NORTHERN ENERGY TASKFORCE

IPPR North

GEARING UP FOR THE TRANSITION

A NORTHERN ENERGY TASKFORCE WORKING PAPER ON THE ROLE OF TRANSPORT IN A NORTHERN ENERGY STRATEGY

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ABOUT THE NORTHERN ENERGY TASKFORCE

The Northern Energy Taskforce has been established to oversee an ambitious programme of work over the next 18 months that will develop an energy strategy for the northern powerhouse. The Taskforce is chaired by Sir John Harman, who will be supported by a number of high-profile figures with expertise across infrastructure, engineering, finance, academia and local government. It is supported by IPPR staff in a research and secretariat capacity.

The taskforce has three central objectives.

- Develop a plan for the northern energy system to 2030, addressing the key needs and challenges facing energy consumers and businesses in the North.
- Create an economic vision for the northern energy sector in 2030 and a practical roadmap for how to get there, addressing the opportunities for businesses, higher education institutions and the public sector in the energy sector.
- Set out a plan for 'energy devolution' that will consider whether and how various powers and responsibilities for energy issues should be devolved to different pan-northern, sub-regional and lEocal levels.

DISCLAIMER

While this report reflects the deliberations of the Northern Energy Taskforce on these issues, it does not represent the view of all members and some disagree with the consensus position. Analysis and recommendations contained within this paper should therefore be attributed to the taskforce as a whole rather than any individual member.

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1. INTRODUCTION

Transport is of foundational importance to the British economy and society. In turn, how transport is powered and the efficiency of its use are some of the most important policy issues facing the country. In the north of England, there has been much focus on transport as a key driver of economic growth, with Transport for the North recently publishing a Strategic Transport Plan position paper for the region (TfN 2017).

Transport is responsible for 41 per cent of total energy consumption in the UK (DfT 2017a). Within this, road transport accounts for 29 per cent, railways for 1 percent, shipping for 2 per cent and aviation for 9 percent. As such, this paper will primarily focus on road transport.

In recent years, the growing understanding of the leading role road transport plays in contributing to illegal levels of air pollution has dramatically enhanced the political salience of transport policies, with as many as 40,000 deaths being attributed to poor air quality each year. Having lost a series of court cases, the government is now required to produce an air quality plan to bring air pollution to within legal levels within the shortest time possible. Central and local governments are developing policies to achieve a faster turnover in the vehicle fleets, from diesel and petrol engines to low and ultra low emission alternatives, including electric, hydrogen and gas. This looks set to accelerate a transition to cleaner, more efficient vehicles that has been underway for decades, partly as a result of to the imperative to decarbonise transport fleets in meeting the UK's climate change obligations.

Meanwhile, developments in digital technology have opened up profound opportunities to improve network efficiency, including an increase in shared vehicle use, a decrease in the overall number of journeys and vehicles, and greater penetration of cleaner fuels. The promotion of ultra low emission and connected and autonomous vehicles features as a major strand of the government's emerging industrial strategy.

This new transport frontier offers a significant socioeconomic opportunity for the UK through reductions in negative health, environmental and congestion outcomes, and the promotion of domestic industry. Furthermore, as the UK leaves the European Union, its already well-developed comparative advantage in innovative mobility solutions could be advantageous as it seeks to seeks to obtain bilateral trading agreements in a world that has broadly committed to net zero emissions, and growing markets in low carbon services and goods.

However, this mobility transition will only succeed if a new generation of clean and connected vehicles can be powered. In particular, suitable ultra low emission fuels will need to accommodate the growth in clean vehicles while also ensuring the steady decarbonisation of their supply chains. The north of England is well positioned to take advantage of this challenge, with its high renewables potential, industrial assets and 'first-mover' advantage in new fuel technologies.

In this context, this paper explores the major problems facing transport, and the potential of a mobility transition to overcome these problems as part of a wider programme of socioeconomic renewal. It argues that the north of England is well positioned to play a leading role in this transition.

2. THE TRANSPORT CHALLENGE

Britain's road transport is responsible for – or at least significantly contributes to – the following major socioeconomic problems.

- **Air pollution**
  Around 40,000 deaths per year in the UK are attributable to exposure to outdoor air pollution, with an estimated overall economic cost in excess of 3.7 per cent of GDP (RCP 2016). Road transport is the dominant source of transport-related air pollution. Non-road transport is responsible for 9.5 per cent of national NOx emissions, compared to 34 per cent for road transport, and 2.5 per cent of national PM10 emissions, in contrast to 14.2 per cent coming from road transport (Defra 2016). The growth in vehicles passing over the UK's roads, particularly diesel, and the increase in journey times resulting from congestion are root causes for the entrenchment of high levels of road-side air pollution in urban areas. The continued failure to comply with legal standards on air pollution has led the European Commission to issue a final warning, after which it may impose large fines. All but two of the eleven UK air quality reporting zones in the North exceed legal limits on nitrogen dioxide (NO_2) (Defra 2017). The Teesside Urban Area and North West and Merseyside zones are, respectively, the third and fourth worst offenders, with maximum annual mean NO_2 concentrations exceeding 150 per cent of the legal limit.
- **Congestion**
  Since 1993, road traffic has increased by around 25 per cent (DfT 2016a), and is expected to increase by a further 36 per cent, to 48 per cent, by 2040 (DfT 2016b). Population growth has continued to result in increased demand for car travel: even if car mileage and the number of trips per capita falls, in line with recent trends, total vehicle miles are still expected to increase. Some forecasts expect the cost of highway congestion will increase to £21 billion a year by 2030, enacting a total cost of £300 billion over the next 16 years in wasted fuel and time (CEBR 2014). Congestion is increasing across the North, with average delays on A roads rising by an average of 3 per cent between 2015 and 2016 (DfT 2017b). Some estimates put the rising economic cost of congestion in excess of £2 billion for Manchester and Liverpool alone by 2015 (INRIX 2016).
- **Carbon emissions**
  Transport is responsible for around 25 per cent of the UK's greenhouse gas emissions, with 93 per cent of domestic emissions coming from road transport (DfT 2016c). Even by 2030, the Department for Transport estimates that only 5 per cent of cars will be powered by electricity rather than petrol or diesel, and rising demand may be outweighing carbon intensity improvements (DfT 2014). While the North East has the lowest carbon dioxide emissions from transport, the North West has above average emissions, at 13.4 $MtCO_2$ in 2014 (DECC 2016).
- **Spatial inefficiency**
  Road transport is also a major determinant of how space is used and, often, this use is highly inefficient. It is estimated that, on average, vehicles are parked for around 97 per cent of the time (Bates and Leibling 2011) and that the average occupancy rate of a private car is less than two people

per journey (DfT 2015). This level of underutilisation is highly inefficient and increases the amount of land given away to vehicles, imposing a large opportunity cost in forgoing alternative spatial opportunities.

These problems are interrelated and are likely to increase over time, or at least to remain highly entrenched. This is partly the result of increasing demand for road use due to population growth and increased urbanisation, as well as changing patterns of consumption and rising incomes, both of which are growing certain businesses – such as home delivery – while imposing high economic costs in return. It is likely that the political impacts of the continuance of these problems, particularly in the case of air pollution, will increase over time.

Outside of road transport, the second greatest consumer of energy in transport is the aviation industry. International aviation emissions represent nearly all UK aviation emissions (CCC 2017). As such, there are little regional policy levers through which to affect the aviation fuel mix beyond the UK's role in international agreements. Indeed, international aviation emissions are not formally included in carbon budgets. In contrast, shipping consumes 2 per cent of UK energy, and around a fifth of shipping emissions come from domestic traffic (CCC 2017). Emissions have been falling. There are a number of areas in which the North can reduce GHG emissions and air pollution from shipping, including, for example, liquefied natural gas (LNG) bunkering, which is seen as an effective way to reduce the cost and environmental impact of ships, by powering them using onshore LNG rather than on-board engines while docked at a port. However, infrastructure to support LNG is very capital-intensive, with a long payback period. This necessitates certainty of energy policy and of LNG supply into the medium term, which has been forthcoming from national government in recent years (Laybourn-Langton et al 2016).

At 1 per cent of UK energy consumption, rail is a low cost, underexploited resource that could enable modal shift across both private and commercial vehicle use. However, funding as well as infrastructural barriers exist that are preventing a modal shift away from congested road routes and towards rail and coastal shipping (Laybourn-Langton et al 2016). While Transport for the North is leading efforts to drive such a modal shift across the region, more support and guidance is needed from central government.

3.
THE MOBILITY TRANSITION

Overcoming these problems will primarily involve changes in the fuel mix of transport fleets and increases in the efficiency of vehicle use.

- **Fuel**: increasing fleet turnover to ultra and zero emission fuels, including electric, hydrogen and gas-powered vehicles.
- **Utilisation**: increases in shared vehicle use, decreases in private use and ownership, consolidation of commercial activities and a transfer to rail and shipping, and reconsidering road building programmes that are likely to induce demand.

In the case of the fuel transition, successive governments have actively sought to increase the uptake of ultra low emission vehicles (ULEV). The current government has an ambition for the UK to be the best place in the world to develop, manufacture and use zero emission vehicles. Accordingly, it has committed to ensuring all new cars and vans produce zero emissions by 2040, and allocated over £600 million into the low emission vehicle market and domestic industry over the last parliament, with an additional £390 million announced in the 2016 Autumn Statement (DfT 2017). Strategic interventions have seen vehicle registrations grow by 145 per cent between 2014 and 2016, and, in 2016, the UK was the largest market in the EU for ultra low emission cars (SMMT 2017).

However, more investment is needed, particularly in bringing down the cost of vehicles and providing more affordable replacement options for commercial fleets, expanding charging infrastructure coverage and in developing battery storage – all areas which are under consideration around the future of industrial strategy (OLEV 2017). Indeed, the government has committed to investing an additional £4.7 billion up to 2020/21 on research and development; this includes the new Industrial Strategy Challenge Fund, which will support the development of battery technologies (BEIS 2017).

In the case of vehicle utilisation, digital technology has enabled the development of new transport services, including journey planners, car clubs and on-demand private hire. In principle, these new mobility services could, as a network, act to complement existing efforts to achieve more sustainable transport and travelling behaviours. A recent study in Lisbon by the International Transport Forum (ITF) modelled the impact of replacing all car and bus trips with shared vehicle trips, providing a system in which private ownership was no longer necessary (ITF 2016). The study found that this system required 3 per cent of the cars to make the same trips in 24 hours because of higher utilisation and occupancy rates. The modelling suggested that this would lead to a 34 per cent fall in CO_2 emissions, as well as reductions in air pollution, with higher utilisation also leading to faster turnover of vehicles, and thus more rapid clean technology penetration. Congestion dropped to negligible levels, enabling higher and more equitable access to healthcare, jobs and education. Moreover, smaller vehicle fleets meant that the parking requirement fell by 95 per cent, providing enormous opportunities for spatial renewal to increase liveability.

Into the future, autonomous vehicles could accelerate these outcomes, with estimates putting the overall socioeconomic benefit of connected and autonomous vehicles at around £51 billion per year by 2030 (KPMG 2015). For this reason, the government has established a Centre for Connected Autonomous Vehicles (CCAV) and invested hundreds of millions of pounds in developing connected and autonomous technologies in the UK. As the determinant of the amount of vehicles on the road and their utilisation rate, the growth of new mobility services will potentially have a non-trivial effect on the energy system.

4.
CAN THE NORTH POWER THE TRANSITION?

Large changes in the fuel mix will increase stress on electricity grids, needing a commensurate increase in energy supply. This will further underline the imperative to decarbonise the energy supply, lest environmental and economic opportunities of switching to ULEV are lost. The north of England is well positioned to lead the UK in rising to this challenge. Primarily, this is because the North has a high renewables potential with well-developed supply chains and the industrial capacity to exploit this potential. As argued in Leading, Adopting or Drifting? (Baxter and Cox 2017), the North's renewable potential will be best realised from a whole-systems approach to the energy system, integrating power, heat and transport. In the case of transport, the mobility transition will only be successful with such an approach, including managing energy demand to support the efficient delivery of mass EV charging, integrating hydrogen vehicle charging with greater hydrogen penetration of heat networks, and continued research, development and deployment of battery storage technologies.

The North already has a first-mover advantage in these areas. Nissan and Northern Powergrid are working together to achieve greater energy system integration for transport, developing capacity for EV owners to sell electricity back to the grid, among other areas (Manning 2017). These efforts come alongside the North's major role in European ULEV production, with Nissan's flagship plant at Sunderland playing a leading role in the manufacture and export of the Nissan Leaf, the world's top selling EV. Northern universities provide the region with a large research and development capacity to support clusters around ULEV production and markets, including, for example, the Institute for Automotive and Manufacturing Advanced Practice at the University of Sunderland, with programmes on hybrid technologies and fuel cells. Research and development capacity is complemented by the strength of regional industrial assets, skill base and relative proximity to centres of innovation in the Midlands (Pitas 2017).

Demand for cleaner vehicles and their supporting infrastructure is set to increase as major urban centres across the North seek to reduce air pollution levels to within legal limits. The energy system will need to be ready. Furthermore, it is unlikely that the air pollution problem, as well as congestion and transport carbon emissions, can be solved through the rollout of clean vehicles alone (Laybourn-Langton et al 2016). More efficient, shared use of transport is required, and so the process of scaling ULEV penetration should move in step with the rollout of car clubs, demand-responsive services and journey planning platforms. Indeed, this is already the case in most urban centres, where, for example, car clubs have a higher penetration of ULEV (Carplus 2017). The North, with its large city areas and developed urban transport networks, has large potential to expand shared mobility markets in the UK.

Alongside these more localised opportunities, Transport for the North (TfN) is developing a Strategic Transport Plan, setting out connectivity priorities

and delivery pathways up to 2050 for the whole of the North (TfN 2017). In doing so, TfN is seeking to increase multi-modality across the region, driving a

modal shift away from private vehicle dependency and toward rail and public transport use. In turn, it may be that attendant reductions in road use affect a net reduction in key outcomes, including air pollution, congestion and carbon emissions. As TfN recognises, the improvement of strategic and local rail connectivity is vital to achieving this vision.

However, TfN's initial position has attracted some criticism for a lack of emphasis on the full spectrum of transport related problems (ibid). In particular, there is a need for TfN to emphasise a holistic vision of progress pertaining to key environmental outcomes for the Northern transport system and their relation to economic indicators. This will require setting targets and accountability mechanisms for reductions in air pollution concentrations, greenhouse gas emissions, congestion and utilisation rates, as well as collecting locally disaggregated data by which to measure the scale of the problem and progress.

A whole-systems approach to the energy and mobility transitions will also be required. TfN is already planning to improve connectivity between non-carbon energy and research assets located along the North West and North East, but greater systems integration of energy and transport infrastructure is needed. Crucially, this integration must enable the accelerated development and deployment of new mobility technologies and services – such as car clubs, electric vehicles and journey planners – as a means to reduce negative transport outcomes and realise the socioeconomic potential of the mobility transition, including the potential for spatial renewal from increased efficiency in utilisation of transport assets. Furthermore, across all of these areas, the transboundary nature of these problems requires greater national coordination.

5. CONCLUSION AND RECOMMENDATIONS

The potential socioeconomic and environmental gains from the realisation of a cleaner, more efficient transport system are enormous. The UK's comparative advantage in the development and deployment of clean and intelligent mobility technologies could confer great domestic benefit, and this advantage is an asset as Britain seeks to obtain trade deals and carve out a global economic and soft power advantage. Indeed, there could be much to learn from abroad; other countries are beginning to overtake the UK in ushering in a new mobility system. Germany, in particular, is undergoing an explicit mobility transition (Verkehrswende); the UK could and should do the same. In doing so, the North could have an important role to play, powering the transition with its renewables potential so the UK can realise the potential of a shared, clean transport future.

There is also a long list of measures that could be taken at the local, pan-northern and national level to ensure the UK realises the potential of the mobility transition.

LOCAL LEVEL

We recommend that:

- local authorities publish easily accessible transport data on air pollution, carbon emissions, congestion and vehicle utilisation rates
- local authorities introduce clean air zones to increase the cost of driving unsustainable vehicles
- local authorities and local enterprise partnerships work in conjunction with Transport for the North to develop Local Mobility Transition Plans, in order to realise the socioeconomic potential of new mobility services and sustainable transport.

PAN-NORTHERN LEVEL

We recommend that Transport for the North:

- provides a clearer vision of how the North can benefit from the mobility transition
- convenes a Northern Trasnport Sutainability Working Group to help coordinate Local Mobility Transition Plans, ensuring these efforts are joined up with pan-regional transport strategies and the emerging industrial strategy
- works with any pan-regional energy bodies to ensure the integration of energy and transport assets as a means to accelerate the transition to a more sustainable fuel mix
- reforms the Mode Shift Revenue Support and Waterborne Freight Grant, and provides clear guidance in the National Planning Strategy and National Policy Statement on ports on how a modal shift from road to rail and shipping can be supported.

NATIONAL LEVEL

We recommend that central government:

- introduce a new Clean Air Act that targets air pollution, including nitrogen oxides and particulate matter
- make an explicit pledge to phase out diesel cars over the coming years – and formally investigate even more ambitious targets – as part new national legislation
- mandate the creation of a network of new clean air zones, covering all major urban areas in the UK
- utilise industrial strategy – in particular the creation of a new smart scrappage scheme – to incentivise business and individuals to drive improvements in air quality
- mandate the Department for Transport to convene all relevant departments, in order to ensure that the transport analysis guidance accurately reflects the cost of air pollution within its appraisal process.

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