The Road to Sustainable Travel: The role of visions, forecasts and pathways

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Summary

Visions of the future of personal mobility, as seen in forecasts, roadmaps and pathways written by and for policymakers and the automotive industry, tend to assume little change in how we get around beyond switching to new types of cars. What is more, while there are many scenarios of successfully meeting emission targets and transport goals, there are few that show where we might fail. This narrow vision might leave us underprepared in the future. Specific shortcomings include:

- Many scenarios project a simple one-for-one replacement of conventional (petrol- and diesel-powered) vehicles with electric vehicles (EVs) over coming years and decades. This does not play to the strength of electrified transport, which has trouble competing on quick refuelling, length of travel and upfront cost, but has other advantages, which might only materialise in the longer term, such as ICT connectivity and electricity storage.
- A one-for-one replacement in an otherwise unchanged transport system is also unrealistic, as a shift to EVs requires, and will cause, changes as new functionalities emerge. Using EVs as storage is one new aspect but there are others, including changing behaviour patterns of travel due to electrification needs, which might have large impacts on grid management, traffic patterns and more.
- People and their behaviours are not adequately represented in the visions analysed. It is well established that travel decisions, from daily commute to car purchase, are not adequately captured by the 'rational actor' approach. Scenarios would benefit from a more realistic and complex approach to travel behaviour, considering not only price, but changing context, culture and habit.

Recommendations

Our recommendations focus on the need for a broader variety of visions of the future, from a wider array of stakeholders, as the basis for policymaking. These should include a more realistic understanding of behaviour and demand and acceptance of disruption and discontinuity as part of a transition to a more sustainable transport system.

Our research

This briefing is based on a study of how visions of personal mobility are constructed. We analysed 20 relevant documents from the period 2002-2015, which contain forecasts or other future visions of UK personal transport. The documents were written by and for a range of stakeholders in the UK transport sector, including the Department for Transport (DfT), Department of Energy and Climate Change (DECC), the Committee on Climate Change (CCC), the RAC, National Grid and Foresight. Our study focused on two innovations in private car technology and use: electric vehicles (EVs) and car clubs.

The full papers are available online:
Imagined people, behaviour and future mobility: Insights from visions of electric vehicles and car clubs in the United Kingdom
http://www.sciencedirect.com/science/article/pii/S0967070X1630381X

Stories of the future: Personal mobility innovation in the United Kingdom:
http://www.sciencedirect.com/science/article/pii/S2214629617302001?via%3Dihub

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The role of forecasting, pathways and scenarios in the innovation process

Visions of the future are very powerful tools, politically and culturally. They influence reality by legitimising action in the present to work towards a commonly perceived future. A strong vision of sustainable, low carbon mobility can inspire engineers towards technological innovation, funders to invest in new inventions, and policymakers to support courses of action. A shared vision can capture public imagination and garner support for policy.

Forecasting and scenario exercises play a key role in creating visions of the future. They can legitimise – or delegitimise – certain technologies, especially when put forward by powerful actors, such as policymakers, financial actors or business and industry. It is therefore important to consider what visions are being created, how and by whom, and whether they are serving policymaking (and society) as well as possible.

In this briefing we highlight some of the shortcomings we identified with scenarios and forecasting studies that have been carried out in the UK and provide some recommendations for how they might be remedied.

Visions of future mobility tend to be too narrow

Our analysis found that the majority of reports had a 'narrow' view of the future. That is, they were much more likely to feature incremental change, in the form of a straightforward substitution of electric vehicles for petrol and diesel cars, than more radical change to the transport system. Non-technical innovations, such as car clubs or more fundamental changes such as reduced mobility (perhaps as a result of teleworking or future changes to city planning), or other forms of electric mobility (such as electric bikes, buses and mobility scooters) were much less likely to feature. Moreover, the effects of electric mobility (such as the effects on the oil industry and the car repair industry and changes to local travel patterns) were ignored.

The growing interest in autonomous vehicles, which could combine the technological innovation of electric vehicles (and more) with the product-to-service shift approach of car clubs, is an example of an innovation which could cause a systemic shift in the transport system, including considerable disruption. This example and other potentially more radical changes to the system were absent from most of the documents analysed.

Many of the forecasts appeared to be influenced by two key drivers: the need to decarbonise and the need to continue with current patterns of mobility to support our current model of economic growth. Other factors, such as tackling congestion or air pollution played a less prominent role. In other words, a narrow framing of sustainability was effectively adopted, one which minimises required change to the transport system (see box).

Framing

The way transport, in particular car-based transport, is framed, plays a crucial role in the visions and narratives we build about the future. Car-based transport can be framed as a right or as a necessary evil, as a means of economic growth or as a source of pollution and social inequality. Sustainability can likewise be framed narrowly as reducing greenhouse gas emissions, or more broadly addressing a host of environmental, social and economic concerns. These different framings lead us to build and support different narratives about desirable and plausible futures.

The result is a simplistic and static future, in which technological innovation minimises the environmental burdens from transport, thus allowing for a business as usual focus on economic growth. It ignores some of the broader possibilities and implications of electric mobility.

It was notable that elements that don't fit this narrow vision of the future are lacking or absent. For example, the so-called 'peak car' phenomenon was absent from all studies. This well recognised phenomenon has, since around 1990, shown the use and private ownership of cars to have stabilised and even declined throughout the developed world, particularly among younger generations and in cities, although the dynamic is complex and not fully understood.

Another notable example is that only one study (National Grid[i]) generated scenarios that actually missed carbon targets (despite the fact that the UK is currently not on track to meet emission reduction ambitions in the transport sector[ii]) and only one (Foresight[iii]) contained radically different views of the future.

A vision of the future where EVs are being sold as a technological substitute for internal combustion engine vehicles (ICEVs) presents three important problems:

1. EVs have to compete on ICEVs' terms

A narrow vision of the future can unintentionally perpetuate ownership and use of ICEVs as the norm against which any other form of mobility has to compete. This is problematic because EVs have the potential to bring benefits to the transport system, but which are not necessarily advantageous in the current system with its expectations of immediate availability of personally owned vehicles.

For example, ICEVs' fortes include quick fuel refill and long distance travel; two challenges for electric vehicles. Meanwhile, EV advantages such as connectivity to a smart grid system (for example, as short term electricity storage) are not necessarily recognised in the current system. EVs have a high up front cost, which is a barrier to purchase, but a low running cost; again, this makes them less suited to the current personally-owned car model.

By conceiving ICEVs as the norm, EVs appear suboptimal in comparison, increasing the barriers to a shift to EVs. Moreover, this framing risks potentially preventing a deeper transition towards sustainability by locking out alternative futures and limiting EVs to the role of a techno-fix, rather than explore the vast possibilities of electrical mobility.

2. 'Colonising the future'

Too many similar narrow visions from powerful actors can collectively have the effect of 'colonising the future' – presenting a single narrative of the future as if it is indeed inevitable. This can then become a self-fulfilling prophesy:

- A 'technofix' framing helps reinforce currently prevailing understandings of the relationships between economy, transport, technology and environment – and may reduce opportunities to tackle problems such as congestion and air pollution.
- Narrow visions legitimise incumbency instead of genuinely empowering disruptive innovations and systemic change in the way that might be needed for a sustainable transition – that is, overly narrow visions may themselves be a barrier to disruptive innovations.

3. The lack of scope leaves us poorly prepared to deal with shocks to the systems

Among the documents analysed, typical visions of the future had an unrealistic lack of disruption and discontinuity, and therefore would leave us poorly prepared for bigger changes. For example, the fuel shift away from oil would itself be hugely disruptive, and is not engaged with in any of the studies. Changes to the electricity grid, local travel patterns, and even the car repair market could all cause disruption as well.

As mentioned above, other potentially disruptive changes, such as the 'peak car' phenomenon and the growing interest in autonomous vehicles are generally not engaged with. This highlights the unrealistic expectations of continuity despite technological change.

People and behaviours do not fit the models

Our study found that the models that are often used to predict/forecast people's choices and behaviours are overly simplistic and do not adequately reflect best understanding of human behaviour and the context in which choices are made. Below we set out four ways in which the models fall short.

1. People are not economic rational actors

People are imagined and modelled primarily as 'economic rational actors' who make choices that maximise their utility. However, there is a wealth of evidence demonstrating that people do not behave as purely rational consumers. For example, there are habit-related behaviours, (people prefer tried and tested technologies and show brand loyalty) and cars can act as a status symbols or source of identity.

Documents by and for government[iv] were the most likely to use simplistic rational actor models whereas the automotive industry more readily recognises the variety of factors that affect car purchase decisions.

As people are 'irrational' when it comes to cars, the focus on upfront cost as the key barrier to EV purchase could be misguided as other barriers and drivers are missed. Moreover, the meaning of the car in society is changing, and arguably becoming *less* of a status symbol among younger generations, as evidenced by the peak car phenomenon.

Several reports by and for government[v] seem to be puzzled that people are not buying EVs despite cost and benefit analysis suggesting that they 'should' prefer these vehicles. This highlights the need for a better understanding of when and how to use such economic models.

2. Modelling behaviour change

The reports tend to focus on behaviour very narrowly as a choice of which car people will buy, not whether they buy a car at all or make other changes to mobility practices. Several modelling exercises[vi] use assumptions of completely unchanged mobility practices, including distances travelled, except for choice of which type of car to purchase.

Capturing the changes in demand creation is impossible if demand is poorly understood and modelled. A simplistic portrayal of behaviour can lead to poor policy as projections could be unrealistic and drivers and barriers to change are misrepresented. This could leave us underprepared for the future.

Portraying behaviour as individual travel decisions and car purchases also misses the context in which decisions are made. Greater change to a more sustainable travel system requires not only lower carbon vehicles, but city planning, joined up transport and more, enabling a different set of choices for people, and a contextually and culturally different space.

Crucially, we note that different models of behaviour *do* tend to be used when considering changes such as reduced travel or modal shift. For example, one document suggests that successful demand-side emission reduction programmes (e.g., Smarter Choices) would require "locking in" via ongoing use of policy levers, as evidence suggests consumers might revert to previous behaviours; this is in line with what we know about behaviour – but not with rational actor models.

Furthermore, there is a distinct lack of projections which use models assessing how individuals and households might behave as 'rational actors' by deciding to forgo their cars if public transport and slow modes (cycling and walking) became cheaper, more available and convenient; only one of our documents – an academic paper – used rational actor modelling to project car club potential[vii]. In other words, implicitly or explicitly, the importance of habit and the difficulty of changing behaviour patterns is recognised for non-car modes of travel. This discrepancy reveals inconsistent assumptions about behaviour, and a bias towards continued high demand for personal vehicles.

3. People are not just consumers

There is some consideration of people as subjects whose behaviour affects sustainability (primarily through uptake), but little thought of the public as stakeholders, knowledge providers, or partners in shaping the future. For example only two of the 20 reports we studied had primary research of people's opinions via consumer surveys.

This passive role accorded to users can miss opportunities for other possible shifts towards sustainability, such as reduced travel demand. It can also fail to predict changes from innovations which emerge from the bottom up, such as car clubs, or behaviour as 'prosumers' (someone who both produces and consumes electricity), if EVs become part of a vehicle-to-grid system.

4. People are not all identical

Many of the documents, especially those with a focus on low carbon vehicles, imagine people as roughly identical, interchangeable users. When heterogeneity is acknowledged, it is usually in the form of population segmentation (into groups of interchangeable individuals) focusing on the order of adoption (with consideration on how to support uptake for each segment), but not on heterogeneity of use or needs.

Recent research on population segmentation emphasises heterogeneity more, highlighting how EVs are more attractive to population sub-groups for reasons including upfront and running costs, variety of car types and brands, image and charging issues[viii]. Documents which show an explicit interest in serving a heterogeneous public suggest that a broad range of brands and models of EVs are required for different preferences and needs. However, the emphasis is on consumer choice and the need for EVs to replace ICEVs through mirroring existing choices and brand loyalty, rather than an analysis of different vehicles for different needs.

References and further reading

[i] National Grid (2015) *Future Energy Scenarios: UK gas and electricity transmission*

[ii] Committee on Climate Change (2017) *Meeting Carbon Budgets: Closing the policy gap. 2017 Report to Parliament*.

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[iv] King, J. (2007) The King Review of low-carbon cars: Part I: the potential for CO2 reduction. HM Treasury; King, J. (2008) The King Review of low-carbon cars: Part II: recommendations for action. HM Treasury; Committee on Climate Change (2010). The Fourth Carbon Budget: Reducing emissions through the 2020s; Department for Business Enterprise and Regulatory Reform & Department for Transport (2008) Investigation into the Scope for the Transport Sector to Switch to Electric Vehicles and Plugin Hybrid Vehicles.

[v] ibid

[vi] Department for Business Enterprise and Regulatory Reform & Department for Transport (2008) Investigation into the Scope for the Transport Sector to Switch to Electric Vehicles and Plugin Hybrid Vehicles; Energy Saving Trust (2002). *Pathways to Future Vehicles*; Energy Saving Trust (2007) *Passenger Car Market transformation model*.

[vii] Le Vine, S., Lee-Gosselin, M., Sivakumar, A. & Polak, J (2014). A new approach to predict the market and impacts of round-trip and point-to-point carsharing systems: Case study of London. *Transp. Res. Part D Transp. Environ*. **32**, 218–229

[viii] For example, Brand, C., Cluzel, C. & Anable, J. (2017) Modeling the uptake of plug-in vehicles in a heterogeneous car market using a consumer segmentation approach. *Transp. Res. Part A Policy Pract.* **97**, 121–136

[ix] Lyons, G. *Future Demand: Summary report*. (NZ Ministry of Transport, 2014).

Conclusions and recommendations

1. A broader and more diverse set of visions is needed for policymaking

Most of the documents studied present a static future as an unbroken continuation of the present and recent past. A broader set of visions for the future would serve us better in preparation for change and planning for the transport of the future.

Commissioning forecasts and future projections from a broader set of actors, including those representing public transport, car clubs and slow modes, and sustainable transport promoters, as well as diverse transport researchers, could lead to visions that challenge assumptions of the current transport system (as the Foresight scenarios do[iii]), and this should be welcomed by policymakers. We must ask the difficult questions: Will travel by personal car continued to be seen as a right? Will low carbon vehicles deliver the emissions reduction targets they promise?

2. A new approach is needed to thinking about mobility futures

The visions contain an element of determinism, presenting a future which is presumed to be inevitable. This is a simplistic and static future, in which technological innovation in the form of electric vehicles replacing petrol and diesel cars allows for a business as usual focus on economic growth by minimising the environmental burdens such growth will cause, while ignoring some of the broader possibilities and implications of electric mobility.

Even if car travel will persist as the norm for decades into the future, it will inevitably change as technologies, infrastructure and society change. Models that assume a simple substitution of petrol and diesel cars with electric vehicles are therefore unrealistic. A better approach would be for policymakers to embrace the changes that might happen in the transport system, and plan for them.

A good example of this type of approach is the New Zealand Ministry of Transport's Future Demand project, which considered 'How could or should our transport system evolve in order to support mobility in the future?'. This project recommends moving from 'predict and provide' to debating desired mobility futures and providing for them, and aims to improve understanding of changing demand patterns as a way of dealing with uncertainty, and 'refreshing' demand models periodically.[ix]

3. Policymakers need to consider wider issues relating to mobility and sustainability; not just emissions

While swapping petrol and diesel vehicles for electric vehicles can improve air quality and contribute to emissions reduction, this alone is far from a panacea. It does not address issues of **traffic congestion**, which could grow worse if we rely on personal car use. Nor does it address issues of **inequality**, which are the result of limited access to mobility among those who can't drive or can't afford a car. Even the contribution of electric mobility to **emissions reduction** is limited unless an enormous investment in renewable electricity, energy storage and grid upgrade is made.

The Government has made a commitment to ban sales of new petrol and diesel vehicles from 2040. While this is a fantastic opportunity, it must not be squandered. It is an opportunity to build a truly sustainable vision of personal transport.

4. Use a more sophisticated approach to modelling behaviour in all studies

Planning for the future requires more realistic portrayal of people and behaviour. Too many models assume economic rational actor behaviour, ignoring the limits to this model and the contexts within which travel decisions are made. Studies with a more realistic view of travel behaviour in a broader context are needed, which apply the same methods consistently to car travel and other modes of behaviour.

5. Think about how things might go wrong, as well as how they might go right

It is important not only to have a variety of scenarios for the future, but that these scenarios include both successes and failures in meeting emission reduction targets and other policy goals. This more realistic portrayal of the future could better serve policymakers in policy choices. Failure to think about failure means we could be left underprepared for the future.