Oliver Lah,
Chapter 6 - National Urban Mobility Policy Frameworks,
Editor(s): Oliver Lah,
Sustainable Urban Mobility Pathways,
Elsevier, 2019,
Pages 119-132,
ISBN 9780128148976,

https://doi.org/10.1016/B978-0-12-814897-6.00006-5.

Oliver Lah

National Urban Mobility Policy Frameworks

Book Chapter

Sustainable Urban Mobility Pathways

https://doi.org/10.1016/B978-0-12-814897-6.00005-3

National Urban Mobility Policy Frameworks

Oliver Lah

Abstract

The transport sector can be set on a sustainable development pathway through cost-effect efficiency gains. They can be achieved through already existing technologies and practices, which will not alone reduce greenhouse gas emissions considerably, but also create social, environmental and economic co-benefits. However, growth in the uptake of low-carbon mobility measures fails to meet the potential. This is resulting from a number of contributing obstacles. This chapter explores these and outlines key elements of a wider policy framework to improve the efficiency of the transport sector and reduce emissions. This chapter recommends that a combination of fuel pricing, differentiated vehicle taxation, vehicle standards coupled with a National Urban Mobility Policy that provides a framework for policy coordination and funding flows is required to move transport on a sustainable development path. Funds generated through national level policy fuel and vehicle taxation measures can provide the sources of investments for improved urban design and modal choices, which are vital cornerstones of a transition towards low-carbon mobility.

Keywords: Sustainability, fuel efficiency, policies, low-carbon transport, climate change

1. Introduction

Decarbonising the transport sector accounts requires an interplay of all available mitigation options, which includes, among others, vehicle fuel efficiency, modal choice and compact urban design, covering all transport modes at both national and local levels of government. Local and national sustainable transport policy measures provide a wealth of experience. However, apart from the design and implementation of single policies, a number of combined measures is needed for their success in avoiding rebound effects and to advance the contribution of low-carbon mobility to sustainable development. A mutually enforcing set of policy and infrastructure measures are required at both the national and local level to achieve this. This chapter will shed a light on the key obstacles to energy efficiency in the transport sector and will address the key policy steps needed to be undertaken in order to overcome them.

2. Obstacles to low-carbon transport

Moving to a low-carbon development pathway demands the transport sector make considerable efforts. The argument could be made, however, that fuel economy improvements are no-regret options to lower CO_2 and harmful emissions, better energy security and increase economic productivity (Greene 2009). There is a pressing need to boost vehicle fuel efficiency from economic, societal and environmental perspectives. Doing so has the potential to lead to co-benefits, if the efficiency technology is strengthened enough to be introduced cost-effectively (Leinert et al. 2013; Viguié and Hallegatte 2012). However, vehicle fuel efficiency technologies are widely underused; while a few countries have made significant progress in this area, others have largely failed to do so (IEA 2013). There are split incentives between societal and individual benefits that produce a collective action problem, which hinders optimal outcomes in this area. The next section will explore those obstacles and emphasise the need for policy intervention.

Split incentives

The initial-financial barrier is a pressing problem, especially for individuals, even though information of the relevant payback periods is available (Lescaroux 2010; Giblin, S., McNabola 2009). The key factor holding back improvement of the vehicle fleet's efficiency is the split incentive between individual-cost and economy-wide benefits, which is particularly strong in the transport sector. Vehicle purchases are made by individuals who apply discount rates up to 20%, while most consumers do not take into consideration cost-savings from fuel efficiency beyond 2-3 years (ITF 2010). As such, only a small percentage of the economy-wide benefits are taken into consideration by individuals when deciding on a purchase, with negative consequences on the economy-wide benefits/costs over the approximately 15 year lifespan of the vehicle.

The investment barrier continues to be the most pressing obstacle to the widespread market penetration of energy efficient products (Sorell et al. 2009). Various studies indicate that GHG reduction measures in transport have quite favourable abatement costs but need higher capital intensity than many measures in other sectors (McKinsey and Company 2009; Shalizi and Lecocq 2009). Even though over the lifetime of a vehicle these investments lead to considerable economy-wide benefits, they may not create sufficient payback rates for consumers ultimately responsible for vehicle purchasing decisions. However, these efficiency gains may be undermined by rebound effects, in turn further complicating the collective action problem. These are explored in the following section.

Rebound effects

The rebound or take-back effect is an additional issue impacting upon energy efficiency measures. The effect refers to the tendency for total demand for energy reduction less than anticipated after energy efficiency improvements are introduced caused by the subsequent decrease in the cost of energy services (Sorrell 2010; Gillingham et al. 2013). Ignoring or underestimating this effect when planning policies may result in producing inaccurate forecasts and unrealistic expectations of the outcomes, which, in turn, give way to considerable errors in the calculations of policies' payback periods (WEC 2008). One of the most common examples in the transport sector is increased vehicle efficiency failing to generate the desired fall in energy consumption, as efficiency gains are counteracted by increased travel.

Some authors even claim that energy efficiency improvements can lead to increased energy consumption: the rebound effect is greater than the original efficiency gain (Khazzoom 1987; Inhaber 1997; Brookes 2000). This claim has yet to be validated, however a number of studies illustrate that the rebound effect is in fact a concern which should be taken into consideration when formulating effective energy efficiency policies (S. Sorrell 2009), but should not act as a reason for not implementing efficiency policies (Gillingham et al. 2013). The expected rebound effect is approximately 0-12% for household appliances such as fridges, washing machines and lighting, while it is up to 20% for industrial processes and 10-30% for road transport (IEA 1998). A high potential rebound effect coupled with a wide range of possible take-back, results in a greater uncertainty of a policy's cost effectiveness and its impact upon energy efficiency (Ruzzenenti and Basosi 2008).

The collective action problem

Individual motivation and political will to achieve collective action are allied in numerous ways (Olson 1965). Individuals are inclined to be driven by rational behaviour and therefore opt for the most cost effective choice, irrespective of how morally objectionable it may be (Diamond 2005). When it comes to global climate change, individual perpetrators can be relatively assured of getting away with behaviour that is detrimental to the environment (e.g. driving a large instead of a small car) if there is no policy framework guiding individual behaviour. This depicts the common social dilemma situation, which dissuades individuals from cooperating, as they can free-ride on the contributions of others. Atmospheric pollution is a tragedy-of-the-commons in reverse. It is not the situation of taking something out of the commons, but instead is concerned with putting something into it (the atmosphere), namely carbon dioxide. The overuse of the atmosphere as a dumping ground for greenhouse gases is the outcome of individuals rationally deciding to maximise their personal gain (wealth, comfort, status etc.) through increasing their carbon footprint, or at least by not reducing it (Stern 2006). This condones and promotes bad behaviour, as good behaviour would be penalised (e.g. increased travel time as a result of taking the bus, or Increased prices through flight emissions offsetting). Energy consumers are more often than not rational, however each individual acts differently. Governing the commons means also dealing with the varying habits of those who use it (Dietz 2003, Stern et al. 2002).

Synergies as cornerstones to overcome barriers and link local and national policy objectives

While from a climate change mitigation angle vehicle efficiency and low-carbon fuels may provide the greatest potential, this is not completely reflective of a broader sustainable transport perspective. A multimodal and integrated policy approach can reduce rebound effects, overcome split-incentives and create more socio-economic co-benefits (Givoni 2014). Energy efficiency and low-carbon fuels have a pivotal role to play in decarbonizing the transport sector. However, strategies, such as avoiding travel through compact city design and shifting to low-carbon modes are the measures which yield considerable opportunities to contribute to sustainable development (see Chapter 4).

The combination of varying policy objectives which can be addressed through an integrated multi-level policy and governance approach gives a firm basis for durable polices which can have long-lasting effects. Climate change, air quality, noise prevention, safety, energy security and productivity are key policy goals for policy makers at both local and national level, despite to varying degrees (de Hartog et al. 2010; Rabl and de Nazelle 2012; Tiwari and Jain 2012; Jewell, Cherp, and Riahi 2013). The polices outlined in the next section provide a framework in which synergies between the policy objectives can be created to nurture the contribution of low-carbon mobility to sustainable development.

Overcome the barriers to fuel efficiency through policy

There are numerous policy options to increase the efficiency of the vehicle fleet (UKERC, 2009, ITF 2010, IEA 2013, IPCC 2014). This section outlines some of the leading aspects of policies which are seen in this chapter as being key for a low-carbon vehicle fleet: vehicle efficiency standards, fuel tax, and differentiated vehicle taxes. These measures, coupled with the provision of modal choices and compact city design, are believed to lower transport activity, move towards a more efficient transport structure, improve the energy intensity of fuels and foster the uptake of low-carbon fuels. Only this integrated approach can produce the co-benefits necessary to create coalitions among national and local stakeholders, which is needed to overcome the barriers discussed previously.

National level policies

Vehicle fuel efficiency standards

Fuel efficiency standards aim to safeguard a supply of efficient vehicles and, even more importantly, aim to curb the level of fuel consumption throughout the vehicle fleet. The key benefit of this measure, for policy-makers, compared with other mechanisms is the need to deal with only a relatively small number of car manufacturers, compared with other policies which usually target a vast number of individuals.

The provision of long-term efficiency targets provides certainty to vehicle manufacturers; critical for them to invest in new technologies (Schipper, 2007). To ensure conditions for all manufacturers are equal, standards should apply to all vehicles entering the fleet, irrespective of the whether they are locally manufactured or imported. Furthermore, efficiency targets should be combined with demand-side polices in order to guarantee the supply of more efficient vehicles meets consumer demand. Together, the resultant changes have the possibility to achieve the largest share of CO_2 mitigation in the transport sector. However, a debate is unfolding regarding whether or not fuel economy standards individually are the most effective way of lowering transport fuel consumption and GHG emissions. Even though the leading manufacturing countries have standards in place, they have failed to create substantive progress in reducing vehicle fleet carbon emissions, which is related to some extent to cheating practices in the automotive industry, but also to a lack of policy measures that reinforce efficiency gains, in particular stronger fuel taxation. This remains in line with the observation that only integrated policy packages, alongside standards and fiscal measures, will achieve significant results.

The rebound effects which standards, as the sole policy measure to reduce fuel consumption can initiate, remains their key shortfall (Skinner et al. 2010; Van Dender 2009; IEA 2009; Santos, Behrendt, and Teytelboym 2010). Vehicle efficiency standards lower the financial cost of driving and in turn encourage increased travel (Plotkin, 2009). However, increased travel in association with stricter standards is not treated as a strong argument against them, because the increased travel declines as income rises (Small and Van Dender, 2004). In addition, the rebound effect can be reduced by appropriate fuel pricing, as discussed below. From a societal viewpoint, individuals do not act responsibly when undertaking purchasing decisions. Consumers seldom evaluate the trade-off between higher initial cost for efficient vehicles and the advantage of fuel saved, as previously discussed. The gap between private and societal discount rates can be alleviated to some degree by policies, an example of which is vehicle standards (O. Lah 2014).

Fuel taxes

Fuel taxes and excise duty rates ought to be set at a level, which internalises external costs (e.g. from GHG emissions) (Barker et al., 2007; Litman 2008). This would directly impact upon both travel demand and the vehicle technologies used and, in turn, fleet fuel consumption and CO_2 emissions. Also, fuel prices potentially have a considerable impact on rate of vehicle ownership. The influence of fuel price changes on consumption is defined as its price-elasticity. At present, there is little change in demand in response to price changes (WEC, 2009), e.g. a 10% fuel-price increase leads to only 0.11%-0.6% lower demand (Goodwin et al., 2004; Graham/Glaister, 2004; Small/Van Dender, 2007), i.e. fuel demand is inelastic in the short term. However, more sustained fuel price increases, e.g. from taxation, lead to considerable reduction on energy demand : a 10% rise in fuel prices will yield a 2.5% to 3% decrease in energy use in the first year and up to 6% after 5 years (Goodwin et al., 2004).

Fuel prices impact upon both energy demand and vehicle choice. A 10% rise in petrol prices would lead to a fleet-average CO_2 emissions reduction of ≈0.5 g/km in the first year, and up to ≈2.8 g/km in the longer term (Ryan et al., 2008). Goodwin et al. (2004) estimate the vehicle efficiency improvement resulting from a 10% fuel price increase to be 11% over the long-term. Irrespective of this evidence.

Differentiated vehicle taxation

Consumer demand can be guided by differentiated vehicle registration, purchase taxes and/or feebate schemes. This in turn can help reduce split incentives between individuals and society. These schemes need to be responsive to developments in the vehicle fleet to guarantee sufficient demand for more efficient vehicles and to increase cost-effectiveness (TIS, 2002; Nemry, et al., 2009). Circulation/ownership taxes are a reoccurring charge (typically yearly), which can be used to promote purchasing more efficient cars by calculating the charge according to cars' fuel economy, either directly or by proxy (CO_2 emissions, engine size or power-to-weight ratio). Relating taxes to greenhouse gas and harmful emissions like this is a well established and researched policy measure, and has proven to be more cost-effective than enforcing direct controls (Baumol and Oates, 1971; Baumol, 1972; Parry,2007).

Ryan et al. (2008) analyse the influence of fiscal instruments' on individual purchasing decisions, finding that vehicle and fuel taxes have a significant impact on the efficiency of vehicles introduced into the fleet. An increase in vehicle circulation taxes by 10% could yield a short-term decrease of 0.3 g/km in fleet CO_2 emissions, rising to 1.4 g/km in the long term (Ryan et al., 2008). The European Commission believes it to be essential to differentiate taxes, rewarding energy efficient cars with considerably lower taxes and imposing significant taxes on cars with poor fuel efficiency. COWI (2002) found that substituting existing vehicle taxes with taxes dependent on only CO_2 emissions, with sufficient differentiation, resulted in the largest reductions. Where differentiated taxes are already in existence, the addition of a CO_2 emissions dependant element provides smaller, but still notable reductions. For example, the Irish CO_2 emissions-differentiated vehicle tax is estimated to have led to a 3.6–3.8% emissions intensity reduction and a yearly transport CO_2 emissions reduction of 3% (Giblin, McNabola 2008). Under a feebate system, the level of progression is being increased over time, and thus result in even greater CO_2 emissions reduction, but considerable savings also could be attained by increasing the differentiation of existing taxes.

Registration taxes

Through placing higher taxes on the purchase of less efficient vehicles, registration taxes directly impact upon consumer behaviour at the point of vehicle sale. Denmark's purchase-tax system saw an average increase in fuel efficiency of 4.1 l/100km for diesel light vehicles and 0.6 l/100km for petrol (Smokers et al., 2006). Purchase or registration taxes are very visible, which is especially helpful in guiding buyers' decisions towards more efficient vehicles and may also give way to a reduction in car ownership rates (Anable/Bitrow, 2007): a 10% growth in car registration taxes would see a reduction in car ownership in European cities by about 1.4% (Smokers et al., 2006), which would, consequently, result in lower overall car use and a greater share of more efficient modes in urban areas. However, this may result in negative welfare or equity implications (UK ERC, 2009). Taxes imposed at the time of the first registration could lead to the delay of vehicle fleet renewal, as car owners may keep their vehicles longer and may prefer to replace their current vehicle with used, rather than new ones (Kageson, 2003). An ex-post assessment of the Netherland's feebates estimated that approximately 0.6-1m tonnes of CO_2 per annum was saved through the scheme (Harmsen et al. 2003), accounting for approximately 2-3% of the Netherland's total transport sector CO_2 emissions. The Dutch system's use of direct incentives to buy very efficient cars has had a measurable impact on purchasing decisions, with the market share of cars from the highest efficiency class rising from 0.3% to 3.2%, and that for the second highest class increasing from 9.5% to 16.1% in 2002 (VROM; 2003). Subsequent to the government's decision to terminate the feebates, efficient cars' market share fell almost instantly, even though it remained higher than before the introduction of the scheme (Smokers et al. 2006).

France established a feebate scheme in December 2007. Through the scheme vehicles with CO_2 emissions below 60 g/km (e.g. electric vehicles and plug-in hybrids) are rewarded a rebate of up to €5,000. The scheme also covers a charging fee of €2,600 for cars with CO_2 emissions above 250g/km. According to official figures, the scheme has been very successful, with sales of vehicles with CO_2 emissions less than 130 g/km increasing 45% in the first eight months of the scheme. A number of ex-ante calculations have been made of the policy potential of feebate schemes. A feebate scheme of US$ 1,000 for every 0.01 gallon per mile improvement, if introduced in the United States for one year and then stopped, would lead to a light vehicle fleet efficiency increase of 24% over the following 10 to 15 years (Greene et al. 2005). Langer (2005) estimated that a feebate of US$1,825/gallon/100mi (4.25 L/km) would lower the average fuel consumption of vehicles introduced into the the fleet 16% by 2010 and 28% by 2020.

Policy packaging and integration

It is frequently claimed that transport is the most difficult sector to decarbonise (ECMT 2007; IEA 2011). However, some countries have achieved emissions reductions in this sector, at least to some degree. While it is recognised that current measures in most, if not all, countries will not be enough to put transport onto a 2°C pathway, some countries have shown reasonable progress.

It has been emphasized in a number of studies that vehicle fuel efficiency improvements are a key gauge to cost-effectively reduce transport-sector energy consumption (and in turn greenhouse gas emissions), in specific over the short- and medium term (IPCC 2014). While emissions reductions can be secured through several different ways, such as modal shift, efficiency gains and reduced transport activity, it is apparent that vehicle efficiency has a vital role to play. Fulton et al. (2013) state that considerable cuts in overall travel and substantial modal shifts would be necessary to take the place of slightly reduced fuel efficiency improvement in OECD countries, and likewise, that travel demand growth would need to be restrained significantly if reasonable efficiency gains are not continued in developing countries. While in developing and emerging countries will be more on maintaining the currently still high share of low-carbon transport modes, fuel efficiency will play an important role to facilitate the growth in travel demand and still making a contribution to global climate change mitigation efforts. A vital element for this strategy is a policy package as outlined in the previous sections and summarised in the below table .

Table 2: Elements of a multi-modal, multi-level sustainable transport package

Examples for national measures	**Examples for local measures**
Fuel tax	Compact city design and integrated planning
Vehicle tax based on fuel efficiency and/or CO2 emissions	Provision of public transport, walking and cycling infrastructure and services
Vehicle fuel efficiency regulation and labelling	Urban logistics
	Travel demand management, incl. Road User Charging, parking pricing, access restrictions
	Registration restrictions and number plate auctions
	Public awareness campaigns, eco-driving schemes

The integrated policy approach is discussed in more detail in chapter 4 and chapter 5 emphasises that not only the policies alone (*content*) are an important, but also the policy environment (*context*) (Oliver Lah 2017). This context includes not only socio-economic, but also political aspects, taking into consideration the institutional structures of countries. The combination of policies and policy objectives can help building coalitions, but can also enlarge the risk of the failure of the package if one element faces strong opposition, which, nonetheless, can be overcome if the process is managed carefully (Sørensen et al. 2014). A key aspect of success is the involvement at an early stage of potential veto players and the incorporation of their policy objectives in the agenda setting (Tsebelis and Garrett 1996).

National Urban Mobility Policies

Urban mobility plays a key role in the decarbonisation of the transport sector and in delivering on the Paris Agreement, the Sustainable Development Goals and the New Urban Agenda. The complexity of urban transportation requires a strong policy framework from the national level that supports integrated urban design, enables the shift to low-carbon modes and fosters the take-up of low-carbon vehicle technologies. While this creates challenges for appropriate policy design that avoids trade-offs, it also creates opportunities for co-benefits between climate policy and other objectives, such as safety, air quality and energy security. The interplay of various policy objectives calls for coalitions among key local and national political actors and a National Urban Mobility Policy (NUMP) can provide a framework and process for this.

A coherent National Urban Mobility Policy (NUMP) that links national and local policy and investment flows is a vital element in a common strategy to decarbonise the transport sector. NUMPs can help to ensure policy coherence on the national level (vertical integration) and foster the take-up of Sustainable Urban Mobility Plans by cities (horizontal integration). A NUMP identifies the linkages between local and national policies, sets-up coordination mechanisms between institutions in charge of delivering on urban mobility policy and planning, establishes funding and financing mechanisms that embrace the concept of subsidiarity, but also ensure that local actions meet national climate and sustainable development objectives. It aims at policy coherence and the exploitation of synergies among different policy fields on the national level (vertical integration) and at facilitating the uptake of high-quality Sustainable Urban Mobility Plans (SUMPs) in cities and regions (horizontal integration, enabling cities). Elaborating and adopting a NUMP is a consensus building process that defines system boundaries (i.e. relevant policy fields and actors), derives and ranks policy objectives, responsibilities and resources, identifies policy measures and establishes a review and evaluation process.

There are critical interlinkages that need to be addressed by NUMPs:

- Decarbonisation of the transport sector is not possible through isolated measures. A broad range of local and national actions are needed to bring the sectors on to low-carbon development path. NUMPs need to ensure local and national actions are complementary and mutually reinforcing.
- A holistic policy approach is needed to deliver on wider sustainable development objectives. Addressing a broader range of policy objectives can help forming coalitions and consensus among key political and societal actors. NUMPs need to provide frameworks that help addressing a range of sustainable development objectives.
- Consensus oriented institutions are needed to maintain a stable policy environment that enables the long-term transitions towards a low-carbon development path. Coordination mechanisms established during the course of the development of an NUMP should aim to develop a consensus on key policy objectives, how to deliver on them and how to fund them.

Key elements of NUMPs

National Urban Mobility Policies (NUMPs) provide a framework for municipal authorities to deliver sustainable urban transport systems and mobility solutions. NUMPs identify the linkages between policies and regulations, removes barriers and structures local and national funding flows to increase efficiency and give clear priorities to sustainable transport infrastructure investments.

Key elements of a NUMP are:

- A long-term vision for sustainable transport at the local and national level
- Co-creation of policy priorities
- Identification of the needs of local authorities
- Coordination among all relevant ministries
- Facilitation of dialogue between the local, sub-national and national level
- Consensus building and based on a common understanding; build a sense of ownership among key actors
- Support for the development of SUMPs and foster coherence horizontally and vertically
- Provide financial resources to enable cities (resources and competences), eliminating incentives for non-sustainable mobility on the national level
- Establish monitoring and reporting systems, analyse and integrate external costs

Conclusion

Lowering greenhouse gas emissions in the transport sector is a pressing challenge. The situation varies significantly from country to country, but it is clear that these differences can best be explained through policies. The packaging and integration of policy is a key component of the (relative) successes. Policies have to be designed to be part of a consistent framework, with the goal of improving vehicle fleet efficiency, but also of promoting efficient vehicle use. If applied as standalone measures it is unlikely they will achieve their stated goals of lowering overall emissions and increasing vehicle fuel efficiency. For example, vehicle standards alone are likely to raise the fleet's efficiency, but this improvement is likely to be countered by increased vehicle use (rebound effect). Likewise, higher fuel taxes, without the provision of modal alternatives and/or measures to guarantee a supply of efficient vehicles, would negatively impact on mobility and transport affordability. As such a balanced and integrated policy approach, which combines vehicle efficiency standards, fuel tax, differentiated vehicle taxes with the provision of modal choices and compact city design, is necessary. While the mixture of measures is key to the success of sustainable transport policies, the policy environment and the institutional structures are equally key to make these policies succeed. National Urban Mobility Policies and institutional frameworks can help coordinating these actions across levels of government and establish the basis for coalitions that can connect local and national governments and other relevant stakeholders.

Bibliography

Banister, David. 2008. "The Sustainable Mobility Paradigm." *Transport Policy* 15 (2): 73–80.

———. 2011. "Cities, Mobility and Climate Change." *Special Section on Alternative Travel Futures* 19 (6): 1538–46. https://doi.org/10.1016/j.jtrangeo.2011.03.009.

Boschmann, E.Eric. 2011. "Job Access, Location Decision, and the Working Poor: A Qualitative Study in the Columbus, Ohio Metropolitan Area." *Geoforum* 42 (6): 671–82. https://doi.org/10.1016/j.geoforum.2011.06.005.

Carisma, B., and S. Lowder. 2007. "Estimating the Economic Costs of Traffic Congestion: A Review of Literature on Various Cities & Countries."

Cherp, Aleh, Adeola Adenikinju, Andreas Goldthau, Francisco Hernandez, Larry Hughes, Jaap Jansen, Jessica Jewell, et al. 2012. "Chapter 5 - Energy and Security." In *Global Energy Assessment - Toward a Sustainable Future*, 325–84. Cambridge University Press, Cambridge, UK and New York, NY, USA and the International Institute for Applied Systems Analysis, Laxenburg, Austria. www.globalenergyassessment.org.

Creutzig, Felix, and Dongquan He. 2009. "Climate Change Mitigation and Co-Benefits of Feasible Transport Demand Policies in Beijing." *Transportation Research Part D: Transport and Environment* 14 (2): 120–31. https://doi.org/doi: 10.1016/j.trd.2008.11.007.

Delucchi, M. A. 2010. "Impacts of Biofuels on Climate Change, Water Use, and Land Use." *Annals of the New York Academy of Sciences* 1195: 28–45. https://doi.org/10.1111/j.1749-6632.2010.05457.x.

ECMT. 2007. *Cutting Transport CO_2 Emissions: What Progress?* Paris: OECD. http://www.internationaltransportforum.org/Pub/pdf/07CuttingCO2.pdf.

Figueroa Meza, Maria J., Oliver Lah, Lewis M. Fulton, Alan C. McKinnon, and Geetam Tiwari. 2014. "Energy for Transport." *Annual Review of Environment and Resources* 39 (1): null.

Fulton, Lewis, Oliver Lah, and François Cuenot. 2013. "Transport Pathways for Light Duty Vehicles: Towards a 2° Scenario." *Sustainability* 5 (5): 1863–74. https://doi.org/10.3390/su5051863.

GEA. 2012. *Global Energy Assessment - Toward a Sustainable Future*. Cambridge University Press, Cambridge, UK and New York, NY, USA and the International Institute for Applied Systems Analysis, Laxenburg, Austria. www.globalenergyassessment.org.
Giblin, S., McNabola, A. 2009. "Modelling the Impacts of a Carbon Emission-Differentiated Vehicle Tax System on CO2 Emissions Intensity from New Vehicle Purchases in Ireland." *Energy Policy* 37 (4): 1404–11.
Gillingham, Kenneth, Matthew J. Kotchen, David S. Rapson, and Gernot Wagner. 2013. "Energy Policy: The Rebound Effect Is Overplayed." *Nature* 493 (7433): 475–76. https://doi.org/10.1038/493475a.
Givoni, Moshe. 2014. "Addressing Transport Policy Challenges through Policy-Packaging." *Policy Packaging* 60 (0): 1–8. https://doi.org/10.1016/j.tra.2013.10.012.
Goodwin, P. 2004. "The Economic Costs of Road Traffic Congestion." London, UK.: UCL (University College London), The Rail Freight Group.
Hartog, Jeroen Johan de, Hanna Boogaard, Hans Nijland, and Gerard Hoek. 2010. "Do the Health Benefits of Cycling Outweigh the Risks?" *Environmental Health Perspectives* 118 (8): 1109–16. https://doi.org/10.1289/ehp.0901747.
Hultkrantz, Lars, Gunnar Lindberg, and Camilla Andersson. 2006. "The Value of Improved Road Safety." *Journal of Risk and Uncertainty* 32 (2): 151–70.
IEA. 2011. *World Energy Outlook 2011*. Paris: International Energy Agency, OECD/IEA.
———. 2012. "Energy Technology Perspectives 2012." Paris: International Energy Agency.
Jacobsen, P.L. 2003. "Safety in Numbers: More Walkers and Bicyclists, Safer Walking and Bicycling." *Injury Prevention* 9 (3): 205–9.
Jewell, J., A. Cherp, and K. Riahi. 2013. "Energy Security under De-Carbonization Energy Scenarios." *Energy Policy* 65: 743–760.
JICA. 2005. "The Master Plan for Lima and Callo Metropolitan Area Urban Transportation in the Republic of Peru; Chapter 6, Traffic Control and Management Conditions." Transport Council of Lima and Callo, Ministry of Transportation and Communications of the Republic of Peru.
Kahn Ribeiro, Suzanna, and Maria Josefina Figueroa. 2012. "Energy End-Use: Transportation." In *Global Energy Assessment - Toward a Sustainable Future*, 575–648. Vienna, Austria, Cambridge, UK and New York, NY, USA: International Institute for Applied Systems Analysis and Cambridge University Press.
Kunieda, Mika, and Aimée Gauthier. 2007. "Gender and Urban Transport: Smart and Affordable — Module 7a. Sustainable Transport: A Sourcebook for Policy-Makers in Developing Cities." Eschborn, Germany: Deutsche Gesellschaft fur Technische Zusammenarbeit (GTZ).
Lah, O. 2014. "The Barriers to Vehicle Fuel Efficiency and Policies to Overcome Them." *European Transport Research Review*.
Lah, Oliver. 2017. "Continuity and Change: Dealing with Political Volatility to Advance Climate Change Mitigation Strategies—Examples from the Transport Sector." *Sustainability* 9 (6). https://doi.org/10.3390/su9060959.
Leiby, P.N. 2007. "Estimating the Energy Security Benefits of Reduced U. S. Oil Imports." *Estimating the Energy Security Benefits of Reduced US Oil Imports*.
Leinert, Stephan, Hannah Daly, Bernard Hyde, and Brian Ó Gallachóir. 2013. "Co-Benefits? Not Always: Quantifying the Negative Effect of a CO_2-Reducing Car Taxation Policy on NOx Emissions." *Energy Policy* 63 (December): 1151–59. https://doi.org/10.1016/j.enpol.2013.09.063.
Lescaroux, François. 2010. "Car Ownership in Relation to Income Distribution and Consumers' Spending Decisions." *Journal of Transport Economics and Policy (JTEP)* 44 (2): 207–30.
Leung, Guy C.K. 2011. "China's Energy Security: Perception and Reality." *Energy Policy* 39 (3): 1330–37. https://doi.org/10.1016/j.enpol.2010.12.005.

Marshall, Julian D. 2011. “Energy-Efficient Urban Form.” *Environmental Science & Technology* 42 (9): 3133–37. https://doi.org/doi: 10.1021/es087047l.
McKinsey, and Company. 2009. *Roads toward a Low-Carbon Future: Reducing CO2 Emissions from Passenger Vehicles in the Global Road Transportation System*.
Miranda, Hellem de Freitas, and Antônio Nélson Rodrigues da Silva. 2012. “Benchmarking Sustainable Urban Mobility: The Case of Curitiba, Brazil.” *Transport Policy* 21: 141–51. https://doi.org/10.1016/j.tranpol.2012.03.009.
Rabl, Ari, and Audrey de Nazelle. 2012. “Benefits of Shift from Car to Active Transport.” *Transport Policy* 19 (1): 121–31. https://doi.org/10.1016/j.tranpol.2011.09.008.
Rojas-Rueda, David, Audrey de Nazelle, Marko Tainio, and Mark J Nieuwenhuijsen. 2011. “The Health Risks and Benefits of Cycling in Urban Environments Compared with Car Use: Health Impact Assessment Study.” *British Medical Journal* 343: 1–8.
Ruzzenenti, F., and R. Basosi. 2008. “The Rebound Effect: An Evolutionary Perspective.” *Ecological Economics* 67 (4): 526–37. https://doi.org/10.1016/j.ecolecon.2008.08.001.
Schipper, L., Figueroa, M.J., Price, L., Espey, M. 1993. “Mind the Gap The Vicious Circle of Measuring Automobile Fuel Use.” *Energy Policy* 21 (12): 1173–90.
Shakya, Shree Raj, and Ram M. Shrestha. 2011. “Transport Sector Electrification in a Hydropower Resource Rich Developing Country: Energy Security, Environmental and Climate Change Co-Benefits.” *Energy for Sustainable Development* 15 (2): 147–59. https://doi.org/10.1016/j.esd.2011.04.003.
Shalizi, Zmarak, and Franck Lecocq. 2009. “Climate Change and the Economics of Targeted Mitigation in Sectors with Long-Lived Capital Stock.” 5063. World Bank Policy Research Working Paper. Washington DC, USA: World Bank. http://ssrn.com/paper=1478816.
Sietchiping, Remy, Melissa Jane Permezel, and Claude Ngomsi. 2012. “Transport and Mobility in Sub-Saharan African Cities: An Overview of Practices, Lessons and Options for Improvements.” *Special Section: Urban Planning in Africa (Pp. 155-191)* 29 (3): 183–89. https://doi.org/10.1016/j.cities.2011.11.005.
Sørensen, Claus Hedegaard, Karolina Isaksson, James Macmillen, Jonas Åkerman, and Florian Kressler. 2014. “Strategies to Manage Barriers in Policy Formation and Implementation of Road Pricing Packages.” *Policy Packaging* 60 (0): 40–52. https://doi.org/10.1016/j.tra.2013.10.013.
Sorrell, S. 2009. “Jevons’ Paradox Revisited: The Evidence for Backfire from Improved Energy Efficiency.” *Energy Policy* 37 (4): 1456–69.
Sorrell, Steve, and Jamie Speirs. 2009. “UKERC Review of Evidence on Global Oil Depletion - Technical Report 1: Data Sources and Issues.” UKERC/WP/TPA/2009/016. Sussex/ London, UK: UK Energy Research Centre.
Sovacool, Benjamin K., and Marilyn A. Brown. 2010. “Competing Dimensions of Energy Security: An International Perspective.” In *Annual Review of Environment and Resources, Vol 35*, edited by A. Gadgil and D. M. Liverman, 35:77–108. Palo Alto, USA: Annual Reviews.
Stern, N. 2006. *Stern Review on the Economics of Climate Change*.
TFL. 2007. “Transport for London Annual Report and Statement of Accounts.” London, UK: Transport for London. http://www.tfl.gov.uk/assets/downloads/annual-report-and-statement-of-accounts-06-07.pdf.
Tiwari, G., and D. Jain. 2012. “Accessibility and Safety Indicators for All Road Users: Case Study Delhi BRT.” *Journal of Transport Geography* 22: 87–95. https://doi.org/10.1016/j.jtrangeo.2011.11.020.
Tsebelis, George, and Geoffrey Garrett. 1996. “Agenda Setting Power, Power Indices, and Decision Making in the European Union.” *International Review of Law and Economics* 16 (3): 345–61. https://doi.org/10.1016/0144-8188(96)00021-X.

Viguié, Vincent, and Stéphane Hallegatte. 2012. "Trade-Offs and Synergies in Urban Climate Policies." *Nature Climate Change* 2 (5): 334–37. https://doi.org/10.1038/nclimate1434.

World Bank. 2002. *Cities on the Move : A World Bank Urban Transport Strategy Review.* Washington, D.C.: The World Bank.