bids containing elements central government does not like (e.g. light rail proposals (Knowles 2007)) are arguably disadvantaged even if they are robust strategies in climate-change terms. As yet local authorities have been unable to take advantage of bond financing and some county councils, such as Essex, are investigating ways of creating new revenue streams through private sector partnerships (*Transport Times* 2007a). The fragmented nature of local government in cities is also a hindrance: for example, the 10 local authorities putting together a joint TIF bid for the Manchester city-region have encountered inter-authority squabbling as two councils withdrew their support for the road-user charging element prior to local elections in May 2007 and majority support among members of the Greater Manchester PTA still not assured (*Transport Times* 2007b).

In short, London-style arrangements of devolved political authority, appropriate funding and strong political leadership – i.e. 'strategic capacity' (Marsden and May 2006, MacKinnon *et al.*, in press) – are not in place in other travel-to-work areas in the country. Although strong political leadership can never be legislated for, Marsden and May (2006: 771) argue that London provides 'a compelling argument for ... an overarching tier of government to organise travel over a spatial scale compatible

with that of major commuter patterns.’ Interestingly, the city-region agenda is gaining support in influential transport policy circles (Centre for Cities 2007, Commission for Integrated Transport 2007b, Improvement and Development Agency 2007) and there are signs that some form of regional transport governance arrangements might be introduced in and around the major English conurbations within the medium term. Marsden and May note that the prize of securing London-style institutional arrangements for transport in the city-regions ‘alone may justify the disruption from a further set of institutional changes’ (p 787).

Conclusion

In this paper we have developed an overview and critique of how the formulation and delivery of transport policy fit alongside the exposition of climate policy objectives within the UK, reflecting the sector’s significant and growing contribution to greenhouse-gas emissions. Our analysis has revealed serious imbalances between the two in terms of priorities and means of delivery, including a disproportionate dependence on technological advancement compared with securing behavioural changes to reduce transport-related emissions. From this we contend that whilst the contributions of economists, engineers and psychologists are all essential in devising adequate pricing mechanisms, technological developments and behavioural modifications to reduce transport’s climate impacts, these need to be complemented by a greater appreciation of geographical – and especially scale – factors involved in the design and delivery of transport policy. Drawing upon notions of governance scales and convergence space, we have argued that the city-region provides a promising arena for addressing transport’s climate impacts. City-regions are spaces in which large numbers of journeys take place and in which these can be effectively managed, and in which devolved government and communities can converge to transpose international agreements and national aspirations (e.g. Kyoto and VAs) into strategic action plans (including charging schemes and ‘smart measures’) capable of delivering geographically bespoke but nevertheless meaningful reductions in CO₂ emissions.

The effective pursuit of the city-region agenda will, however, require the creation of more robust governance arrangements involving the genuine devolution of power. The London example demonstrates clearly how institutional change combined with strong leadership has allowed the development of crucial strategic capacity to deliver genuine on-the-ground reforms that can evade political acceptability barriers that tend to afflict initiatives like national road-user charging. This contrasts with transport governance in other conurbations but also with experience in other sectors where an apparently regionalising policy agenda has been followed. Writing about English regional development agencies, Roberts and Benneworth (2001, 142) note that although these bodies were supposed to ‘inject a higher level of territorial specificity into the design and content of economic development policies’, they were created ‘without increasing the degree of political devolution’ and as such can be criticised as being agents of the central state. To judge by the analysis in this paper,

simply repeating such an exercise in the transport sector is unlikely to be of much benefit in tackling climate change.

Acknowledgements

Dr Anable is funded by the UK Energy Research Centre (UKERC), Grant # NE/C513169/1. We would also like to thank Clive Charlton, Ian Bailey and two referees for their extremely valuable comments on an earlier draft of this paper, and Jamie Quinn and Brian Rogers of the Cartographical Resources Unit at the University of Plymouth for drawing the artwork.

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Table 1 UK emissions of carbon dioxide (CO₂ expressed as Carbon) by transport mode, UK 1990-2005, Million Tonnes Carbon (MtC). Source: Defra 2007a; figures by 'source'.

	1990	2005	1990-2005 change	Share of total transport sector 2005	Share of total CO₂ 2005
	(MtC)	(MtC)	%	%	%
Passenger cars	19.2	19.1	-0.5	41.3	11.7
Heavy Good Vehicles (HGVs)	6	7.8	30.0	16.9	4.8
Light duty vehicles (LGVs)	3.1	4.6	48.4	10.0	2.8
Buses	1.3	1	-23.1	2.2	0.6
Motorcycles	0.1	0.1	0.0	0.2	0.1
<i>Road transport only</i>	<i>29.8</i>	<i>32.7</i>	<i>9.7</i>	<i>70.8</i>	<i>20.1</i>
Railways	0.4	0.6	50.0	1.3	0.4
Civil aircraft	0.3	0.6	100.0	1.3	0.4
National maritime	1.1	1.1	0.0	2.4	0.7
Other	0.2	0.2	0.0	0.4	0.1
<i>Domestic transport sector</i>	<i>31.7</i>	<i>35.1</i>	<i>10.7</i>	<i>76.0</i>	<i>21.6</i>
<i>Domestic UK CO₂</i>	<i>160.7</i>	<i>151.7</i>	<i>-5.6</i>		<i>93.2</i>
International aviation	4.3	9.5	120.9	20.6	5.8
International maritime	1.8	1.6	-11.1	3.5	1.0
<i>Total transport sector (incl. international)</i>	<i>37.8</i>	<i>46.2</i>	<i>22.2</i>	<i>100.0</i>	<i>28.4</i>
<i>Total CO₂ (incl. international)</i>	<i>166.8</i>	<i>162.8</i>	<i>-2.4</i>	<i>-</i>	<i>100.0</i>

Table 2. Changes in Local Bus Passenger Journeys by Area 1985 / 86 – 2004 / 05 (million bus passenger kilometres). Source: DfT, 2006.

<u>Area</u>	a) <u>1985/86</u>	b) <u>2000/01</u>	c) <u>2004/05</u>	<u>% change</u> <u>a) to c)</u>	<u>% change</u> <u>b) to c)</u>
London	1152	1347	1782	+54.7	+32.3
England metropolitan ¹	2068	1166	1083	-47.6	-7.1
England shire ²	1588	1247	1167	-26.5	-6.4
<i>England total</i>	<i>4807</i>	<i>3761</i>	<i>4032</i>	<i>-16.1</i>	<i>+7.2</i>
Scotland	671	443	465	-34.0	+5.0
Wales	163	116	113	-30.7	-2.6
<i>Great Britain</i>	<i>5641</i>	<i>4312</i>	<i>4609</i>	<i>-18.3</i>	<i>+6.9</i>

¹ Provincial conurbations of Greater Manchester, Merseyside, South Yorkshire, Tyne and Wear, West Midlands and West Yorkshire, centred respectively around the cities of Manchester, Liverpool, Sheffield, Newcastle, Birmingham and Leeds.

² Non-metropolitan counties ranging from large cities to rural areas.

Figure 1 Estimated carbon savings in 2010 from transport measures included in the UK CCP. Source: DTI 2007a 2007b. Notes: *Voluntary Agreements Package* – voluntary agreements have existed since 1997 between the EC and the European, Japanese and Korean automobile producers to reduce average sales-weighted new car fuel emissions. The initial target for emissions from the tailpipe was 140g/CO₂/km by 2008/9. The UK is expected to reach 162g/km by 2008. Savings include those from vehicle excise duty and company car tax designed to accelerate the purchase of low carbon vehicles; *Fuel Duty Escalator* – annual increase in duty rates introduced in 1993 at a rate of 3% above inflation, increased to 5% in 1995, and again to 6% in 1997 and removed in 2000; *Renewable Transport Fuels Obligation* – introduced in 2008-09, with the obligation level set at 2.5% volume of fuel sold, rising to 3.75% in 2009-10 and again to 5% in 2010-11. This figure is ‘gross’ and does not take into account the carbon emitted during the production of biofuels; *Other policies* – include some urban congestion charging schemes, sustainable distribution (including in Scotland) smarter measures, rail investment and ‘other’ policies. Figures are updated from the original CCP by DTI 2007a and b.

Figure 2 UK historic and projected sector end user CO₂ emissions to 2020. Source: DTI 2007c. Note: These projections exclude the effect of the EU Emissions Trading Scheme.

Figure 3 London congestion charging zone. After TfL 2006.

Figure 4 Excess emissions from transport over 60% target. Reproduced with kind permission from K Buchan.

Figure 5 Passenger Transport Authority areas in Great Britain. Note: Strathclyde PTA’s boundaries are shown from 1996, when it was expanded in size, to 2005 when it was superseded by Strathclyde Partnership for Transport. After Docherty 1999.