The governance of transport and climate change

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Abstract

Climate change is one of the key global policy issues of our time. Transport is the sector from which it has been hardest to cut emissions and, to make substantial progress in the future, action will be required at all levels of government from EU to local. The governance of transport within this already challenging arena is further complicated by the existence of different structures for the management of transport modes and variations in formal governance structures across countries and regions.

This paper examines the prospect for deep cuts in CO_2 emissions from transport through an examination of the key policy levers for change and considering the governance issues that surround them. The focus of the paper is the United Kingdom, and in particular England and Scotland. The UK is the first country to have a legally binding internal obligation to meet carbon dioxide reduction targets and this has prompted significant activity in both governance institutions and delivery. The research uses a Multi-Level Governance framework to understand the policy environment in England and Scotland, capturing both the range of spatial actors and the influence of sectoral actors in what is a complex polity.

It is concluded that the policy approach currently appears constrained by a desire to divide accountability by formal institutional structures, thus failing to tackle the dispersed nature of travel and the national and international nature of businesses. There is currently a lack of clarity about the tiering of responsibilities between spatial levels and there is therefore a comparative lack of commitment to the potential for demand management and travel reduction strategies to contribute to carbon reduction. Carbon reduction policies are also influenced by strong industry lobbies whose goals may not be fully aligned with carbon reduction strategies. The profusion of actors engaged in climate change policy seems to dilute rather than promote effective policy making.

1.   Introduction

Climate change is one of the most important policy challenges facing the world population and globally, transport is responsible for 24% of greenhouse gas (GHG) emissions (IEA, 2005). Whilst overall UK GHG emissions fell by 21% between 1990 to 2007 (DECC, 2009), over 75% of this was due to a decline in heavy industry and changes in fuel used for energy supply, from coal to gas. UK GHG emissions from transport rose by 11% over the same period (EEA, 2009), due largely to continuing increases in private vehicle km travelled. With the current set of policy measures in

the UK, the Government forecasts that transport emissions will rise by 5% by 2020 with current policies but may fall by 10% if an enhanced package of policy measures can be delivered (DfT, 2009).

In response to the analyses of bodies such as the Intergovernmental Panel on Climate Change (IPCC) and the Stern Report the UK has introduced The Climate Change Bill which places a legally binding requirement on the UK Government to set targets and report on progress on climate change emission reductions. The government subsequently established a new agency called the Committee on Climate Change (CCC) which is responsible for advising government on a long-term greenhouse gas emission reduction target for 2050 and for recommending five year carbon budgets, compatible with EU policy to attempt to limit global temperature rise to 2 degrees Celsius. In December 2008 the CCC made the following recommendations to the UK Government:

1.   adopt an 80% reduction by 2050 (compared with 1990 levels);

2.   that this target should include international aviation and shipping;

3.   that the first three five year budgets achieve between a 34% and 42% reduction in emissions (compared with 1990 levels) with the most ambitious target being enacted when a broader global agreement is signed. (CCC, 2008)

Numerous research studies question whether the current moderate cuts implied in the transport sector by 2022 are consistent with such an ambitious low carbon future and suggest that more radical cuts are required (e.g. Chapman, 2007; Tight et al., 2005).

This paper provides an analysis of the contribution of the transport sector to the climate change problem. The paper considers the problem of climate change through the perspective of multi-level governance (Bache and Flinders, 2004a) as this is clearly a problem which transcends any one level of government and is heavily influenced by the actions of individuals and organisations as well as formal institutions. It is developed through a study of the policy positions adopted in the UK drawing separately on emerging differences between Scottish and English policies where relevant. The comparison of Scotland and England is potentially important in further mapping the extent to which devolution of transport responsibilities leads to innovation and divergence of policy approaches (MacKinnon et al., 2008). The paper also looks out to supranational organisations such as the EU (Fairbass and Jordan, 2004) as well as down to the local level where actions may be critical (Bulkeley and Betshill, 2005). It begins by introducing multi-level governance as an analysis framework (Section 2) and from this starting point it poses some key questions:

   1) What type of policy problem is climate change (Section 3)?

2) What policies and actions are required to achieve a substantial shift to a lower carbon transport system (Section 4)?

3) What is the environment in which such policies are formulated and delivered (Section 5)?

The discussion and conclusion draw together the answers from the three questions and look at the capability of these governance structures to deliver changes required to limit the UK's GHG emissions from transport (Section 6).

2.   Multi-Level Governance

Multi-level governance has emerged as a conceptual approach to studying the development, implementation, effectiveness and accountability of policies. It steps away from the assumptions that national government is the dominant policy making unit and that policy making occurs within a nested hierarchical set of government layers (International, national, regional, sub-regional, local). These are referred to as Type 1 institutions. Whilst acknowledging that policy competencies between governmental layers are now much messier, particularly within a European context, multi-level governance also gives equal credence to the notion that the levers for policy implementation and the basis for policy development are also influenced by the changing policy space. The increase in non-departmental government agencies, public private partnerships and statutory consultees limit the extent to which central government can influence change. These are referred to as Type II institutions. Some commentators suggest that this places cities at centre stage in developing innovative strategies (Betsill and Bulkeley, 2007). Hooghe and Marks (2001) depict these two different types of governance arrangements as shown in Table 1 with exemplar explanations. There is also an observed growth in the external influence of informal institutions such as companies, coalitions of interested parties, non-governmental organisations, charities and citizen groupings.

Table 1: Types of Multi-Level Governance (adapted from Hooghe and Marks, 2001)

Type 1	Type 2
multi-task jurisdictions Local government responsible for waste, transport, social services, education	*task-specific jurisdictions* Highways Agency responsible for national trunk roads
mutually exclusive jurisdictions at any particular level Government boundaries do not overlap	*overlapping jurisdictions at all levels* Friends of the Earth may have a national campaign and align with a local airport anti-expansion campaign group
limited number of jurisdictions Typically few layers of government	*unlimited number of jurisdictions* issue specific and geographically flexible groupings.
jurisdictions organized in a limited	*no limit to the number of jurisdictional*

number of levels e.g. European, national, regional, local	levels informal groupings from local to international and can be virtual
jurisdictions are intended to be permanent	*jurisdictions are intended to be flexible*

Whilst the exact definition of multi-level governance remains contested, Bache and Flinders (2004b) identify four key features from a synthesis of research viewpoints:

1. "Decision-making at various territorial levels is characterized by the increased participation of non-state actors

2. The identification of discrete or nested territorial levels of decision-making is becoming more difficult in the context of complex overlapping networks

3. In this changing context, the role of the state is being transformed as state actors develop new strategies of co-ordination, steering and networking to protect and, in some cases, enhance state autonomy

4. Fourth, that in this changing context, the nature of democratic accountability has been challenged." (p197)

This paper assesses the nature of transport and climate change problem through the key concepts mapped out above with a view to establishing what type of governance arrangements exist in England and Scotland and whether they are well suited to providing an effective policy response.

3.   Transport and climate change: the problem

The current scientific and political consensus, as represented by the IPCC, is that rising man made emissions of carbon dioxide and other GHGs are causing a significant rise in global average temperatures, over and above that which might be due to any natural phenomena (IPCC, 2007). Depending on the scale of the rise in average temperatures (compared to the pre-industrial period), this is predicted to lead to reduced food yields, significant water shortages, sea level rise on a scale that will threaten many major cities, species extinction, extreme weather and, ultimately, abrupt and large scale changes in global climate. Together, these changes are likely to bring about enormous social and economic upheaval. Their impacts on the economy (in terms of reduced production, and the costs of adaptation/mitigation, including in the transport sector) are also likely to be large: 5% of world GDP per year if no action is taken, rising to 20% if and when catastrophic climate change occurs (Stern et al., 2006).

In economic terms GHG emissions are therefore a classic externality with the costs of climate change not falling directly on the producer of the emissions. It is a particularly difficult issue as not only are the likely impacts dispersed across the globe in an uneven manner, but also the worse impacts are likely for future generations and there is great uncertainty about how bad they will be. Climate Change is also therefore an example of a tragedy of the commons.

The introduction to this paper established that transport is a major contributor to climate change. Figure 1 provides a further breakdown of how emissions from different types of transport contribute to the problem in the UK.
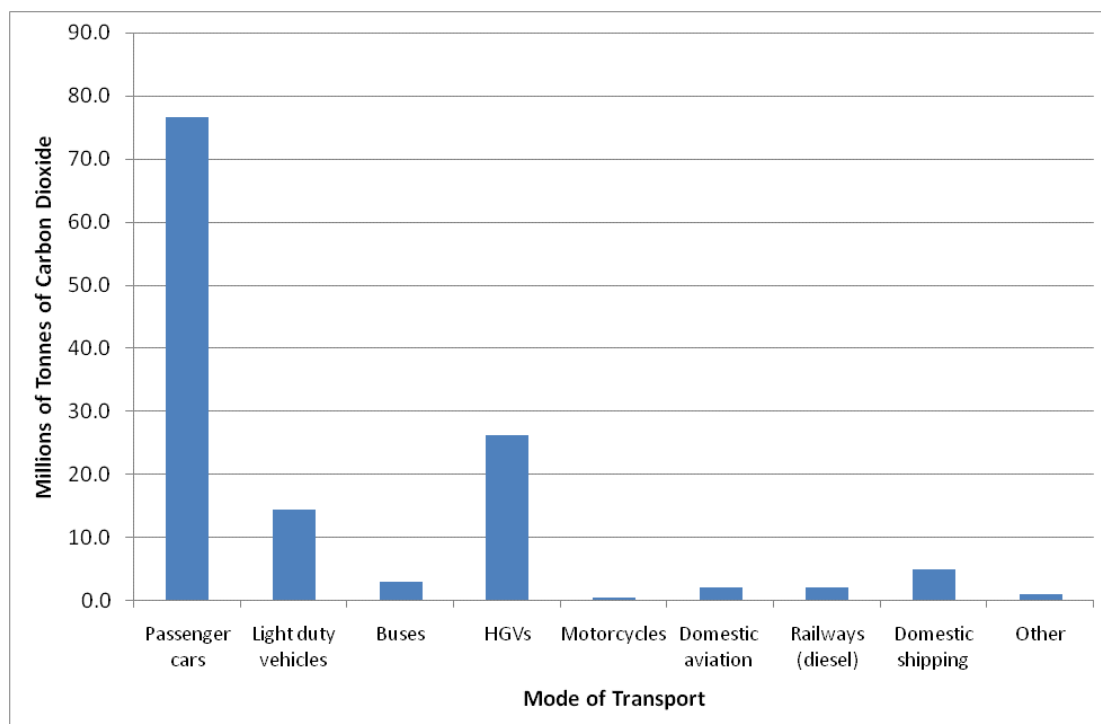
Figure 1: Greenhouse Gas Emissions from Transport in the UK in 2007
(Source: DfT 2008c)[1]

Whilst government reporting suggests that we can easily present accounts of GHGs there are serious definitional issues which need to be grappled with in the debate surrounding who should act. For example, should emissions be attributed to power stations and the energy sector (source accounting) or to the people, businesses or transport modes using the energy (end user accounting). Whilst currently in the UK much transport is driven by fossil fuels directly, this distinction is not overly critical but with a more diverse fuel mix or a greater use of cleaner electricity as proposed it might be (CCC, 2008). Another, perhaps more serious accounting issue comes from

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[1] Shipping only covers domestic shipping and international flights are not included in the current UK Kyoto accounts.

the spatial allocation of emissions. Consider a journey from Region A to Region B. How should the emissions be attributed?

- To the person making the trip? This would count as part of carbon footprint of Region A

- To the destination activity?. If so, do both the outward and return journey count against Region B or should this be shared with Region A?

- To regions or countries en-route? This could be done according to the greenhouse gas emissions used in their area

- To the company (and associated country of registration) providing the travel (if this is applicable)?

This is one journey but these arguments can be played out across different spatial scales (for example, should the small town of Newbury, England, have an inflated carbon footprint because it is on an important through route?). There is currently no agreement on accounting for cross-boundary emissions and this is one of the reasons why international aviation and maritime emissions were excluded from the Kyoto protocol.

A further major tension is the changing nature of international freight movements. There has been a radical shift towards imports from the Far East over recent decades and, whilst India and China are often pilloried for expanding their industrial base and therefore GHG emissions, much of this is to serve developed country markets with cheap goods. Recent research (DEFRA, 2008a) has shown that if GHG emissions from international aviation and the production of goods consumed in the UK are taken into account, the country's total GHG emissions actually increased by 17% from 1990 to 2005. Under the current accounting rules, have developed countries simply exported their pollution? Does the allocation of responsibility lie with the producer or consumer?

Of at least equal importance to the debate over how to account for emissions is the debate about which sector should take action. Here, the CCC has adopted a position of promoting cuts in those sectors which have the lowest marginal abatement costs (relative to a forecast carbon price of £40/tonne) and, where more ambitious cuts are still shown to be required, to prefer those technological advances which offer most long-term market leading potential to put the UK on a pathway to achieving an 80% cut by 2050 (CCC, 2008). Whilst the marginal abatement costs of technology change are relatively straightforward to estimate, those from many transport interventions which will impact on GHG emissions (such as enforcing speed limits and reducing the need to travel) are more complex to calculate as they have benefits and costs (e.g. congestion, accidents) which fall beyond the climate change impacts

(Short et al., 2009; Gross et al., 2009; Marsden, 2006). There is also an inherent tension between the policy benefits of more efficient vehicles and less fuel consumption and the funding of government expenditure. The CCC estimates that by 2020 a £4bn reduction in fuel duty income to the UK Treasury may arise (CCC, 2008).

Climate change can therefore be characterised as a complex environmental threat which is unlikely to be tackled at an appropriate scale if left solely to market-based solutions. Peters' and Pierre's (2004) suggest that the more "inclusive bargaining" approaches which have arisen through the expansion of influence of Type II institutions in particular risks leading to weak action. If this is true, then it could be particularly damaging to taking action to tackle climate change which requires both actions based on a precautionary principle *and* a reliance on countries (and within that organisations and citizens) acting together to achieve long-term goals which are not necessarily in the short-term interests of all involved. Within this, transport is but one policy sector which might be treated differently in different nations.

4. Policy Actions

Both climate change policy and energy policy are matters for which the UK Parliament in Westminster is responsible; i.e., these are not in the main devolved to national administrations in Wales or Scotland (renewable energy and energy efficiency are exceptions, as they are devolved in Scotland). The Climate Change Programme (DEFRA, 2006) is applicable to Scottish Government, the Welsh Assembly and the Northern Ireland Assembly. Equally, the Climate Change Bill provides a legally binding framework for UK GHG emissions (DEFRA, 2008b). This is in part due to the international nature of climate change treaties and emissions accounting. However, there are also some differences in approach between the different administrations and the UK's carbon management framework is acknowledged to have a "complex interplay of reserved and devolved responsibilities" (*Ibid*., p12).

The policy responses for the transport sector are set out, at a macro level in the 2009 Carbon Reduction Strategy for Transport, although they remain largely unchanged from the 2006 Climate Change Programme. These are:

1. Supporting lower carbon fuels;

2. Supporting a shift to new lower carbon vehicle technologies;

3. Using market mechanisms to encourage a shift to low carbon transport (including the EU Emissions Trading Scheme); and

4. Promoting lower carbon transport choices (e.g. mode shift) (DfT, 2009)

The Scottish Parliament has, since May 2007, been in the control of a Scottish National Party (SNP) government and its policy position may change from that set out by the previous Labour/Liberal administration which defined the Climate Change Programme for Scotland (Scottish Executive, 2006a). It has adopted a broadly similar set of policies to its English counterpart, putting considerable emphasis on tax, vehicle excise duty and bio/renewable fuels. Perhaps the most significant difference initial difference[2] is the inclusion of reference in the Scottish document to Scotland's National Transport Strategy (NTS), a document that in theory at least sets out the scope of the "wider transport measures" suggested under point 4.

The primary measure for achieving point 1 is the UK Renewable Transport Fuel Obligation (Statutory Instrument 3072) which fulfils the UK's commitment to EU Directive (2003/30EC). This involves mandating the inclusion of a certain percentage of biofuels within the normal fuel mix by a particular date. Whilst the initial target was 5% by 2010-11 this has recently been pushed back to 2013-14 due to concerns over the wider environmental impacts of some of the biofuels options currently available (DfT, 2008c). This is clearly an area where EU policies are having an important impact although it can be seen that the UK government is actively engaging in interpreting and implementing the proposals. Fuel technology is an international business and it seems likely that action by individual member states is less likely to be effective than action at a pan-European level.

The primary measures listed for point 2 are cited as being better information to consumers, investment and grants in low carbon vehicle technology, agreements with manufacturers on more fuel efficient vehicles and vehicle taxation. Of these measures the first two are subject to greater degrees of potential variation between administrations. The first involves actions such as the ActonCO$_2$ campaign[3] and fuel economy labelling on new cars (such as that used on washing machines) which has been introduced in advance of proposed EU measures. Information can be communicated at many different levels (community groups to national adverts) and by different types of organisations (e.g. product advertising by manufacturers and government bodies) and we review the role of information as part of a transport strategy below. The second is largely channelled through the Low Carbon Vehicles Partnership which is "is a partnership of over 280 organisations from the automotive and fuel industries, the environmental sector, government, academia, road user groups and other organisations with a stake in the low carbon vehicles and fuels agenda" (LCVP, 2009). Whilst supported both financially and by steering group representation by the UK Department for Transport and Department for Business, Enterprise and Regulatory reform, it is a Type II agency for the UK, influenced

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[2] The English publications from 2008 onwards have closed the gap in rhetoric
[3] www.actonCO2.gov.uk

strongly by private sector organisations which operate across the UK and global policy space.

The other measures under point 2 are matters over which differences between England and Scotland are negligible. The EU regulates new goods vehicle and bus engines but only in relation to local air quality, not CO_2 emissions; and these local emissions are measured in relation to the power of the engine, which has acted as an incentive on manufacturers to increase engine output. CO_2 emissions from trucks and buses therefore remained largely stable in the period 1990-2000 (see EEA, 2003). For new private cars sold in the EU, there are currently no binding limits on CO_2 emissions. Importantly, the vehicle manufacturers lobbied the EU to adopt a voluntary target of 140g CO_2 per km by 2008-09. Whilst manufacturers already produce cars with emissions well below the current EU target, the average car sold does not meet the target in part due to consumer preferences for larger, heavier, faster cars. The voluntary agreement has seen CO_2 emissions fall to 163 g CO_2/km in 2004, 12.4% below the 1995 starting point of 186 g CO_2/km (European Commission, 2007). Given that the target now appears unlikely to be met, the EU proposed mandatory limits on emissions for new cars with 130g/km achieved by 2012 (COM(2007)856; Ryan and Turton, 2008). Lobbying from various quarters has seen the target adopted but pushed back to 2015. Fines will be levied for manufacturers failing to achieve their targets increasing sharply from €5 per gram per car sold for the first gram to €95 for the fourth gram and beyond (Beith, A., 2008). Both these actions suggest that the EU as a Type I institution is subject to significant external influence.

At the regional and local level, governments have limited influence. They can take action on the efficiency of their own fleets and it is possible for those authorities to stipulate minimum vehicle standards (including emissions) insisting on efficient fleets amongst contracted operations and/or to subsidise operators to buy such vehicles. London Buses, for example, does the former within its contracts with operators.

Vehicle Excise Duty and fuel duty are matters reserved for the Treasury in Westminster. Local governments have limited additional influences which can be exerted through additional purchase taxes or circulation taxes and through the ways in which business mileage is taxed but the former is rare and the latter two have limited impact (Potter, 2008). Other forms of regulation can be introduced locally where traffic management regulations can be relaxed for low-emitting vehicles or tightened for more polluting vehicles; this is discussed further in the next section. These types of measures are typically limited in their application and operate over small areas when adopted.

The measure under point 3 revolves around the ability of the UK to effectively influence the international agenda on Emissions Trading. The UK Air Transport White

Paper (DfT, 2003) flagged the importance of the inclusion of aviation within international emissions trading schemes and, as part of its EU Presidency in 2005, the UK took forward the debate on how to include aviation within an EU trading scheme and it is anticipated that this will begin in 2008 (DfT, 2007). Maritime GHG emissions are even less well understood and regulated. Aviation and shipping remain subject to standard setting through the International Civil Aviation Organisation and the International Maritime Organisation. In aviation for example, enshrined in the Chicago Convention of 1944, is a ruling that duty cannot be levied on aviation fuel which leads to a perverse incentive relative to road transport. Both bodies operate with a broad international membership and work on majority voting limiting the extent to which anything other than lowest common denominator standards emerge. The UK government believes that these bodies have not yet "provided comprehensive solutions that respond to the challenge of climate change" (DfT, 2007, p36). This appears to be an arena in which complex supranational interests are working against the development of an effective solution.

The fourth action point is one in which matters are devolved fully to Scottish Government and where differences in emphasis and delivery emerge between Westminster and Holyrood.

The 2006 Climate Change Programme sets out the UK Government's expectations of the impacts of the different policy options being pursued. This is shown below in Table 2. The figures should be set against an anticipated net increase (if all measures are implemented) of 1.7MtC over the period of assessment (2004-2010) due to rising traffic levels. As can be seen, the principal savings are anticipated to come from actions which are taken at a UK or EU level although the delay of RTFO and the limited success of the voluntary agreements have certainly dented progress for the transport sector. In addition, it seems unlikely that the lofty goals of the July 2000 10 Year Plan for Transport will be achieved (Marsden and Bonsall, 2006; Docherty and Shaw, 2008) and therefore, the extent to which any carbon savings from wider transport measures are secure is very uncertain. Overall, whilst progress is being made on many fronts the route from policy development to implementation appears to be complex and constrained.

Table 2: Anticipated Changes in CO$_2$ emissions in the transport sector

| Measure	Carbon Savings in 2010 (MtC)	On track
Renewable Transport Fuels Obligation (RTFO)	1.6	✘
Voluntary Agreements, reform of company car tax and graduated VED	2.3	✘
Future EU level agreement with car manufacturers to reduce CO$_2$ emissions from new cars	0.1	?
Fuel Duty Escalator	1.9	✓
Wider Transport Measures	0.8	✘
Sustainable Distribution (in Scotland)	0.1	✓
TOTAL	**6.8**	

The recent Carbon Reduction Strategy for Transport (DfT, 2009) estimates that additional cuts of 17.7MtC can be achieved by the new or more intensive measures described in the strategy. In particular this includes the mandatory fuel efficiency standards but also other measures such as lower carbon buses, new tyre technologies and some rail electrification (*Ibid.*)

Whilst there is greater certainty over the costs and timescales for near-term technology improvements there is uncertainty in progress in tackling the impacts of the growth in travel demand. The UK CCC report states: "The Committee has not carried out detailed analysis of the opportunity to reduce surface transport emissions via demand side measures (i.e. measures which reduce kilometres travelled or modal shift to less carbon intensive transport…)" p14 – but at the same time it notes that "Significant opportunities exist across all the sectors - power, buildings, industry, transport and agriculture in each of Northern Ireland, Scotland and Wales, but with some variation. National authorities have an important role to play in unlocking this potential given the balance of reserved and devolved powers." (p16). The following section of the paper goes on to consider that potential and to highlight any differences between the national authorities in their approach to managing emissions from surface transport.

5.   Surface Transport Policy and Climate Change

This section presents a comparative analysis of the policy positions and delivery structures within England and Scotland for surface transport GHG emissions. The emphasis is on road transport as it contributes 93% of all domestic emissions from transport (DfT, 2007). The discussion is broken down by formal administrative layers

from national to local as outlined in Figure 2, an albeit simplified chart showing the principal relationships.
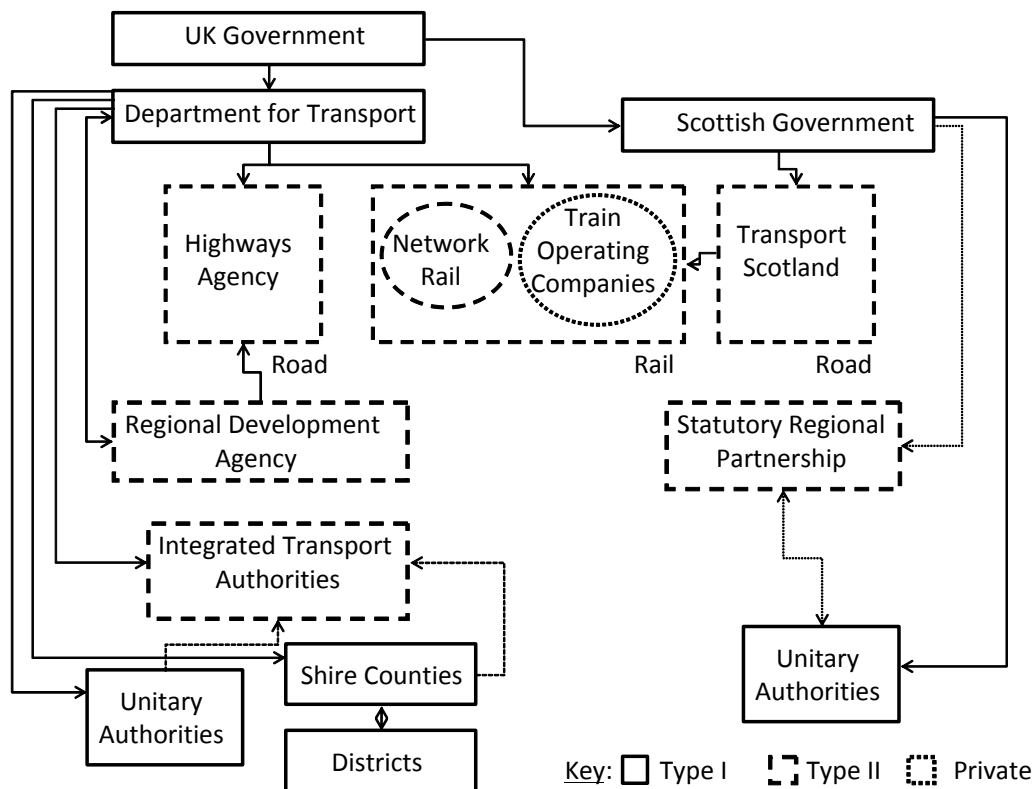
Figure 2: Simplified Institutional Relationships in England and Scotland

5.1 National Policies

Towards a Sustainable Transport System is the emerging national English policy framework for transport as set out by the Department for Transport. It sets out five key goals: Maximising competitiveness and productivity; reducing transport's emissions of CO_2 and other greenhouse gases, better health and less accidents; improved quality of life and well-being and greater equality of transport opportunity (DfT, 2007).

The Scottish National Transport Strategy was published by the Scottish Executive in 2006, with three key objectives: to reduce emissions, to cut journey times and improve connections by all modes, and to improve the quality, accessibility and affordability of public transport (Scottish Executive, 2006b).

Both England and Scotland promise continued work on biofuels and in promoting eco-driving and more efficient vehicles and there is, as yet, little indication of radical

policy departures between the administrations, partly for the reasons described in Section 4.

The English approach set out in Towards a Sustainable Transport System implies action at a local level:

"The impact of local travel on climate change is very significant. In 2006, 57 per cent of all trips (excluding cycling and walking) were of less than five miles, including 56 per cent of car journeys….our national networks produce a lower share of emissions than the local and international networks" (*Ibid*., p82 and p 86).

This is further expanded with a focus on the greater possibilities for mode shift, more integrated land-use planning and behaviour change at a local level whereas national actions are more likely to be focussed on better vehicle technology and some traffic management.

The Scottish National Transport Strategy also contains a number of measures to reduce GHG emissions which also seem focussed at a local level. In particular, encouragement of "Smarter Choices" travel behaviour change and investing ring fenced funds of around £10 million per year via Sustrans and local authorities in local walking and cycling measures, and the national cycle network. We note that the new government elected in 2007 has since abandoned almost all ringfenced transport funding to local authorities. The Scottish strategy also refers to investigating stricter enforcement of speed limits on national and local roads, through the extension of average speed cameras, amongst other methods. Whilst this is potentially an important policy divergence it is not yet implemented, and similar ideas have been floated in England but as yet without adoption.

It is currently difficult to see any major policy divergence between the administrations. In England the position was summarised in November 2008 "substantial work will be needed to inform consideration of the best package of measures for each network (local, regional, national), including the impact of greenhouse gas emissions" (DfT, 2008c, p19, brackets added). Despite being at the forefront of policy concerns for a number of years it appears that there is little clarity about what the best solutions might be, at what spatial levels they should be applied and how they should be delivered. This is not to suggest that individual cities and regions may not be innovating (e.g. Betsill and Bulkeley, 2004) but simply that there is no clear delineation of responsibilities and expectations within which this is happening, and therefore little systematic approach to the implementation of policies - particularly at the local/regional level - to reduce GHG from transport.

5.2 National Networks

Little difference seems to exist in the priorities for the national road and rail networks in England and Scotland with the emphasis being on investment in new capacity at strategic pinch points and 'making better use' of existing infrastructure.

The 2007-2012 roads programme for Scotland (Transport Scotland, 2007) includes some 4 major (> £100 million), 8 medium (£20 million - £100 million) and 37 minor (> £20 million) schemes planned to be at least started by that date, subject to planning procedures. It is difficult to derive an accurate total for anticipated expenditure due to the way the information is presented by Transport Scotland but, for example, two major schemes (M74 completion and a bypass of Aberdeen) are forecast to cost in total some £700 - £950 million, depending on outturns. Costs of committed rail schemes (Airdrie-Bathgate, Stirling-Alloa and Glasgow Airport) total around £520 million (cash prices).[4] In December 2008 the Scottish Government published its Strategic Transport Projects Review (STPR), a prioritised list of national transport investments for the years 2012 to 2026. Whilst new and enhanced rail schemes are prominent in the list, all the schemes identified focus on cutting inter-regional journey times; the predicted overall change in surface transport GHG emissions from the package of schemes is 1% less than that predicted in the "business as usual" scenario, a figure which is well within the bounds of modelling error.

In England, the Highways Agency has been allocated up to £6bn in funding "for improvements to strategic national roads in the period up to 2014 to cut congestion, support economic growth and improve road safety" (DfT, 2008c). On rail, "over £10 billion will be invested in enhancing capacity between 2009 and 2014, with overall Government support for the railway totalling over £15 billion" (DfT, 2007). The rail industry has been tasked with reducing its overall carbon footprint, partly due to the renewal of some very aged rolling stock. Rail however contributes less than 2% of the total transport GHG emissions.

The important point to be drawn from the descriptions above is that there are modest but significant planned expansions of the network to cater for increased demand. The evidence from a previous round of Multi-Modal Studies in England demonstrated that in the absence of demand restraint, absolute reductions in CO_2 emissions were not achievable, even allowing for substantial technological improvement (Marsden, 2005). The absence of more stringent demand management means that the national networks are unlikely to achieve significant reductions in transport GHG emission.

5.3 Regional Decision Making

[4] It seems likely that fiscal pressures following the banking crisis will cause a number of schemes in Scotland and England to be postponed or cancelled – but not for environmental reasons.

Lodged in between the national and local layers of government is a regional tier of government, one whose role is increasingly uncertain. With perhaps the exception of relatively powerful metropolitan and regional councils in the period 1974 to 1996 in Scotland, and 1974 to 1986 in England, the role of the regional governmental tiers in England and Scotland has been weak compared with many countries (such as Germany).

In England, the Regional Assemblies – once planned to be elected bodies - are now to be abolished by 2010 with powers handed over to Regional Development Agencies (reflecting a transfer from what was initially thought to be an emerging Type I institution to a Type II institution). These powers currently relate to the development of what is a fairly weak regional planning process (Headicar, 2006) and powers to decide over the allocation of major infrastructure schemes within a region on roads and local transport. There is a requirement to identify the carbon impacts of plans for expenditure for regional funding allocation and also to conduct a sustainability appraisal of regional spatial strategies but of themselves these are weak filters against growth in emissions (Headicar, 2009; Marsden et al., 2009).

In Scotland, Regional Transport Partnerships (RTPs), of which there are seven, are statutory bodies with one statutory duty – that is, to produce a quinquennial Regional Transport Strategy (RTS). Created under the 2005 Transport (Scotland) Act, these bodies were intended to distribute gradually greater and greater proportions of local transport funds to local authorities, and so to introduce a more regional dimension to transport planning in Scotland. However, the new minority SNP government has reversed this policy and left the RTPs somewhat emasculated and largely dependent on their local authority members for funds (Pangbourne, 2008). It is not therefore, from the transport sector, particularly clear what role regional bodies actually have in limiting greenhouse gas emissions other than as interpreters of national policy or arbiters of national and local policy, although this is an emerging picture.

5.4 Sub-regional decision making

There is an additional layer of sub-regional governance in England compared with Scotland. The larger English Regions have, within them multiple large city areas (e.g. Yorkshire and the Humber has city regions formed around the major cities of Leeds and Sheffield). Whilst the transport governance arrangements around these major metropolitan areas have essentially mirrored those in the Strathclyde region of Glasgow this is now diverging.

At a sub-regional level in England the Local Transport Bill required passenger transport executives (who were charged with the co-ordination of passenger transport services in their areas) to change their roles to Integrated Transport

Authorities (as of February 2009). Within the legislation there exists the potential for local authorities to pass up powers and funding to the ITA to assist with local and sub-regional transport planning. One of the aims of the legislation is for ITAs to operate over what is a much larger travel to work area than current administrative boundaries suggest, and to allow new ITAs to be established in areas such as the East Midlands and the former Avon counties. However, when given the opportunity to pass powers, funding and accountability over to a new body, it is unlikely that many local authorities will find this attractive – as Pangbourne (2008) has argued in relation to experience in Scotland. The change to ITAs has only just happened and governance reviews are currently underway. Whilst ITAs are to have regard to GHG emissions reduction – which may provide a lever to push forward policy in this area – the doubts over their powers and funding may work in the opposite direction.

5.5 Local Decision-Making

Finally then, at a local level, what powers do local authorities have to act and what priority will they afford climate change amongst many other policy priorities? There exists a range of policy measures which could be deployed to cut fuel use and to promote a shift from less to more fuel efficient modes – essentially from low occupancy car to public transport, walking and cycling (Gross et al., 2009; CfIT, 2007; Mayor of London, 2006). A recent study using the English national transport model has developed a list of potential policies which would help transport deliver its part in carbon reduction (Buchan, 2008). Those policies which are relevant to local transport authorities are reviewed in Table 3. The table shows whether the powers are currently available and whether or not they are applied at the sub-regional scale in England and at the local scale in England and Scotland. The assessment of the extent of application is the authors' based on the suggested application range indicated by Buchan or by comparative standards with leading cities elsewhere in Europe. Buchan's assessment of the potential impact of the policies is also provided (although these impacts may only be achievable alongside other changes to national taxes and policies that he recommends (*Ibid*.).

Insert Table 3 about here

The table suggests that there are some differences between powers available to English and Scottish local authorities with respect to the degree of control which could be exerted over workplace parking levies. The differences in practice are however much smaller due to the political difficulties associated with introducing substantial demand restraint. There is also significant uncertainty and potentially substantial revenue risks associated with a major upheaval of the bus industry and so more radical franchising type powers – that could have benefits in terms of GHG

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reductions, by encouraging mode shift - have not been adopted. According to the definition of a "task specific governance structure" offered by Hooghe and Marks (2001, p11), bus operators and rail operators acting alone cannot be seen to constitute a Type II governance body. However, this definition risks understating the very significant influence – and autonomy – that they have over both strategic and operational decisions about elements of public transport policy that in other countries rest firmly with Type I institutions. Thus we argue here that, whilst theory may not permit us to classify them as Type II institutions, their effect on the governance of transport in the UK is profound.

This analysis would suggest that the main policies for local carbon reduction which authorities have control over are parking allocations for new development, smarter choices and improvements to walking, cycling and public transport (bus) infrastructure. The first is important but only likely to have a substantial impact in the longer term, and whilst the latter are all important, without the introduction of demand restraint they are unlikely to achieve their full potential to change travel patterns (Cairns et al., 2004).

There are no countries in the world that have brought about large scale mode shift at a national scale, except in times of war. Evidence from cities and city regions that have reversed the growth in car use and increased the proportion of trips made by cycling, walking and public transport, shows commonalities in their experiences. They have to a greater or lesser degree improved their public transport systems' speed and coverage with network simplification, priority and increased network length; kept public transport prices down, especially for multi-journey (season) tickets; promoted easy interchange between modes and services; improved walking and cycling conditions; and made car travel slower and more costly through traffic and parking management measures. Additionally, in some cases, careful land-use to manage the demand for travel and to focus high trip generating land uses around public transport stops, has also contributed (HiTRANS, 2005). Whilst road user charging schemes offer a potentially important contribution, their implementation difficulties should not be underestimated (May et al., 2000 and Rye, Gaunt and Ison, 2008). The prospects of a major mode shift away from the car therefore seem somewhat remote, and thus of transport making a full contribution to carbon emissions reduction.

In both England (through the Local Area Agreements and New Performance Framework) and Scotland (through the Single Outcome Agreements and Scottish National Performance Framework) cities have the potential to adopt commitments to reduce their carbon emissions. However, both frameworks leave the decision to adopt and set a carbon reduction target to the local authorities. There is, as yet, no guidance on how ambitious a local authority should be (Section 5.1) and little

understanding of the marginal abatement costs in different authorities and areas. The analysis in this section suggests that there are few tools which are currently deemed practicable which would make the adoption of a substantial carbon reduction target a rational policy position to adopt. Nonetheless, it may yet be the case that a sub-set of more radical cities drive forward this agenda by demonstrating early successes. London for example, although having more powers and funding than other cities in the UK, has set a target for a 60% reduction in carbon emissions by 2025 (compared with 1990 levels).

5.6 Transferability

It is not possible, within the constraints of this paper to do justice to an analysis of the transferability of these findings but evidence suggests that many elements will be. Short et al. (2009) report on a study of almost 50 countries in the OECD and central and eastern Europe. Their study examined progress to date and the key policies which have been put in place. They found that:

- "Transport sector emissions have risen strongly between 1990 and 2005, in all regions except many former Eastern Bloc Countries" (p35)

- The majority of measures focus on fuel efficiency and subsidies for public transport with little emphasis on demand management

- "The measures in place today will not achieve net reduction (of GHG) from current levels…

- The analysis is plagued by lack of knowledge about likely costs" (p38, brackets added).

This implies that the same policy dilemma's being faced in England and Scotland are also being faced in many other countries. The English and Scottish decision-making structures differ from those in other countries (Zografos et al., 2005) and this may have a bearing on the types of strategies which different countries can bring forward. However, Betsill and Bulkeley (2007) observe that the reality is likely to be conditioned much more by the growth in importance of Type II institutions and the relationships between public and private actors. Without being specific, it is only possible to conclude generally that the issue of delivery is not uniquely defined by formal institutional structures and so the cases of England and Scotland will have some parallels to other locations.

Conclusions

Climate change is a complex policy problem which spans all levels of territorial governments. Transport is a particularly challenging policy sector as it does not

respect administrative boundaries and so responsibility for action is also therefore contested across administrative frontiers.

At a supranational level, the failure to agree even on how to account for international aviation and maritime exemplifies disagreements in supranational Type II organisations with limited accountability. The notion that a plethora of formal and informal institutions will lead to better outcomes seems not to be borne out for climate change, consistent with theoretical expectations of self-interested responses to externalities. Even at a European level, where member states such as the UK claim to exert a strong steer on policy, the influence of powerful lobby groups on a consensus-led political process appears capable of slowing progress. Many of the major carbon reduction actions pushed forward by Westminster require effective EU action but, as yet, a number of these seem to be falling short of their expectations.

The approach to tackling climate change in England and Scotland does not yet appear to have diverged or led to particular policy innovations evident in other aspects of transport, although the formal structures and processes for delivery do differ in a number of respects. More generally, the evidence base regarding the costs and benefits of change is weak.

The UK approach to transport emissions reductions is established around thinking about Type I institutions and the current delivery mechanisms of the Department for Transport and Scottish Government. In particular there is a split between modes and between national networks and local travel. Whilst on some levels these dichotomies work, journeys do not both start and end on national networks and whilst many trips are local, further analysis by the Department for Transport shows that 44% of all CO_2 from cars comes from journeys of between 5 and 25 miles. The very principles of an integrated transport network imply the need for co-ordinated approaches relevant to the journeys in question.

Local authorities in both England and Scotland may begin to move towards a CO_2 reduction target, guided by the new public management approaches being adopted. It is not clear, however, what contribution will need to come from transport nor, given spatial competition and the spillover of benefits to other areas and other time periods, why any particular authority should seek to set an ambitious transport target.

Multi-level governance has proved a useful analysis framework to begin to study the delivery of climate change policies. It appears that it is becoming increasingly difficult and artificial to maintain discrete levels of hierarchical decision-making steered by Type I institutions, due to the nature of travel and the spatial distribution of businesses. The profusion of Type II institutions whose functional remit does not map well to the climate change agenda and the presence of strong external

industrial lobbies suggests however that further devolution of powers will not necessarily lead to optimal negotiated solutions but may risk further delays and watering down of commitments.

Whilst this paper has not addressed issues of accountability one of the major questions which remains to be answered is who is responsible for tackling GHG emissions and what contribution should each player make? This is certainly highly contested territory. Without clarity over this then action can be put off, blame assigned to other sources and any need to take up accountability obfuscated. The Committee on Climate Change offers a potential route into providing a clearer framework by developing the debate on these issues but it seems unwise to rely on yet another Type II institution to resolve them.

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