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Mullen, C orcid.org/0000-0003-2915-5009 (2020) *Governing a Risky Relationship Between Sustainability and Smart Mobility*. In: Finck, M, Lamping, M, Moscon, V and Richter, H, (eds.) *Smart Urban Mobility - Law, Regulation, and Policy*. MPI Studies on Intellectual Property and Competition Law, 29 . Springer-Verlag , Berlin, Heidelberg , pp. 21-40. ISBN 978-3-662-61919-3

<https://doi.org/10.1007/978-3-662-61920-9>

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Governing a Risky Relationship Between Sustainability and Smart Mobility

Caroline Mullen*

Abstract New mobility services, enabled by developments in digital technology, could be the making of sustainability in urban mobility. Alternatively, they could act to increase car dependence and so worsen what are already severe sustainability problems. Governance of new mobility services needs to steer implementation towards sustainability, and this chapter explores what that governance might look like. The stakes are high because of the extent of sustainability impacts of transport, especially the increasingly urgent need to decarbonise the sector. There is evidence that reductions in car dependence are required to address many of the pressing social, environmental and economic transport problems, including carbon dioxide emissions. Uncertainties about the sustainability implications of new mobility services present challenges for governance. Those governance challenges are heightened by the complex landscape of actors, with new developers and service providers joining an already complicated multi-level system. I argue that collaborative and reflexive governance provides a basis for meeting these challenges of uncertainty and complexity. However, its implementation should involve reframing the relationships between transport authorities and developers of mobility services such that innovation is rewarded, but priority is given to responding to evidence on sustainability impacts as they emerge.

Keywords Sustainability · Decarbonisation · Transport authorities · Reflexive and collaborative governance · Uncertainty · New mobility services

1 Introduction

It is becoming commonplace to draw attention to, and to question, the optimism placed in what is called smart mobility: that is the use of digital technologies to provide and coordinate new mobility services including (where legal) ride sharing, car sharing, shared cycles and scooters, and possibly combinations of these. The optimism is amplified by progress in electrification of transport, and anticipation of increasing automation. The promise is that these new mobility services will reduce reliance on private motor vehicles and so will tackle major problems associated with our current mobility systems.¹ Conversely, the concern is that

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¹ For instance: Iain Docherty, Greg Marsden and Jillian Anable, 'The Governance of Smart Mobility' (2018) 115 Transportation Research Part A 114; A Fonzone, W Saleh and T Rye, 'Smart Urban Mobility – Escaping the Technological Sirens' (2018) 115 Transportation Research Part A 1; M Gebresselassie and TW Sanchez, "'Smart' Tools for Socially Sustainable Transport: A Review of Mobility Apps' (2018) 2 Urban Science 45; E

if we do not get the governance of new mobility services right, then we will be faced with increasing reliance on motor vehicles. Such caution is far from overstated as traffic increases bring problems for social, economic and environmental sustainability, and there is an increasingly acute need for reductions in traffic in order to meet the requirements for decarbonisation. The basis for concern that traffic may increase is the modelling evidence that new mobility services could encourage—and then embed—greater use of vehicles. Researchers, and some governments, have made the case for the importance of good governance of these mobility services, and there have been efforts at outlining the sorts of governance measures which might be required to steer the new mobility services.²

Alongside this consideration of substantive measures, there has been research focusing on how governance can effectively involve the multiple actors engaged in the development of smart mobility.³ New mobility services are not unique in bringing public, private and non-governmental actors together in the provision of mobility,⁴ however it is noticeable that new actors—many of whom had not previously been involved in the mobility sector—are now participating. This may bring into focus the significance of collaboration between actors to enable governance which takes account of, and is informed by, the interests and knowledge of the multiple stakeholders whose actions will shape the use and impact of new mobility services.

What has not yet been given significant attention is the processes of governance as they occur over time, and which are needed to improve the prospects that smart mobility will contribute to, rather than further damage, sustainability. As I argue in this chapter, these processes will

Papa and A Ferreira, 'Sustainable Accessibility and the Implementation of Automated Vehicles: Identifying Critical Decisions' (2018) 2 *Urban Science* 5; Department for Transport, 'Future of Mobility: Urban Strategy: Moving Britain Ahead' (2019) <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/846593/future-of-mobility-strategy.pdf> accessed 10 March 2020; M N Mladenović, 'How Should We Drive Self-driving Vehicles? Anticipation and Collective Imagination in Planning Mobility Futures' in M Finger and M Audouin (eds), *The Governance of Smart Transportation Systems* (The Urban Book Series, Springer 2019); F Sharmeen and H Meurs, 'The Governance of Demand-Responsive Transit Systems—A Multi-level Perspective' in M Finger and M Audouin (eds), *The Governance of Smart Transportation Systems* (The Urban Book Series, Springer 2019).

² Z Wadud, D MacKenzie and P Leiby, 'Help or hindrance? The Travel, Energy and Carbon Impacts of Highly Automated Vehicles' (2016) 86 *Transportation Research Part A* 1; Docherty, Marsden and Anable (n 1); Fonzone, Saleh and Rye (n 1); D Hensher, 'Tackling Road Congestion – What Might it Look Like in the Future Under a Collaborative and Connected Mobility Model?' (2018) 66 *Transport Policy A* 1; J Kent, 'Three Signs Autonomous Vehicles Will Not Lead to Less Car Ownership and Less Car Use in Car Dependent Cities – A Case Study of Sydney, Australia' (2018) 19 *Planning Theory & Practice* 767; G Lyons, 'Getting Smart About Urban Mobility – Aligning the Paradigms of Smart and Sustainable' (2018) 115 *Transportation Research Part A* 4; Greg Marsden, 'Planning for Autonomous Vehicles? Questions of Purpose, Place and Pace' (2018) 19 *Planning Theory & Practice* 771; Department for Transport (n 1); E Fraedrich, D Heinrich, F J Bahamonde-Birke and R Cyganski, (2019) 122 'Autonomous Driving, the Built Environment and Policy Implications' *Transportation Research Part A* 162; A D May, S P Shepherd, P Pfaffenbichler and G Emberger, *The potential impacts of automated cars on urban transport: an exploratory analysis* (World Conference on Transport Research, Mumbai 2019); Sharmeen and Meurs (n 1).

³ Docherty, Marsden and Anable (n 1); Louise Reardon, 'Ensuring Good Governance: The Role of Planners in the Development of Autonomous Vehicles' (2018) 19 *Planning Theory & Practice* 773; Jingrui An and others, 'Collaborative Governance in the Sharing Economy. A Case of Free-Floating Bicycle Sharing with Visualized Analyzation' (2019) 22(supp 1) *The Design Journal* 777.

⁴ For instance, D Hensher and J Stanley, 'Contracting Regimes for Bus Services. What Have We Learnt after 20 years?' (2010) 29 *Research in Transportation Economics* 140; Ian Bache and others, *Multilevel Governance and Climate Change, Insights from Transport Policy* (Roman and Littlefield 2015); Robert Hrelja, Tom Rye and Caroline Mullen, 'Partnerships Between Operators and Public Transport Authorities. Working Practices in Relational Contracting and Collaborative Partnerships' (2018) 116 *Transportation Research Part A: Policy and Practice* 327.

be central to the prospects for effective governance for two major and related reasons. The first of these is common to many sectors, and arises from a recognition that the future is uncertain, and that any governance or regulation which ignores this, and attempts to plan for every eventuality, will run into problems. This recognition underpins a large body of work on collaborative and reflexive governance.⁵ However, as the following sections explore, uncertainty and the beliefs which uncertainty allows take on a particular importance in governing the mobility system. The second reason stems from a combination of the path-dependency which is characteristic of the mobility system, and the acute sustainability problems which are exacerbated by our current mobility system. I will argue that this means that not only is there a risk that smart mobility could increase the difficulty of achieving sustainable mobility, but also that the severity of this risk is heightened by the need to act rapidly to address sustainability concerns. In other words, we cannot afford to go backwards with sustainability of transport. The argument of the chapter indicates that the processes needed to govern new mobility services involve an acceptance that planning and decision-making are reflexive processes which take account of new evidence. An acceptance that we need to rethink the role of both public and private sector service providers, and the way in which service providers can expect to participate in, and benefit from, their engagement in the mobility system is also crucial. Since the argument is concerned with how smart mobility can contribute to sustainability, it concerns what needs to happen, rather than what is easy or perhaps even likely. The justification for this approach is that unless we consider what is required we will not know what to aim for, or how to assess our existing state of affairs.

The chapter is organised into six sections. After this introduction, the next section outlines how and why mobility matters for sustainability. This is a vast area, and space allows us only to focus on the most pressing concerns particularly relevant to new mobility services. So, this section will outline the need for transport to decarbonise, the problems of poor local air quality associated with transport, and the relationship between social exclusion and transport. This section will also briefly review existing literature on the potential sustainability implications of new mobility services. Section 3 will outline historical and current efforts to improve governance for the sustainability of transport and will discuss some of the major challenges for those efforts. This will include an outline of literature and discussions **to date** on governance of smart mobility. This section briefly describes previous and ongoing hopes for technological solutions and some of the criticisms of what is sometimes held to be a reliance on seeking technological fixes. It will then discuss the evidence that for effective change we need to intervene at the level of the mobility system: that is, in order to change the way in which travel is used we need to change the infrastructure, the provision of services, and the economic and social pressures which encourage particular travel practices. It will also indicate the counterpart to this point, which is that the structure and nature of the mobility system influences the way in which people travel. So, if the mobility system develops in a way which privileges motorised mobility then it becomes harder for people to move away from reliance on that mobility. I argue that two points follow from this section. The first of these is that it would be unrealistic to expect the tendency to look to technology to solve complex mobility problems to suddenly disappear. The more so as we are currently witnessing optimism about the potential of new mobility services. Consequently, we might

⁵ D Van Slyke, 'Collaboration and Relational Contracting' in R O'Leary and Lisa Bingham (eds), *The Collaborative Public Manager: New Ideas for the Twenty-First Century* (Georgetown University Press 2009); J Lenoble and M Maesschalck, *Democracy, Law and Governance* (Ashgate 2010); Peter Vincent-Jones and Caroline Mullen, 'From Collaborative to Genetic Governance. The Example of Healthcare Services in England' in O De Schutter and J Lenoble (eds), *Reflexive Governance* (Hart Publishing 2010); Peter Vincent-Jones, 'Contractual Governance: A Social Learning Perspective' in P Valkama, S Bailey and A Anttiroiko (eds), *Organizational Innovation in Public Services* (Palgrave Macmillan 2013).

expect this optimism to influence planning decisions. The second point is the case for ongoing monitoring of the way in which the mobility system is developing, particularly since that development in turn tends to affect prospects for subsequent changes to the mobility system. Section 4 outlines the powers of, and constraints on regional, city, and national governments or transport authorities, when seeking to steer the mobility system. This looks at the legal powers of planners at different levels of government, and at the capacities that those planners have (since the two are not the same). This section informs the subsequent discussion of how new mobility services might be governed to support sustainability. Understanding the constraints and limitations on government actors is, as we would expect, important if we are to understand their powers and possibilities in relation to steering the development of new mobility services and the actions of non-governmental mobility providers. Then it is in Section 5 (informed by the argument of the previous sections) that the argument for a collaborative and reflexive approach to governance of new mobility services is presented. By investigating the circumstances and implications of mobility, the Section makes the case that governance of new mobility services requires significant reassessment of the relationship between public and private actors. The argument also contributes to wider debate about the role of planning authorities at local and national level in shaping the mobility system if we are to support sustainability. Section 6 concludes the chapter.

2 Sustainability and Mobility

Understanding mobility as a matter of sustainability is something that has been mainstream for over two decades, since increasing political and public concern that the previously dominant approach of predict and provide—that is predict traffic increases and build road capacity to accommodate that—was not only failing to bring social and economic benefits, but was also having serious detrimental impacts on the environment and quality of life.⁶ The relationship between mobility and sustainability is complex and vast, and we cannot do more here than to outline some of the major components which will be particularly relevant in thinking about new mobility services. As I have argued elsewhere, in thinking about sustainability and transport, it is helpful to begin by reflecting on the importance that mobility, including all forms of movement from walking to driving to cycling to passenger transport, has in our lives. Mobility enables social, political, personal and economic activities, and is vital for sustaining our lives, particularly given our complex social and economic organisation. So individually and collectively we all benefit from a functioning mobility system, although those benefits are often uneven.⁷ A lack of available, affordable, or accessible transport hampers opportunities, and social and economic welfare.⁸ This lack of access to mobility can be a consequence of poor public transport services, or not owning a car; but it can also be something brought about by high levels of traffic which mean non-vehicular mobility is difficult or even dangerous.⁹ There is significant work on the ways in

⁶ For instance, Caroline Mullen and Greg Marsden, 'Mobility Justice in Low Carbon Energy Transitions' (2016) 18 *Energy Research & Social Science* 109; S Gössling, 'Urban Mobility Justice' (2016) 54 *Journal of Transport Geography* 1.

⁷ Mullen and Marsden, 'Mobility Justice' (n 6).

⁸ John Preston and Fiona Rajé, 'Accessibility, mobility and transport-related social exclusion' (2007) 15 *Journal of Transport Geography* 151; K Lucas and others, 'Transport Poverty and its Adverse Social Consequences' (2016) 169 *Proceedings of the Institution of Civil Engineers - Transport* 353; G Mattioli, '"Forced Car Ownership" in the UK and Germany: Socio-spatial Patterns and Potential Economic Stress Impacts' (2017) 5 *Social Inclusion* 147; Caroline Mullen, Greg Marsden and Ian Philips, 'Seeking Protection from Precarity? Relationships Between Transport Needs and Insecurity in Housing and Employment' (2020) 109 *Geoforum* 4.

⁹ Colin Pooley and others, 'Policies for Promoting Walking and Cycling in England: a View from the Street' (2013) 27 *Transport Policy* 66; Caroline Mullen and others, 'Knowing their Place on the Roads: What Would Equality Mean for Walking and Cycling?' (2014) 61 *Transportation Research Part A* 238.

which planning predicated on car use tends to encourage urban sprawl, which means everyday life involves travel over long distances or complex journeys.¹⁰ There is also evidence that fear of traffic is one of the greatest barriers to cycling.¹¹ Further, there is long standing evidence—since the famous study by Appleyard—that high levels of motor traffic impedes and prevents local mobility on foot.¹² All of this can mean social exclusion for those who cannot drive or cannot own a private vehicle. It can also mean but people take on vehicle ownership even when doing so causes economic hardship.¹³ Alongside all of this is the prominent notion that congestion on the roads is a barrier to economic activity and development.¹⁴ Our use of transport is also responsible for deaths and serious injury through collision, with something under 2000 people killed each year in Britain on the roads, and between 1.2 and 1.3 million people killed worldwide.¹⁵ As with other aspects of transport the burden of risks on the roads are unevenly distributed. As an indication of this, consider that car occupants are more than 10 times less likely to be killed per given distance travelled than cyclists or pedestrians.¹⁶ Reflecting on these issues brings to the fore ways in which mobility matters for social and economic sustainability.

Major environmental concerns associated with transport include greenhouse gas emissions (for which carbon dioxide emissions is often used as a shorthand), local air pollution, pollution of land and water from transport run-off, and land taken by transport which can damage biodiversity.¹⁷ In thinking about the environmental impacts of transport it is important to keep in mind that it is people, and other living beings, who are affected by environmental damage.¹⁸ As such it can be misleading to think of environmental sustainability as something distinct from social sustainability or from economic sustainability, if we consider the economic impacts of environmental harm and of ill health. We have already noted how urban sprawl can be associated with high levels of car use, and that infrastructure and patterns of motor vehicle use have implications for the possibilities of movement on foot or by bicycle and so for the activities associated with that mobility. Beyond this, surface transport is responsible for over one quarter of carbon dioxide emissions in Britain, a proportion which is increasing as other sectors have some success in decarbonisation,¹⁹ and worldwide road transport accounts for between one fifth and one quarter of carbon dioxide emissions.²⁰ Concern about climate change is at the top of the policy agenda at the moment, although—or perhaps because—efforts at decarbonisation are

¹⁰ Mattioli (n 8); Mullen and others, 'Precarity' (n 8).

¹¹ Pooley and others, 'Walking and Cycling' (n 9).

¹² Donald Appleyard, *Liveable Streets* (University of California Press 1981).

¹³ Mattioli (n 8); Mullen and others 'Precarity' (n 8).

¹⁴ See Caroline Mullen and Greg Marsden, 'Transport, Economic Competitiveness and Competition: A City Perspective' (2015) 49 *Journal of Transport Geography* 1. This understanding of the relationship between economic activity and congestion is not without controversy, especially where the understanding relies on views about the economic cost associated with travel time, see for instance David Banister, 'The Sustainable Mobility Paradigm' (2008) 15 *Transport Policy* 73.

¹⁵ World Health Organization, *Global Status Report on Road Safety 2018* (World Health Organization 2018).

¹⁶ Mullen and others, 'Knowing their Place on the Roads' (n 9).

¹⁷ An assessment of how land use taken for transport can impact fauna is given in Mårten Karlson and Ulla Mörtberg, 'A Spatial Ecological Assessment of Fragmentation and Disturbance Effects of the Swedish Road Network' (2015) 134 *Landscape and Urban Planning* 53.

¹⁸ Will Steffen and others, 'Planetary Boundaries: Guiding Human Development on a Changing Planet' (2015) 347 *Science* 6223.

¹⁹ Committee on Climate Change, 'Reducing UK Emissions: 2018 Progress Report to Parliament' (2018) <<https://www.theccc.org.uk/publication/reducing-uk-emissions-2018-progress-report-to-parliament/>> accessed 10 March 2020.

²⁰ International Energy Agency, 'CO2 Emissions from Fuel Combustion: Highlights' (2018) <http://www.indiaenvironmentportal.org.in/files/file/CO2_Emissions_from_Fuel_Combustion_2018_Highlights.pdf> accessed 10 March 2020.

falling well short of levels which appear required if we are to avoid more dangerous climate change.²¹ Transport is faring badly even against this backdrop of inadequate action. The Committee on Climate Change holds that transport needs to decarbonise completely, and it suggests that to successfully achieve this in the time required involves not only the most rapid progress viable on the development and roll out of cleaner vehicles (that is electric vehicles and improvements in the efficiency of conventional vehicles), but also a reduction in motor traffic demand.^{22, 23} As we shall see in the following sections this need to decarbonise is particularly important when thinking about sustainability of new mobility services. Local air pollution from transport, such as nitrogen dioxide and particulate matter, is associated with thousands of early deaths in Britain and millions of early deaths worldwide. The majority of health problems associated with this pollution appear to be cardiovascular, however there is also evidence that pollution from diesel vehicles causes lung cancer, and as time goes on further evidence emerges of links to other forms of ill health.²⁴

Recognition of major sustainability concerns associated with transport is not something fixed but rather something which develops over time as our scientific and social understanding develops (consider for instance our developing understanding of the health impacts of transport pollution such as nitrogen dioxides and particulates). Further, the sustainability impacts of transport change over time.²⁵ Keeping this developing picture in mind is important, as it reminds us that further, as yet unknown or weakly understood sustainability concerns may occur in the future and our governance should be capable of responding to this.

3. Governance and Politics of Mobility

At a high level there is little dispute about the types of measures which will support sustainable mobility or specific components of sustainable mobility. Those include a move to cleaner vehicles, and a reduced reliance on motor traffic enabled by a shift towards more walking and cycling and shared or public transport. However, there can be a worry that there is not enough substance beneath this high-level agreement to tackle the challenges of sustainable mobility. In other words, there is a policy ambition to improve sustainability, but this is not supported by planning or measures to realise the ambition. An example of this is the recent criticism by the Committee on Climate Change of the British government's strategy to decarbonise transport in compliance with the Climate Change Act 2008.²⁶

Related to this is a well-recognised and widely critiqued tendency for planners and politicians to place a high level of hope on technology. This includes the sort of technology which will improve energy efficiency and reduce pollution from vehicles, and increasingly digital

²¹ Intergovernmental Panel on Climate Change, *Summary for Policymakers of IPCC Special Report on Global Warming of 1.5 °C Approved by Governments* (2018) <<https://www.ipcc.ch/2018/10/08/summary-for-policymakers-of-ipcc-special-report-on-global-warming-of-1-5c-approved-by-governments/>> accessed 10 March 2022.

²² The Committee on Climate Change is an independent body which advises the British government on decarbonisation and which produces assessments of the sufficiency of government action on climate.

²³ Annex to letter from Committee on Climate Change (CCC) Lord Deben, Chair of Committee on Climate Change, to Secretaries of State for Transport and Business, Energy and Industrial Strategy (11 October 2018).

²⁴ International Agency for Research on Cancer, *Outdoor Air Pollution: IARC Monographs on the Evaluation of Carcinogenic Risks to Humans* (vol 109, International Agency for Research on Cancer 2015); World Health Organization, *Ambient Air Pollution: A Global Assessment of Exposure and Burden of Disease* (World Health Organization 2016).

²⁵ Consider the increasingly acute impacts of failure to decarbonise transport. See also John Bowers, *Sustainability and Environmental Economics: An Alternative Text* (Longman 1997).

²⁶ CCC Lord Deben (n 23). Note that this letter pre-dates the amendment committing the country to net-zero emissions by 2050: Climate Change Act 2008 (2050 Target Amendment) Order 2019, SI 2019/1056.

technology to coordinate mobility services and reduce reliance on private vehicles (whether automated or driven by humans). While there may be little dispute that technology has a major role to play in sustainable mobility, the concern is that the level of faith placed on technology is unwarranted and may act as a distraction to the sorts of actions required to improve sustainability. We can see this in efforts to decarbonise transport which tend to emphasise technological development.²⁷ However, even where technology brings some progress in relation to pollution, problems for sustainability remain. We have seen a reduction in carbon emissions per kilometre travelled on average for cars in Europe (although the level of this reduction is widely disputed given the increasing gap between reported and real-world efficiency).²⁸ Yet this improvement in efficiency has not led to a corresponding reduction in carbon dioxide emissions from vehicles because traffic volume and vehicle sizes have increased.²⁹ Further, even if technological change were to bring about a substantial reduction in tail pipe emissions, this would still not be sufficient to address sustainability concerns. There would still be problems of emissions, other pollution and resource use (for example carbon dioxide embodied in vehicles and particulate pollution from tyre wear), and complex concerns around the resources required for vehicles, and especially for the batteries in electric vehicles. Beyond this, any approach which does not tackle traffic and car dependence, will at best sustain and at worst exacerbate the social and economic injustices associated with our mobility system which were discussed in the previous section.³⁰

This recent history of a failure of efficiency improvements to turn into a reduction in carbon dioxide emissions serves as a warning in thinking about smart mobility. One of the anticipated benefits of automated transport is improvements in efficiency from the prospect that automated cars will use the roads more efficiently than human drivers, and will not engage in the sorts of inefficient driving practices (those practices being the opposite of what is called eco-driving) which characterise driving by humans.³¹ The questions about whether these efficiencies would really lead to energy and emissions reductions were raised early in research on automation. Those investigating the question have presented modelling evidence which indicates that much depends on how automated vehicles are used and that there is a risk that automation could not only fail to bring hoped for improvements but could actually induce greater use of motor vehicles and hence greater energy consumption and emissions. We return to this question below when looking at how smart technology might influence the way in which transport is used.

Despite uncertainty about the extent to which technology can solve problems of sustainability and transport, it is perhaps understandable at some level that politicians seek to rely on technological solutions. Changing travel demand, and in particular reducing reliance on private vehicles, has proved difficult both politically and practically. The discussion of the last section outlined how a mobility system based to a large extent on motor traffic use

²⁷ See for instance Transport and Environment (2019) Draft National Energy and Climate Plans Transport Ranking <https://www.transportenvironment.org/sites/te/files/publications/2019_06_Draft_NECP_transport_analysis_final.pdf> accessed 10 March 2020; HM Government, *Carbon Plan 2011*; Department for Transport, *Road to Zero Strategy* (2018).

²⁸ See G Fontaras, NG Zacharof and B Ciuffo, 'Fuel Consumption and CO₂ Emissions from Passenger Cars in Europe Laboratory Versus Real-World Emissions' (2017) 60 *Progress in Energy and Combustion Science* 97.

²⁹ CCC, 'Progress Report' (n 19); Jillian Anable, Christian Brand and Caroline Mullen, 'Transport: Taming of the SUV?' in UK Energy Research Centre (ed), *Review of Energy Policy 2019: December 2019* (2019) 10 <https://ukerc.rl.ac.uk/UCAT/PUBLICATIONS/UKERC_Review_Energy_Policy_2019.pdf> accessed 10 March 2020.

³⁰ Mullen and Marsden, 'Mobility Justice' (n 6).

³¹ Wadud, MacKenzie and Leiby, 'Help or Hindrance' (n 2).

becomes one in which it is difficult to travel by other means. The problem is one of path dependency in that once we start to use and accommodate particular ways of travelling and moving goods we then increasingly plan our infrastructure, built environment, and even economic and social activities in a way which comes to depend on those ways of travelling and moving goods. It is not difficult to see the problems that planners face in encouraging or insisting that people change the way in which they travel. We can see this when economic measures, such as fuel tax or road user charging, are used to reduce car use. There are numerous examples of efforts to introduce such measures, and they are generally accompanied by political dispute or protest—sometimes to the extent that the measures cannot be implemented.

Of course, the ideal is to intervene in the mobility system to make life easier to manage without owning a private car, and as the discussion above indicates, the elements which may achieve this would include improving public and shared transport, as well as improving conditions for walking and cycling. The challenge here is to provide the investment and planning which creates an accessible and affordable mobility system, with coverage (that is provision across areas and at times) which enables people to make what are often complex everyday journeys without relying on cars. Such measures, if successful, can improve environmental and social sustainability. Given this, the potential of new mobility services to support sustainability appear very promising. Digital technologies can provide the sorts of information which enables services to be coordinated, and which allows users to navigate their way through multi-modal forms of mobility. For users, the lack of information has been a barrier to reducing car dependence. This has been recognised for well over a decade, and during that period there have been efforts to provide travel planning tools.³² The limitations previously have been a lack of real time information, and sometimes a lack of information about how to use public transport (since this is not always obvious to unfamiliar users).³³ In this way information technology can provide a relatively simple but perhaps very important solution to non-private car travel. It can also be used by service providers to monitor and coordinate public transport and shared transport and to coordinate different modes. However, it is recognised that much of this depends on different providers being willing to share information, and using compatible systems to do so.³⁴ Information technology can also be used to provide pedestrians with information about a route, and this can be particularly helpful for people with mobility difficulties who may need to know about flights of steps or the condition of a footway. For providers, digital technologies underpin the prospects for effectiveness of shared mobility services, including shared bikes and electric scooters, ride sharing (where people pay to travel in a car owned by another person), or car sharing where people collectively own a car. Providers need to be able to track vehicles and to provide users with information about where vehicles located and to coordinate their use.

Yet as noted above there is some discussion about whether automation could increase or decrease transport energy and emissions, and this is tied up with the issue of car sharing or ride sharing. On one hand if people do give up private cars then there is the potential for reductions in emissions and energy use, however this still depends on the way in which ride

³² S Farag and G Lyons, 'To Use or Not to Use? An Empirical Study of Pre-trip Public Transport Information for Business and Leisure Trips and Comparison with Car Travel' (2012) 20 *Transport Policy* 82; J Grotenhuisa, B Wiegman, P Rietveld, 'The Desired Quality of Integrated Multimodal Travel Information in Public Transport: Customer Needs for Time and Effort Savings' (2007) 14 *Transport Policy* 27; S Kenyon and G Lyons, 'The Value of Integrated Multimodal Traveller Information and its Potential Contribution to Modal Change' (2003) 6 *Transportation Research Part F* 1.

³³ See Tim Chatterton and others, 'Flexi-Mobility: Helping Local Authorities Unlock Low Carbon Travel?' (University Transport Studies Group (UTSG) 47th Annual Conference, London, January 2015).

³⁴ This also raises questions about data protection which are largely outside the scope of this chapter.

sharing and car sharing is used. One concern is empty cars driving around waiting for passengers. A further concern is that ride sharing will simply make it easier to travel by car, so even though individual journeys become more efficient, the number of them increases. Added to this is the question of whether, or the extent to which, ride sharing attracts people away from private cars, or instead lures passengers from public transport or discourages walking and cycling.³⁵ There is early empirical evidence emerging that ride sharing, even prior to any automation, is indeed leading to increased traffic. This is happening with ride sharing services such as Uber, for example.³⁶ If new mobility services act to increase traffic, this in turn could further exacerbate car dependence, albeit a form of dependence less predicated on private car ownership than we have at present. So, the risk is that if we begin to use new mobility services in ways which increase rather than reduce traffic, then we may be locking in practices and a mobility system which becomes even more difficult to change than is currently the case. This risk is further increased when we consider how much and how fast our mobility system needs to change if we are to tackle sustainability concerns, particularly those presented by climate change and the need to rapidly reduce carbon emissions.

Questions around bike sharing are slightly different. There are considerations about the attractiveness of shared bicycles for people who do not currently cycle. These are the very people who need to be attracted to bicycle use if we are to see increases in levels of cycling.³⁷ Factors such as the quality of the bicycles, ease of hire, and conditions of use will be relevant. We might also anticipate that the barriers to cycling at present, of which the largest is fear of traffic,³⁸ are going to remain unless that problem is tackled, and a bicycle sharing scheme itself cannot achieve this. There are also questions around the possible implications of shared bicycle and shared scooter schemes (in countries where this is legal) if they are used on footways, and for footway clutter. Both can create safety problems and obstacles for pedestrians, and particularly so for those with any form of mobility difficulty.³⁹ If the pedestrian environment is degraded, this may be a further barrier to sustainable mobility.

4 Transport Planning: Powers and Capacity

In thinking about the power and capacities of local and national governments to steer smart mobility towards sustainability we can begin by reminding ourselves of the existing conditions of a mobility system that is very far from sustainable. Transport authorities are aware that they have legal obligations regarding sustainable mobility and some of those are being pressed by non-governmental organisations and the public.⁴⁰ Yet transport authorities find difficulty in bringing about change. In this context bringing in new actors, and the new mobility services discussed in the last section, may present a solution to a very difficult problem.

³⁵ See, for instance C Pakusch and others, 'Unintended Effects of Autonomous Driving: A Study on Mobility Preferences in the Future' (2018) 10 Sustainability 2404.

³⁶ J Barrios, YV Hochberg and HL Yi, 'The Cost of Convenience: Ridesharing and Traffic Fatalities' (2018) Becker Friedman Institute Working Paper No. 2018-80 <<https://bfi.uchicago.edu/wp-content/uploads/BFI-WP-2018-80.pdf>> accessed 10 March 2020; B Schaller, 'The New Automobility: Lyft, Uber and the Future of American Cities' (Schaller Consulting, 2018) <www.schallerconsult.com/rideservices/automobility.pdf> accessed 9 January 2020.

³⁷ Pooley and others, 'Promoting Walking and Cycling' (n 9).

³⁸ *ibid.*

³⁹ See for instance, Sustrans, 'Our Position on Micromobility' (2019) <<https://www.sustrans.org.uk/our-blog/policy-positions/all/all/our-position-on-micromobility>> accessed 10 January 2020.

⁴⁰ A Andrews, *The Clean Air Handbook: A Practical Guide to EU Air Quality Law* (Client Earth 2014).

One set of questions regarding new mobility services is how transport authorities can commission or find new providers. Transport authorities may have reasons to draw on the expertise of a range of actors to steer mobility, and this could extend to wanting to commission providers who can offer the sorts of information technology discussed in the previous section. The question is whether, or how well, the authority is able to specify what is needed. Further there are substantial ethical concerns around data protection and consent to use of data. Even if the public fully understand that their data will be used by private companies or the public sector, it is very difficult to say that they have a genuine choice about providing their data if that is a requirement for accessing the mobility that they need for everyday life.⁴¹

Further sets of questions surround the mobility parts of the new services and the extent to which there can be alignment between the needs of a functioning sustainable mobility system, and the interests of private providers. On one hand—as has been discussed earlier in this chapter—there are hopes that new mobility services could contribute to developing a sustainable mobility system, something which transport authorities will be aiming to achieve. Moreover, transport authorities in some places may be somewhat reliant on non-governmental and private sector providers of mobility services, if they lack the capacity or resource to run public services themselves. As Docherty et al. have argued, public (transport) authorities in many countries have faced the same sort of hollowing out of the state to which other sectors have been subject over recent decades.⁴² Therefore, new service providers and transport authorities may begin from a position where each has interests in working with the other. Yet it is far from obvious that the interests of different actors can be easily aligned. One consideration is that the interests of private providers are not likely to tend towards providing services in less densely populated areas or providing services at different times of day or night outside peak times. In relation to this we might look at recent history of deregulation of buses in Britain (by the Thatcher government in the 1980s) with the concern over many years that this has meant private providers ‘cherry-pick’ profitable routes, leaving routes to less populated areas to be paid for by public sector providers. Scarcity of resources for public sector providers as meant those services are often cut.⁴³ The result has been a fragmented bus network, to the extent that politicians from left and right have passed legislation intended to enable transport authorities to take bus networks back under public control through franchising. The first such legislation was brought in as part of the Transport Act 2000 and amended in Local Transport Act 2008 by the Blair (Labour government). There have been subsequent efforts by transport authorities to use this legislation to introduce franchising, so while the private sector may actually provide the services, it will be done to a specification set by the transport authority. However, this was not successful partly due to opposition from private bus providers, and perhaps also partly because the legislation was not sufficiently robust to enable transport authorities to push their case. The Bus Services Act 2017, brought in by the May (Conservative) government, was intended to improve the legislation to enable franchising and at the time of writing Greater Manchester is consulting on the introduction of bus franchising. Another factor which might stand in the way of aligned interests is where new mobility services take up either footway or carriageway space, the providers of those services would not have an automatic interest in taking responsibility for the space used, and if there are no restrictions then that may be to their advantage. The problem is that space is scarce, and vehicles left by the side of the carriageway reduce space for other road users. In

⁴¹ See Jonathan Andrew in this volume.

⁴² Docherty, Marsden and Anable (n 1).

⁴³ Campaign for Better Transport, ‘Buses in Crisis: a Report on Funding Across England and Wales 2010-2018’ (2018) <<https://bettertransport.org.uk/sites/default/files/research-files/19.04.12.bic-2018.pdf>> accessed 10 January 2020.

addition, as noted in the last section, anything left on pavements—such as shared bicycles—can create obstacles to pedestrians, especially those with mobility difficulties.⁴⁴ A further area where misaligned interests present a substantial risk concerns safety. This includes the safety of vehicles, other road users related to the new mobility services, and drivers of ride sharing services (at least unless all until full automation becomes commonplace). There is some emerging empirical evidence of safety concerns associated with ride sharing, if those working as drivers on the new services have low rates of pay and so need to work long hours, become tired, and are therefore less able to drive safely. In other words, drivers are working for long periods which presents a risk to themselves (in relation to their health and their safety) and to others.⁴⁵

Where interests are not aligned, transport authorities may consider how to shape, or in some cases restrict or constrain new mobility services in their jurisdiction. We can note that some services in some places will be illegal unless laws are changed—this is the case in Britain with electric scooters which are neither allowed on the public carriageway nor the footway.⁴⁶ Beyond this, transport authorities do have legal powers to prevent or restrict the way in which mobility services run. As Marsden has argued, transport authorities have significant powers over the way in which carriageways and kerbsides are used, and the exercise of these powers could be influential in determining how or whether new mobility services function in a given area.⁴⁷ Authorities may also have powers over licensing, such as licensing of taxis and shared ride services, and again these could be used to steer a functioning of services. A challenge for transport authorities may come from the service providers however, if they decide to test the legality of any restrictions. This type of challenge presents difficulties for transport authorities. First is that there may be uncertainty about the outcome until something is tested by the courts, and this can lead to caution on both sides. However, transport authorities face a further challenge from scarcity, something which has arguably increased over the past decade in many countries, and this could add to a view that they do not have the resources to risk taking on legal cases.⁴⁸ For similar reasons of scarce resources, transport authorities may also have limited capacity to enforce restrictions of powers. However, these powers may at least provide a negotiating tool to help bring different actors together to find common ground.

5 Reflexive and Collaborative Processes of Smart Mobility Governance

Our central question is how can governance develop to support sustainability of smart mobility? As has been recognised in other literature the introduction of new actors increases the case for collaborative approaches to governance.⁴⁹ As we noted in the introduction the mobility system has always been a system of multiple actors rather than one governing actor, but it has not always been conceptualised as such. The work on collaborative governance recognises that different actors have different interests and that they have different expertise and knowledge. Collaborative and reflexive governance also brings recognition of uncertainty centre stage. This matters because it is always the case that we do not know how exactly transport measures will play out, and that uncertainty may be increased with the introduction of new mobility services. In assessing the likely implications of changes to the mobility system, we can be guided by evidence from modelling and previous cases. Yet transport

⁴⁴ Marsden, ‘Planning for Autonomous Vehicles?’ (n 2); Pooley and others, ‘Promoting Walking and Cycling’ (n 9).

⁴⁵ Barrios, Hochberg and Yi, ‘The Cost of Convenience’ (n 36).

⁴⁶ Road Traffic Act 1988.

⁴⁷ Marsden, ‘Planning for Autonomous Vehicles?’ (n 2).

⁴⁸ Docherty, Marsden and Anable (n 1).

⁴⁹ An and others, ‘Collaborative Governance in the Sharing Economy’ (n 3).

policy is littered with examples of poor forecasting, which is all too frequently used in the development of transport decisions. Arguably, one of the problems with forecasting is the assumptions used to explain existing transport behaviour. A further and related problem in assessments of future mobility is a tendency to adopt what is frequently shown to be an erroneous assumption that things will carry on as before, rather than considering the implications of the range of factors which can influence mobility including wider systemic economic and social changes.⁵⁰ So there is a case for governance which expects uncertainty and which seeks to take account of that in the processes of decision-making.

There has been attention to collaborative and reflexive governance in many sectors over decades. Although this came late to transport, it has been considered for several years. It is worth briefly mentioning some of the characteristics underlining this form of governance. To begin, and as was touched on in the last section of this chapter, collaborative and reflexive governance recognises that different actors have different expertise and different interests.⁵¹ It is intended to enable each party to learn from others. It also identifies the need to seek a sufficient commonality between actors, so that they can understand they are engaged in a common project. This does not mean that they will be able to realise all their interests, but the intention is that they will better meet their individual interests in this way than if they see themselves solely in competition. We can see from this that reflexivity is central, so this is more than a negotiation. Instead it is intended to be a process of learning which enables the development of decisions which are informed by the knowledge of all the different actors and which can best meet the interests of those actors.⁵² The common interests are set as high level principles designed to take account of uncertainty. Rather than trying to plan for every eventuality (something which is unlikely to succeed) the principles can guide decision-making over time as events unfold.⁵³ What is crucial is a process of decision-making that the actors are content with, and this requires a level of trust among actors. This trust is not something that would be expected to be placed without justification.⁵⁴ Much of the work on reflexive governance emphasises the importance of continuing relationships through which trust is built. So, there has to be trust that, in the process of decision-making, actors will not seek to undermine each other at every turn but will instead accept the spirit of the principles on which they have agreed. Alongside this, those working on collaborative and reflexive governance recognise the importance of monitoring and benchmarking as means of assessing how well decisions are being made given the principles which are intended to guide them.⁵⁵ In transport we might see benchmarking against cases in other cities and countries.

So, on one level we might say that there is a case for collaborative and reflexive governance because of the multiple actors and because of the uncertainty of new mobility services. However, there are characteristics of smart mobility which have some quite specific

⁵⁰ Chatterton and others, 'Flexi-Mobility' (n 33); Mullen and Marsden 'Mobility Justice' (n 6); Greg Marsden and others, *All Change? The Future of Travel Demand and the Implications for Policy and Planning: the First Report of the Commission on Travel Demand* (Commission on Travel Demand 2018).

⁵¹ For instance, James Bohman, 'The Coming of Age of Deliberative Democracy' (1998) 6 *The Journal of Political Philosophy* 400; Hrelja, Rye and Mullen, 'Partnerships Between Operators' (n 4).

⁵² Cf Sabel, 'Learning by Monitoring: The Institutions of Economic Development', in NJ Smelser and R Swedberg (eds), *The Handbook of Economic Sociology* (Russell Sage Foundation 1994). Van Slyke, 'Collaboration and Relational Contracting' (n 5); Lenoble and Maesschalck, *Democracy, Law and Governance* (n 5); Vincent-Jones and Mullen, 'Collaborative to Genetic Governance' (n 5); Hrelja, Rye and Mullen, 'Partnerships Between Operators' (n 4).

⁵³ Sabel, 'Learning by Monitoring' (n 50); Van Slyke, 'Collaboration and Relational Contracting' (n 5); Hrelja, Rye and Mullen, 'Partnerships Between Operators' (n 4).

⁵⁴ Onora O'Neill, *Question of Trust: The BBC Reith Lectures 2002* (Cambridge University Press 2002).

⁵⁵ Sabel, 'Learning by Monitoring' (n 50); Van Slyke, 'Collaboration and Relational Contracting' (n 5); Hrelja, Rye and Mullen, 'Partnerships Between Operators' (n 4).

implications for the way in which reflexive governance would need to work. These raise challenges for reflexive governance, and also arguably strengthen the case for such an approach. To recap, the questions around the way in which new mobility services actually work are particularly important given the acute sustainability concerns, especially on decarbonisation. We cannot afford to be taking decisions which increase carbon emissions. The risks here are exacerbated by path dependency, so that the more we lock ourselves into increased energy use and carbon emissions the harder it is to get ourselves out of it. This makes managing uncertainty particularly important. Given this, we need to take seriously the tendency towards optimism which is particularly prominent in relation to (hoped-for) technological solutions. What we have seen is that strategies attempting to tackle serious sustainability concerns in mobility can amount to little more than a high-level ambition without a robust plan to support it. Since these historical and contemporary examples are quite well recognised, we might hope that it will guard against a similar tendency in future. Yet this itself may be overly optimistic, and a more risk averse approach would be to try and take account of this tendency within processes of governance. A governance process which recognises uncertainty, and which recognises we need to adapt to unfolding events may offer some protection against previous over-optimism, since it at least offers the possibility of changing approach if that optimism is recognised to be unfounded. The effectiveness of this will depend on the quality and sensitivity of monitoring, and the ability to set up assessment processes which pick up early signs if mobility services are not supporting sustainability. This might include measures such as assessing the comprehensiveness and affordability and accessibility of services, and congestion levels. This approach also keeps open the possibility of benefiting from new mobility services, and in that sense it guards against greater risk aversion towards new mobility services. In other words, it could act as a sort of insurance about the new mobility services which might otherwise face opposition from the public and from transport authorities.

However, there is a potentially serious barrier to reflexive governance in this case. Reflexive governance requires careful monitoring of the implications of new mobility services, and responding if those new services are acting to the detriment of sustainability rather than supporting it. The question is what form this response takes. It may be that services simply need to be altered and that this can be done without greatly affecting the interests of the service providers. Yet this might not be the case, and it could be that the service needs radically changing, restricting, or even removing all together. To a private provider this presents a significant risk, and we might question whether it is one that they would be willing to sign up to. One issue is whether the benefits to service providers are substantial enough to take the chance that their services may be cut. However, the risk for the transport authority and planners (and so for the wider public) is that this acts as an obstacle to service providers developing services which may bring sustainability benefits. So, if mobility systems could benefit from new services brought by private or non-governmental providers, then this form of reflexive government may need to be coupled with a system of rewards which is not predicated primarily, or solely, on the service provision. Instead it may need to give significant attention to rewarding engagement with public sector transport planners on problem solving and rewarding experimentation which might (but which also might not) lead to successful new services. This would require public sector investment for the experimentation, something which may appear unappealing when compared with the prospect of bringing in private sector providers who are rewarded by users rather than the state. However, governments and the public sector already invests in mobility through infrastructure and maintenance, and often through service provision. They also pay indirectly through the health services needed to respond to road traffic collisions and poor health from transport related pollution. Governments and the public sector, along with private sector organisations,

will also face financial costs associated with climate change.⁵⁶ There are of course wider risks associated with this idea, including risks of exploitation by private actors, and there remains a burden on decision makers to consider who to engage with. Nevertheless, the risks of this approach do allow us to avoid some of the more substantial risks of becoming locked into services which are detrimental and the corresponding risk of ignoring the possibility of services which may bring improvements.

It may be quite apparent from this that the reflexive governance we are considering is not a meeting of two equal parties, and as such is unlike the sort of engagement we might get between two companies. Instead it fixes the role of transport authorities in steering, planning and assessing public transport. Given this, there is a wider case for a collaborative or participatory approach to transport governance which involves robust public participation, in part to draw on the public's knowledge about what mobility services they require in order to enable them to go about daily activities without relying on private motor transport.

6 Conclusion

The risks of technological optimism have not been overlooked in relation to smart mobility and in fact there has been a good awareness of these risks both in research literature and policy. However, within the debate around smart mobility there is a more limited awareness of the scale of the challenge facing us. This is particularly so in relation to the need for decarbonisation and to reduce traffic in order to decarbonise at the rates required to avoid more dangerous climate change. Much of the attention has been focused on the risks of increasing congestion, and while this is important it may be distracting from the problem that simply keeping traffic at existing levels is not enough to tackle decarbonisation. The scale of sustainability challenges coupled with path dependency creates a strong case for governance capable of taking account of uncertainty. This should be done in a way that avoids continued use of services when evidence emerges that they are detrimental to sustainability, whilst leaving open the prospect of new services which can support major sustainability aims.

There has been attention elsewhere on the need for collaboration and for adaptation in relation to mobility, particularly to new mobility services. However, this chapter has shown it is only when we work through the processes of governance and consider what this means in the case of mobility, that we can see there are some quite specific implications. There is a case for changing the relationship between service providers and transport authorities, and also a case for changing expectations of the potential rewards for private service providers. The prospect that services may need to be discontinued reframes arguments about the rewards which service providers may expect. The need to monitor services, and to assess whether or how they are supporting sustainability, clarifies the role and responsibility of public sector transport providers in steering the nature of mobility services.

⁵⁶ A point made over a decade ago by Nicholas Stern, *Economics of Climate Change: The Stern Review*. (Cambridge University Press 2007).