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# Transport and Mobility: *A Social Sciences and Humanities annotated bibliography*



**Energy**  
**-SHIFTS**

ENERGY  
SOCIAL SCIENCES &  
HUMANITIES  
INNOVATION  
FORUM  
TARGETING THE  
SET-PLAN

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# Executive summary

## Background

- This annotated bibliography developed as part of the European Commission (EC) funded project *Energy Social Science Humanities Innovation Forum Targeting the SET-Plan (Energy-SHIFTS)*, which contributes to the European Union (EU) Energy Union by further developing Europe's leadership in applying energy-related research and knowledge from the Social Sciences and Humanities (Energy-SSH).
- The bibliography provides context to the findings from the extensive Horizon Scan exercise, which resulted in the '100 priority SSH research questions on transport and mobility' reported earlier.

## The aim

- This report provides annotations to 26 key publications from SSH research on transport and mobility to provide a backdrop to the 100 priority SSH research questions in the Horizon Scanning report.
- With this annotated bibliography, we aim at informing policymakers and other non-experts on the breadth of energy-SSH knowledge that characterises the richness of the research field today.

## The approach

- Expert recommendations on the key literatures and further sampling of relevant literatures to address gaps led to a collection from which the final set of publications was selected.
- Publications were selected to reflect the substantive and disciplinary diversity of the energy-SSH field.

## The findings

- Transport and mobility research has engaged with new research strands and disciplines over the last decades (e.g. Anthropology, Sociology, Political Sciences, Science and Technology Studies), new approaches to study transport and mobility (from techno-economic to mobility perspectives), new themes of research (autonomous vehicles, car-sharing), and new political agendas (from instrumental to critical).
- SSH contributions to transport and mobility have diversified and enriched the field, offering important theoretical and empirical work and providing the cross-disciplinary knowledge needed for transitions to more sustainable mobility systems.



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# 1. Introduction

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## 1.1. Background: energy-SSH and Energy-SHIFTS

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This annotated bibliography was developed as part of the Energy Social Science and Humanities Innovation Forum Targeting the SET-Plan (Energy-SHIFTS).<sup>1</sup> Energy-SHIFTS supports the EU Energy Union to develop Europe's leadership in energy-related Social Sciences and Humanities (energy-SSH) research. The field of energy-SSH has remained marginal within (and beyond) the EC's research, giving way to energy research interests dominated by the natural and technical sciences (Foulds and Christensen, 2016; Overland and Sovacool, 2020; Robison and Foulds, 2019). However, the EC has expressed a commitment to mainstream SSH research and innovation activities, including supporting standalone energy-SSH projects. The Energy-SHIFTS project aims to strengthen energy-SSH for European research and innovation, as well as to strengthen its relevance to EU energy policy. Energy-SHIFTS contributes cutting-edge research priorities from energy-SSH research communities, which can guide and anchor EU research and innovation funding for SSH research and bridge the current science-policy gap. Through the Horizon Scanning initiative, four Europe-wide Working Groups each presented a set of 100 priority SSH research questions on key topics within the EU Energy Union and EC research and innovation funding priorities: (1) Renewable energy (von Wirth et al., 2020), (2) Smart consumption (Robison et al., 2020), (3) Energy efficiency (Foulds et al., 2020), and (4) Transport and mobility (Ryghaug et al., 2020). The annotated bibliographies are companion pieces to these Horizon Scan results.

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 1 For more information about the project, visit the official website: <https://energy-shifts.eu/>

## 1.2. Aims of the Annotated Bibliographies

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The annotated bibliographies aim to provide a contextual backdrop and sense of the evolution of academic research over time that can be read alongside the 100 priority SSH research questions presented in the four Horizon Scanning reports. An annotated bibliography is a list of references to scientific articles and book chapters followed by short descriptions of their content and key arguments. This report provides annotations to 26 key publications in SSH research on transport and mobility. Similar to the four Horizon scan reports, this is one of four bibliographies, alongside renewable energy, smart consumption, and energy efficiency. These are intended to give policymakers and other non-experts insight into the breadth of energy-SSH knowledge and approaches which characterise the field today. They portray the main advances in energy-SSH fields and, as such, offer context for the forward-looking priority SSH research questions.

The annotated bibliographies offer a taste of the main SSH debates, milestones, and advances in the field through a summary of key scholarly contributions, without claiming to provide full coverage of the field. The ambition is to demonstrate the range and variation of energy-SSH research, incorporating different and sometimes contradictory disciplinary perspectives, research themes and approaches. The bibliographies can give policymakers and other non-experts insights to help navigate the SSH field of transport and mobility.

## 1.3. The topic of this bibliography: Transport and mobility

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This annotated bibliography focuses on transport and mobility. Decarbonizing transport and mobility is a key priority in EC research and innovation funding and critical to achieving the EU's aim of carbon-neutrality by 2050. The Energy-SHIFTS Working Group on



transport and mobility has approached transport transitions “as the development and appropriation of new transport technologies, governance and management of transport, as well as efforts to change mobility practices” (Ryghaug et al., 2019, p.5). Through the comprehensive and prospective Horizon Scanning exercise (Foulds et al., 2019), the Working Group produced a list of 100 priority SSH research questions in the field. These questions aim to “promote SSH research in the transition towards a carbon-neutral and socially just European transport system by 2050, which caters for human well-being, while acknowledging planetary boundaries and the need for climate change mitigation” (Ryghaug et al., 2020, p.6).

The 100 SSH priority research questions for transport and mobility are divided into eight themes: (1) Co-producing knowledge and professional practices, (2) Scenarios, futures, visions and transition pathways, (3) Dominant mobility regimes and car dependency, (4) Governance, policy and incentives, (5) Participation and citizen engagement, (6) Mobility practice and mobility needs, (7) Risks, disruptions and negative or unanticipated consequences, and, (8) Social justice and inclusion. While these questions highlight pressing topics and perspectives in SSH research on transport and mobility, the field is much broader, encompassing topics that resist easy categorisation within these eight themes. In this annotated bibliography, we therefore, aim to present a broader view of what constitutes SSH scholarship on transport and mobility, which does not always relate to ‘the transport transition’. Nevertheless, the presented key pieces are important steppingstones and inspiration for stimulating new research topics, interests, perspectives, and debates.

## 1.4. Methodology for selecting key pieces of literature

Twenty-six publications were selected based on their relevance in providing context and insight regarding the research priority questions in the Horizon Scan. This selection includes peer-reviewed scientific publications, review articles, monographs and anthologies. The main selection criteria were diversity and disciplinary representation to highlight the breadth of the

energy-SSH field. Publications were selected following ten expert interviews with leaders in the SSH transport and mobility field, as well as members of the Working Group. The interviews were conducted between January and February 2020, in the initial stages of the Horizon Scanning process. Interviewees included energy-SSH experts from diverse disciplinary backgrounds (Foulds et al., 2019, p.17, p.25). Each interviewee was asked to recommend five publications they considered seminal for the development of the field. From these, a selection of publications was included in the annotated bibliography based on number of citations, perceived impact within the field, and contribution to new research avenues and themes within the field. Some publications suggested in the interviews were excluded because they lacked a focus on SSH, were less relevant to the Working Group theme, or were marginal in terms of their impact and relevance to the field. The authors then identified gaps based on the interviewees’ descriptions of the development of their field and key research themes that emerged during the Horizon Scan. Additional publications were sourced from the Horizon Scanning survey responses (evidence and rationale for proposed research questions) and the authors’ expertise within the field.<sup>2</sup>

## 1.5. How to use the Annotated Bibliographies

The annotations are short summaries of the original source material and provide a taste of each contribution. We hope readers become inspired to seek out the full publications on their topics of interest. Given the limited selection of publications, readers may also use the list as a tool to seek out broader and/or more specific literature in the field. The bibliography may, for instance, be read prior to viewing the 100 priority SSH research questions in the Horizon Scan report, or as an independent source of information.

Readers may also be interested in studying the annotated bibliographies from the Social Sciences and Humanities for Advancing Policy in European Energy (SHAPE Energy) project which was the predecessor to Energy-SHIFTS and offers more systematic reviews of the given fields.<sup>3</sup>

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 2 For more information on the expert interviews and annotated bibliographies, see the methodological guidelines (Foulds et al., 2019).

3 These can be downloaded here: <https://shapeenergy.eu/index.php/publications/annotated-bibliographies/>



## 2. Key literatures in the field of SSH transport and mobility research

Transport studies originated in engineering and physical sciences. The 1960s and 70s were formative years, paralleling rapid growth in car ownership and expansion of transport networks and systems in many countries. Research on transport was, at the time, mainly concerned with so-called 'predict and provide' questions, that is, how to best predict mobility patterns and provide transport solutions (e.g. expand road networks). Consequently, early inquiries were rooted in techno-economic concerns related to speed, efficiency and reliability of transportation modes. This tradition in mainstream transport studies is still prevalent, but human geographers, sociologists, psychologists, environmental scientists, anthropologists and political scientists – to name just a few SSH disciplines – have started to engage with transport issues, and questions surrounding mobility as a distinct and broader concept. This expansion has challenged dominant assumptions about travel behaviour, broadened the understanding of travel as part of socio-technical networks and practices, and diversified inquiries into different normative and experiential aspects of travel, mobility and transport systems and technologies.

In what follows, we highlight key contributions from SSH research on transport and mobility and how they have changed the field. Contributions are arranged into sub-themes that reflect important trajectories within the field and highlight shifts and changes in the SSH transport and mobility field. Author contributions, however, are not limited to the theme named in the title.

### 2.1. Complicating travel: activity-based perspectives and the emergence of accessibility research

A key shift in transport studies in recent decades is from thinking about travel in terms of minimizing costs to thinking about travel as a 'derived demand'. Travel is not an activity that people undertake for its own sake, but to reach activities available at different destinations. Travel demand is generated by the distribution of activities in time and space, which is determined in different parts of the economy. Rooted in Hägerstrand's (1970) time geography and activity-based perspectives on travel behaviour, this was an important shift because it challenged the core assumptions of transport studies, which viewed travel as only a means to an end and travellers as generic figures. The publications below paved the way for activity-based perspectives on travel behaviour that emphasize understanding travel as part of everyday life and daily activities and understanding the experiences of travel. Simultaneously, this also contributed to the emergence of accessibility research which highlights how time, location, activities and groups, among others, influence travel behaviours. These perspectives are relevant to current transport transitions, where influencing individual travel behaviour is a central policy goal.

**Kwan, M.P., 1999. Gender and individual access to urban opportunities: a study using space-time measures. *The Professional Geographer*, 51(2), pp.210-227.**

This article approaches quantitative accessibility research from a gender perspective, drawing on Hägerstrand's (1970) time geography and activity-based perspectives of travel behaviour. Previous examinations of quantitative accessibility conceptualised the





proximity of opportunities as originating from a single location (typically, the home), but this ignored two crucial aspects of women's everyday mobility: (1) multi-stop journeys, e.g. 'trip-chaining' of different activities, and (2) the fact that women have a more constrained time 'budget' because they typically shoulder more household responsibilities (e.g. picking up children from school), and travel is often 'fixed' to specific locations and times of the day (e.g. school hours). These findings, based on travel diary data from residents of Ohio in the United States, provided insights into how women experience higher levels of space-time fixity. This research highlighted the presence of choice limitations with respect to travel in the context of complex everyday life, and how this choice is further differentiated by gender. The work has three policy implications: (1) policies seeking to influence attitudes do not necessarily enlarge the choices available to people in real life, and understanding people's constraints is crucial; (2) notions of the 'universal citizen' that underpin new quantitative planning and analysis must be broadened to encompass social difference; (3) not all solutions to transport problems lie within the realm of transport policy – in this case, more appropriate policies might include more flexible school hours or social policies to advance gender equality by influencing the division of domestic labour within the household.

**Mokhtarian, P.L. and Salomon, I., 2001. How derived is the demand for travel? Some conceptual and measurement considerations. *Transportation research part A: Policy and practice*, 35(8), pp.695-719.**

This article was one of the first to challenge core assumptions in neo-classical economic perspectives of travel. Personal travel was often understood as a derived demand, i.e., travel is undertaken because the traveller wants to engage in an activity at another location. Thus, generally, the traveller seeks to minimize the time and cost spent traveling, regardless of the mode of transport. This article claims the opposite: many people express an affinity for travelling, and may engage in both undirected travel (i.e., travel for travel's sake) and excess travel e.g. choosing a longer route than necessary to reach a destination. Rather than positing a model of travel behaviour where rational humans seek to minimize the time spent travelling, the authors develop a model where travel is sometimes enjoyed and undertaken for its own sake. This model represented a break with the instrumental view of transport, meaning that a person's response to policy measures might differ depending on their general affinity for travel.

**Steg, L., 2005. Car use: lust and must. Instrumental, symbolic and affective motives for car use. *Transportation Research Part A: Policy and Practice*, 39(2-3), pp.147-162.**

In this seminal article, Steg draws on social psychology to understand how non-instrumental factors can explain car use. Previous research on transport usage focused on speed, flexibility, and convenience. This article builds on the results of two separate surveys located in two different cities in the Netherlands. The first study is explorative and identifies categories that can explain car use, including instrumental, symbolic, and affective motivations. Symbolic motives are generated by identity, social position, norms and expectations of travel habits. Affective motives derive from emotions that driving a car may evoke, such as excitement and relaxation. The second study determined the relative importance of motives in explaining car use for commuter traffic. The results were striking, revealing that symbolic and affective motives best explained car use, while convenience was relatively unimportant. Moreover, the article found differences among population groups. For example, younger, male and lower-income groups were overrepresented in highlighting symbolic aspects. These results challenge a highly functional view of commuter travel. Policies aimed at reducing car-use must consider how policy solutions can compensate for the symbolic and affective motivations in driving.

**Silva, C., Bertolini, L., te Brömmelstroet, M., Milakis, D. and Papa, E., 2017. Accessibility instruments in planning practice: Bridging the implementation gap. *Transport Policy*, 53, pp.135-145.**

This article examines why there is an 'implementation gap' with respect to accessibility planning. While the science of defining and measuring accessibility has continued to develop, and many instruments for supporting policy decisions have been developed, these are not widely used in urban/transport planning practice. Silva and colleagues explore this issue by collecting data on 20 'accessibility instruments' (decision-support tools for analysis or modelling), ranging from national to regional and municipal scales of planning. Survey research and workshops in 12 European cities were conducted with organisations developing instruments and planning practitioners, to understand their user-friendliness and usefulness for practical planning tasks. Practitioners were generally found to be positive about instrument usefulness. The article concludes that the primary barrier to the uptake of accessibility planning is not the user-friendliness of decision-support tools, but other issues such as weak





policy commitment, mainstreaming and formal requirements for this type of planning. Most policymaking still focuses on enabling travel as the primary goal, rather than providing access to activities and services. This paper also illustrates a case of the commonly discussed gap between science and policymaking. A lack of quality tools is not necessarily the problem, rather, slow policy changes may result from issues related to institutions, governance and politics.

## 2.2. Broadening the field: the new mobilities paradigm

Next to the broader and more complex view on 'derived demand', one of the most important shifts in transport studies was 'the mobility turn'. The new mobility paradigm was a conceptual reframing of transport from a purely technical challenge (i.e., how to move most effectively from point A to B), to an understanding emphasizing how physical and social aspects of mobility are deeply embedded in society. This shift was relevant for transport studies and challenged SSH scholars on the lack of attention to mobility as an essential part of daily life. Transport was reframed as a technology and activity embedded in wider social relations and ways of life, illuminating the co-production of inequalities through such relations. Research subsequently turned to studying the norms and values connected to mobility, meanings attached to and sensemaking of different mobility practices, and how movement shapes and is shaped by everyday life.

**Kaufmann, V., Bergman, M.M. and Joye, D., 2004. Motility: mobility as capital. *International journal of urban and regional research*, 28(4), pp.745-756.**

This article developed the concept of 'motility', which refers to the ease of moving within spatial and social structures. Motility may be seen as a form of capital and thus exchangeable (e.g. for social, human or economic capital). With this, the article bridges two incommensurable (or at least isolated) theoretical frameworks in mobility research, namely structuralism and post-modernism. In particular, the authors sought to bypass two long-running debates within social theory: (1) whether recent developments in logistics and communications have fundamentally reshaped society by compressing time-space, and (2) whether social structures (e.g. poverty, class) exist in the real world or merely as an analyst's construct. This move helped explain how societal positions might fluctuate with spatial locations; and how motility is depending location. This expands

the theoretical and empirical understanding of how mobility connects to questions of accessibility and inequality.

**Sheller, M. and Urry, J., 2006. The new mobilities paradigm. *Environment and planning A*, 38(2), pp.207-226.**

Building on their previous research, this article presents a cohesive argument for the new mobility paradigm, aiming to rectify the social sciences' lack of attention to mobility. Here, mobility is understood in the most general sense, i.e., real or imagined, physical or digital, local or global movement of people, animals, objects, technologies, images, and ideas. Rather than choosing places and meanings as a starting point, the new mobilities paradigm uncovers the processes through which mobility is facilitated or obstructed, including the material structures implicated in these processes. This view turned attention to how various mobilities influence and constitute social life. The article was central in spelling out the tenets of the then-nascent new mobilities paradigm, including the presentation of a diverse set of theoretical and methodological resources for conducting mobilities research.

**Cresswell, T., 2010. Towards a politics of mobility. *Environment and planning D: society and space*, 28(1), pp.17-31.**

As part of the emerging mobilities paradigm, this article theorised mobility – as distinct from transport – further. Mobility is more than movement from A to B, it encompasses the representation of different mobilities in terms of the cultural ideas and meanings produced in law, media, literature; and embodied experiences. For example, with cycling, mobility includes cycling trips and how different cyclists are represented in the media or policy discourse in relation to socio-economic class; or how cycling might feel to individuals with different bodies, e.g. to women and disabled people. This article provides a framework for thinking about the politics of mobility, referring to the ways which mobilities are related to social relations, including those between classes, genders, ethnicities, and religious groups. The key point is that 'mobility is a resource that is differentially accessed' – in other words, people have different opportunities for and experiences of mobility. Cresswell proposes a set of questions relevant for thinking about social equity and justice issues in transport policymaking: (1) *the politics of movement*: who moves furthest? Who moves fastest? Who moves most often?, (2) *the politics of representation*: how are mobilities represented (e.g. visually)? How is mobility discursively constituted, and what narratives have been constructed about mobility?, (3) *The politics of mobile*



*practice*: How is mobility embodied (related to bodily capabilities and experiences)? How comfortable is it? Is it forced or free?

## 2.3. Taking materiality seriously: the sense-making and construction of transport technologies and infrastructures

Another key contribution of SSH scholars to transport studies highlights how different transport-technologies and infrastructures gain meaning in peoples' lives, as well as how they are shaped by peoples' practices. While some literature focuses on how travel needs to be understood as a sense-making experience, other contributions call attention to how transport technologies and infrastructures are shaped by people and through material-social relations. These theoretical contributions from anthropology, and science and technology studies, brought a new disciplinary perspective to the interconnectedness between materiality and people, and thus also how transport-technologies and infrastructures may be imbued by politics. Such interconnectedness also highlights how similar technologies and infrastructures may be experienced and mean different things across different sites, which precludes one-size-fits-all policy solutions.

**Callon, M., 1986. The sociology of an actor-network: The case of the electric vehicle. In Callon, M., Rip, A. and Law, J. eds., 1986. *Mapping the dynamics of science and technology: Sociology of science in the real world*. Springer, Palgrave Macmillan, London, pp.19-34.**

In this book chapter, Callon provides an Actor-Network Theory (ANT) perspective on the attempted introduction of electrical vehicles in the 1970s in France. This approach provided an alternative to the more traditional sociological analysis. ANT posits that the world can be regarded as a set of networks through which ideas travel and power is exerted. A distinctive characteristic of ANT is that it does not see nature and society as separate entities and regards material components, such as batteries, as having agency. In this specific network, Electricité de France (EDF), an electric utility company, was central in the attempt to electrify public transport and private vehicles. EDF engaged several actors in this network, such as municipalities, manufacturers, and research institutions. They needed to convince other actors of the value of electrification

for reducing pollution, in addition to the need for further research. The chapter provides insights into the failures of the project and presents a case for the examination of the role of science in society. As networks are strengthened by sets of connections, if one part fails the rest may follow. In this case, for example, car manufacturers dragged their feet and challenged EDF, in addition to fuel cells breaking down.

**Ryghaug, M. and Toftaker, M., 2014. A transformative practice? Meaning, competence, and material aspects of driving electric cars in Norway. *Nature and Culture*, 9(2), pp.146-163.**

This article brings perspectives from Science and Technology Studies (STS) to transport studies, showing how technologies and technology users mutually shape each other in everyday life. User-technology relationships can be understood as domestication – a perspective recognizing that technologies are not stable and immutable, but must align with pre-existing routines, practice, identities, and values. Ryghaug and Toftaker focus on the introduction of electric vehicles in Norway and analyse the practical, cognitive, and symbolic dimensions of electric car use with a domestication approach. The analysis unpacks the implications of user-designated meaning in driving practices, the competencies considered necessary when driving electric cars, and the material aspects of electric car driving. Material aspects related to electric car driving may, for example, alter driving habits and raise technological and environmental awareness. Thus, the paper highlights the importance of materiality in transport-technologies to transformation in practices and sustainable transitions.

**Dalakoglou, D. and Harvey, P., 2012. Roads and anthropology: Ethnographic perspectives on space, time and (im)mobility. *Mobilities*, 7(4), pp.459-465.**

In this article (later developed into a book by the same title), the authors approach the study of the road from an anthropological perspective. They argue that roads and highways have been a marginalised area of investigation, arguing that infrastructure should interest the social scientist for several reasons. Roads may seem mundane in comparison to newer forms of technology, but nonetheless are a key part of the globalized world. Roads are also controversial spaces produced by competing interests – sometimes across national borders. This article also functions as an introduction to a special issue and provides a taste of various anthropological studies of the road. For example, roadbuilding in Mozambique involves a tense engagement between Chinese corporate capital and local road



workers, and hawkers in Ghana make a living by the road with entrepreneurship. Although roads may look similar globally, their cultural and social significance differs greatly. Roads are political also in their potential to reinforce power differences. For example, roads facilitate the extraction of resources from disadvantaged regions and enhance connections between some people more than others – shaping both mobility and immobility.

## 2.4. Turning to transitions: climate change concerns and sustainability questions

Climate change and the importance of sustainability transitions for the political and environmental agenda has prompted a wide range of SSH scholarship with a specific focus on transport transitions. Much of the scholarship has been theoretical, developing new models of understanding how transitions occur and how new solutions can be upscaled. Others have explored questions related to why current (unsustainable) mobility practices and technologies, especially the car regime, remain incumbent and resistant to change. This literature frames transitions as multi-dimensional issues; across policies, practices, values, transport technologies and infrastructures.

**Bertolini, L. and Le Clercq, F., 2003. Urban development without more mobility by car? Lessons from Amsterdam, a multimodal urban region. *Environment and planning A*, 35(4), pp.575-589.**

This article presents the ‘accessibility-sustainability dilemma’ whereby sustainable cities require reduced car use while policy measures are often politically difficult to implement. Few transport modes can match the convenience of cars. To solve this dilemma, the most politically promising solutions will address sustainability and aspects such as economy and accessibility. Importantly, the article argues that a successful strategy needs to include land-use policy and good alternatives to the car. Modes of transport should thus be utilized and seen as complementary rather than competing. In this article, the Amsterdam urban region is used as an example of good practice. This region consists of a network of urban nodes connected by train and highway. These urban centres, or nodes, are in turn dominated by different modes of transport. Urban areas with high levels of biking and walking are possible in multifunctional neighbourhoods that reduce commuting distances, and with deliberate measures

such as dedicated bike lanes. In areas with high levels of public transport, service facilities and office buildings have been concentrated around nodes. Parking has also been restricted. Other urban centres are more car-based. Overall, this study of the Amsterdam region shows how they have kept the growth rate of car trips lower than that of the population and number of jobs.

**Geels, F.W., 2012. A socio-technical analysis of low-carbon transitions: introducing the multi-level perspective into transport studies. *Journal of transport geography*, 24, pp.471-482.**

Geels articulates a socio-technical approach and a systems perspective to transport studies, moving beyond changes in technology and behaviour. Geels applies the multi-level perspective (MLP), a prominent theory of transitions which analyses change as the interplay between three analytical levels (niches, sociotechnical regimes and a sociotechnical landscape), to empirical examples from the auto-mobility-system, illustrating potential barriers, drivers and pathways for a low-carbon transition of the transport sector. Examples include the niches of inter-modal travel, sharing schemes, green propulsion technologies, and intelligent transport systems (ITS). Geels also explores destabilizing landscape pressures such as climate change or Peak Oil and stabilizing landscape pressures like the cultural preference for timesaving or values associated with cars. The author concludes that stronger innovation policies are needed, especially to put pressure on the existing regime. The article acknowledges, however, that this is difficult because policymakers are a part of the system that they aim to change. An ongoing analysis of multi-actor processes in transitions between industry, policymakers, consumers, and civil society, therefore, remains crucial.

**Hoogma, R., Kemp, R., Schot, J., and Truffer, B., 2002. *Experimenting for Sustainable Transport: The Approach of Strategic Niche Management*. London and New York: Spon Press.**

This landmark book on socio-technical transitions contributed to the development of Strategic Niche Management (SNM). SNM focuses on how niche innovations, in competition with dominant regimes (in this case, the car and automobility), may build momentum through mechanisms of niche protection. Socio-technical transitions researchers also developed real-life strategies for managing niches, which involved supporting innovations to become market-competitive, and eventually breaking through and causing a regime shift (e.g. transition from Internal Combustion Engines to electric vehicles). Hoogma and colleagues



studied innovations such as car-sharing, electric vehicles and bike-sharing through 13 experiments in different European countries. The book documents the successes and challenges of different mobility technologies at the turn of the 21<sup>st</sup> century. However, Hoogma and colleagues concluded that they overestimated the potential of SNM as a tool for fostering transitions. Instead, they found that their experiments remained relatively 'isolated projects', and that most did not scale up significantly or cause the actors involved to invest further in the innovations. This finding has been of enduring relevance, as many subsequent academic studies have confirmed the limits of experimentation on its own as a mechanism for fostering transitions. The crucial policy implication is that research and development funders and policymakers must carefully consider the diverse transformative impact of technological innovations, rather than pursue innovative pilot projects with blind enthusiasm.

**Sperling, D., 2018. *Three revolutions: Steering automated, shared, and electric vehicles to a better future.* Island Press, Washington.**

Building on decades of research on sustainable transportation, this recent book presents an innovation-based perspective on the future of transportation. Three vehicle innovations exemplify the three revolutions that the author sketches: electrification, pooling, and automation. The individual chapters explore the current status of automated, shared and electric vehicles and what a future based on these innovations could look like. The main takeaway is that innovation alone cannot guarantee a desirable future. On the contrary, the absence of conscious policymaking can lead to detrimental consequences. Steering innovations in the right direction, however, could result in a future with abundant and affordable choices, reduced climate impacts, liveable cities and a healthy population. The analyses and policy recommendations in this book provide a thought-provoking basis for shaping the transportation system of the future.

**Temenos, C., Nikolaeva, A., Schwanen, T., Cresswell, T., Sengers, F., Watson, M. and Sheller, M., 2017. *Theorizing mobility transitions: an interdisciplinary conversation.* *Transfers*, 7(1), pp.113-129.**

In this chapter, the authors present different perspectives on mobility transitions. While this chapter is a theoretical discussion, it touches on core issues of what sustains and might change a (un)sustainable mobility system. The contributors agree that deep-rooted changes are required to steer our mobility systems in a more sustainable direction, requiring technological,

social and political change. Yet, they have different foci and understandings of technology and social action. First, the Multi-level Perspective outlines how large-scale, long-term changes can be generated when technological niches gain widespread use. Second, geographers emphasize the local-level dimensions of transitions. In effect, this may slow down research which is controversial given the pressing need to address climate change. Third, the mobilities approach highlights that sustainable shifts might not always require technological innovation. For example, grass-root organizations can play a central role in lobbying for green policy. Fourth, perspectives from systems of practice and transition illustrate that people consume, bear, and enact social practices associated with technologies they did not produce. Practices such as car driving are sustained by a number of other practices (productions, transport planning etc.), highlighting the interdependence of actions. And lastly, the new mobilities paradigm draws on a similar understanding of action, arguing that incremental change is insufficient. Existing energy systems require radical change. In sum, this article reviews how multidisciplinary interest in low carbon mobilities opens a range of emerging issues in mobility transitions.

## 2.5. Putting justice on the agenda: questioning transport inequalities

Social justice issues have engaged transport and mobility scholars. This literature often challenges transport study perspectives that overlook inequalities in the way people move, what systems they have access to, and how such transport inequalities can reinforce disadvantage. Scholars have raised questions about exclusion, and equal access to transport and mobility. Moreover, they have highlighted features that may exclude certain groups, including age, gender, ability, socio-economic status, and location. In recent years, scholars have also sought to explore the (un)intended consequences of injustices connected to new low-carbon mobility solutions.

**Law, R., 1999. *Beyond 'women and transport': towards new geographies of gender and daily mobility.* *Progress in human geography*, 23(4), pp.567-588.**

This article offers a feminist perspective on gender and mobility by moving beyond the typical dualistic focus on men versus women to shape a new course for the study of gender and transport. Law characterizes the





more traditional focus of 'women and transport' as too narrow. This traditional focus uncovered important differences in gendered travel patterns, primarily due to work-related reasons and fear of sexual violence, but needs to be broadened. Law suggests two avenues. First, reframing the field from 'transport geography' to 'social and cultural geographies of mobility', and second, to stake out a theoretical position that accounts for both symbolism and gendered travel patterns. The article points to five areas for further research: (1) *Gender division of labour and activities*, i.e. the role of paid and unpaid work, changing needs for travel with the development of Information and communications technology (ICT), online shopping, and how these changes are gendered, (2) *Gendered access to resources*, or how gender shapes access to resources, notably time, money, skills, and technology, and how gender and technology mutually shape each other, (3) *Gendered subject identities*, i.e. how do biological processes interact with social roles and translate into mobility constraints, (4) *Gender as a symbolic code*, i.e. how can access to spaces and transport modes be shaped by gendered roles, and (5) *Gendered built environment*, i.e. how is infrastructure shaped by and how does it shape gender roles? This contribution opened a new agenda for feminist geography.

**Lucas, K., 2012. Transport and social exclusion: Where are we now? *Transport policy*, 20, pp.105-113.**

In this article, Lucas summarises the theoretical, empirical and policy progress made in the field of transport and social exclusion. The concept of 'transport disadvantage' is becoming increasingly relevant as societies are based on hypermobility. Low transport capability will create major obstacles in reaching employment opportunities, educational facilities, and social networks. The article argues that low mobility can be connected to issues of information, physical barriers, driving skills, travel times, safety, and exclusion from spaces. Perhaps unsurprisingly, the empirical evidence shows that the poorest parts of the population travel less and over shorter distances, have lower rates of car ownership, and experience more social exclusion due to low mobility. In many countries, Black and minority ethnic people and senior citizens also experience lower mobility. Similar patterns are found in developing and developed countries. Lucas finds that many programmes that initially showed promise had been cut due to austerity measures. She also examined Victoria in Australia, where funding for public transport was increased, focusing on fringe urban and rural areas, in addition to reducing fares for disadvantaged groups. Lucas concludes that transport disadvantage reflects

overall societal structures, and researchers should contribute with innovative methods and theories to move from 'trickle-down' models to 'just cities' for all.

**Martens, K., 2012. Justice in transport as justice in accessibility: applying Walzer's 'Spheres of Justice' to the transport sector. *Transportation*, 39(6), pp. 1035-1053.**

Martens provided new insights into how transport projects are evaluated based on equality issues, including the measurements used and how transportation systems can offer equal opportunities. The article puts transport poverty, social justice and inclusion high on the research agenda. Martens challenged the (often implicit) utilitarian principles underpinning traditional transport planning. She argues that certain goods carry social meaning which should be distributed in society as for instance education, healthcare, and transport. As transport is composite in nature (encompassing artefacts, infrastructures, services, regulations, etc.) and significantly influences social life (including processes of social exclusion), market mechanisms cannot ensure the just distribution of accessibility. Hence, the article stresses that a distributive sphere of transport is needed, whereby average accessibility should be maximized while minimizing the gap between the best and worst level of accessibility. This has profound implications for transport planning practices. An area devoid of public transport should be prioritized over, for example, expanding the passenger capacity of a railway line, even if this benefits fewer people.

**Pereira, R.H.M., Schwanen, T. and Banister, D., 2017. Distributive justice and equity in transportation. *Transport Reviews*, 37(2), pp.170-191.**

The authors review key theories of justice and discuss what justice means and should mean in the context of transport policies. They start by exploring how transportation scholars have framed transport disadvantages. First, they find that transport inequalities are mainly framed as inequalities of transport-related resources, observed daily travel behaviour, and transport accessibility levels. Second, they find that moral principles for changing the distribution of transport-related benefits or burdens are weak or not addressed. Third, the literature on redistribution of transport-related benefits and burdens has mainly been framed as an issue of scaling the level of access different groups have to transport good or services, or questions of why certain groups lack access. Pereira and co-authors conclude that transport researchers and policymakers need to engage with an ethical perspective more explicitly. Drawing on prominent theories of justice in political philosophy,



they argue for an approach that takes into account: (1) how socio-economic opportunities shape access to transport, (2) how a focus on accessibility connects morally to basic needs and equality of opportunity, and lastly, (3) that redistribution of accessibility should not threaten basic rights and liberties, should aim to reduced inequality of opportunity, prioritize vulnerable groups, and set minimum standards of accessibility.

## 2.6. Exploring emerging transport technologies: potentials and pitfalls of new (transport) concepts

New transport technologies (such as electric, hybrid and automated vehicles, smart transport systems, sharing services, and micro mobility such as electric scooters) are a recent avenue in SSH transport studies. Much of this literature looks at barriers to and opportunities for mainstreaming new transport technologies, with some overlap with transition scholarship. Researchers have explored the historical roots or new emergent transport, as well as possible controversies regarding their appropriation in current infrastructures. Moreover, this research highlights the unpredictable effects and risks of such systems. Some of the selected contributions connect technology development, mobility practices, and policies in exploring emergent technologies and novel ways of organizing mobility.

**Mom, G., 2013. *The electric vehicle: Technology and expectations in the automobile age*. Baltimore: JHU Press.**

Mom takes a historical look at the electric car in this book. Similar to Dijk and Yarime (2010) (see below) he shows that the electric car has a long history, dating back to the gasoline powered automobile, showing how thousands of electric vehicles were in use before World War II. The book challenges the assumption that the combustion engine 'won' and became dominant because it was superior, rather, it shows how electric vehicles had many advantages. In a careful retracing of Electric Vehicles (EVs) in Europe and America, the book demonstrates how a multitude of factors produced the dominance of the combustion engine. For instance, expenses for charging stations, the floatation of EV companies, cultural ideas of gasoline-powered vehicles as more adventurous, and price of vehicles. With this, the book illustrates how technological properties alone

do not drive technology-adoption and development. This has implications for sustainability transitions because it shows that policymakers must consider a wider range of factors for sustainable transport technologies to become dominant modes of transport.

**Dijk, M. and Yarime, M., 2010. The emergence of hybrid-electric cars: Innovation path creation through co-evolution of supply and demand. *Technological Forecasting and Social Change*, 77(8), pp.1371-1390.**

This article demonstrates how an effect called the 'sailing ship effect' also unfolded in recent car mobility innovation. It shows that sailing ships did not disappear with the invention of the steam engine, which had advantages, but for many were not attractive, and sailing ships remained the main method for shipping goods for about 40 or 50 years. A similar pattern is evident in the case of EVs. The EV was unveiled at an American automotive show in 1990, and regulators were convinced this was supposed to be the future, at least in California. Despite friendly regulation, automotive manufacturers did not shift investments to electric mobility, but invested more in diesel and gasoline engines, which outcompeted EVs for at least 25 years. While the introduction of the pure electric vehicle was seen as a failure at first, developments since 2000 have created more potential for electric mobility.

**Pangbourne, K., Mladenović, M.N., Stead, D. and Milakis, D., 2020. Questioning mobility as a service: Unanticipated implications for society and governance. *Transportation research part A: policy and practice*, 131, pp.35-49.**

In this article, the authors examine the emerging concept of Mobility as a Service (MaaS) which has garnered significant attention. MaaS combines information and communication technologies with a business model which offers subscribers integrated access to a variety of transport modes. According to the rhetoric of MaaS proponents, MaaS will provide increased freedom of movement for subscribers, a more efficient transport system for transport authorities, and a new market for the private sector. However, the authors in this article show that the realization of MaaS could have negative ramifications for the environment, public health, and social inclusion, suggesting that public intervention might be warranted. By contrasting the promises made by MaaS proponents with potential negative outcomes, the authors make the case for properly assessing emerging transport innovations. What possible negative side effects exist, how would these affect the realization of wider urban objectives, and how might this be avoided through governance intervention?





**Milakis, D., Van Arem, B. and Van Wee, B., 2017. Policy and society related implications of automated driving: A review of literature and directions for future research. *Journal of Intelligent Transportation Systems*, 21(4), pp.324-348.**

Milakis and co-authors review existing literature on automated driving, and map research gaps. Automated driving may substantially impact the organization of society depending on unknown aspects such as the degree of automation, connectedness of vehicles, sharing, electrification, and how widely they are used. The study notes that owning an automated vehicle will probably be expensive, which might not outweigh savings from fuel consumption. Various simulations show that less congestion can reduce travel times by 30-40% even in scenarios where only a part of the vehicles is automated. Over the longer term, however, a potential increase in number of vehicles may neutralize such effects. Vehicle ownership rates are difficult to predict and will depend on aspects like vehicle sharing, consumer willingness, and public transport services. Research is lacking on the effects of land-use, but automation might increase urban sprawl as travel becomes easier. The article stresses that implications for energy consumption, air pollution, safety, social equity, the economy, and public health, can arise from the direct and indirect effects of automation. While available research indicates that automation can reduce fuel use and enhance traffic safety in the short term, the authors argue that the long-term impacts are more uncertain and difficult to predict.

## 2.7. Stepping into the realities of policymaking: new perspectives on the governance of transport

Transport governance has become a broad topic of debate, including cross-cutting issues related to land use, urban development, and sustainability. SSH scholars have contributed political critiques and policy recommendations for how transport governance can be improved. Some studies in this field challenge the dominant paradigms that govern transport planning by placing the broader societal and environmental implications of transport policies on the agenda. The scholarship also questions of power and the distribution of responsibilities between the state, private sector and civil society. The study of transport governance is characterised by cross-fertilization between transport

studies and fields like political science, public policy, and organizational and management studies.

**Banister, D., 2008. The sustainable mobility paradigm. *Transport policy*, 15(2), pp.73-80.**

In this landmark article, Banister offers a very useful overview of some of the key issues in sustainable mobility particularly for a policy audience. Banister questions a key premise of conventional transport planning: that travel time should be minimized, on the basis that slower forms of travel can reduce emissions, be safer, and provide relaxation and exploration. The tools necessary to provide sustainable mobility already exist: reducing travel demand, policy measures (road pricing, parking control, relocation of space, better access to public transport etc.), reducing commuting distances through urban planning, technological innovation, and alternative fuels. Creating public acceptance for existing tools that can drive political action is the critical question. Banister points out that alternative travel modes and policies often enjoy higher acceptability than policymakers assume. Yet, to increase acceptance, people need to experience the effectiveness and fairness of measures, as mere information provision is not enough. However, compromises are often made when legislating in a democratic-electoral system that may reduce the effectiveness of a measure. To overcome such issues, participatory processes including broad expert coalitions, practitioners, and policymakers are needed. Such processes should also include debate on the wider societal benefits of a sustainable transport system, such as public health.

**Aldred, R., 2012. Governing transport from welfare state to hollow state: The case of cycling in the UK. *Transport Policy*, 23(C), pp.95-102.**

Aldred adopts a historical governmentality perspective on transport policy. The paper begins by discussing shifts in policy governance that have affected transport policy and two distinct periods within UK cycling policy: (1) from 1945-1990, when cycling was marginalized in policy debate (via a slight return in the 1980s when cycling was seen as a risky and marginal pursuit) and, (2) the 1990s and onwards. Aldred explains why cycling never became a 'strategic' priority for the national government by introducing concepts of the 'hollow state' and the 'responsible individual' to transport policy analysis, where they have been seldom used. Dominant policy approaches have led to cycling being, (a) located outside the national state, and (b) attached to discourses around healthy and environmental lifestyle choices. This in turn has shaped the evolution and boundaries of policy solutions.



**Marsden, G. and Reardon, L., 2017. Questions of Governance: Rethinking the Study of Transportation Policy. *Transportation Research Part A: Policy and Practice*, 101, pp.238-251.**

Marsden and Reardon review 100 articles from two leading policy-oriented journals in the transport research field. While the number of articles on transport policy is growing, the authors question the extent to which researchers study policy processes as such. Most articles were concerned with optimizing a given policy rather than looking into the mechanisms driving

decision-making processes and assessing which policies should be implemented. Further, studies employing abstract simulations are overrepresented in the field, compared to studies engaging with real-world policymakers and processes. The article argues that real life policymaking is not a clean-cut process well captured by abstract models, but characterized by compromises, speedy decisions, ideologies, and coalitions. A more thorough focus on these processes is therefore needed, often requiring qualitative research and conceptual frameworks that can be generated by SSH.



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## 3. Concluding remarks

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This annotated bibliography has surveyed the breadth of scholarship characterising SSH research on transport and mobility. The field has shifted from a techno-economic focus to a more comprehensive and diverse understanding of transport and mobility, including the sensory experiences of travellers, inter-relatedness between transport, technologies and practices, transport cultures, and the politics of transport and mobility. The selection of scientific work also pays tribute to the agenda-setting done by the European Commission, directing the course of transition from the dominant mobility practices towards more just and socially inclusive transport in the future.

While the digitalization of mobility services has already been taken up in recent debates and is also featured already in our selection of literature, we expect this theme to further accelerate over the next decade. In order to identify the possible and desirable pathways towards sustainable and just mobility systems, unintended consequences and appropriate responses to rebound effects will likely become more prominently in the scientific debate ahead. Moreover, the presented co-benefits of mobility transitions for

other sectors (e.g. energy, housing) and aspects of subsequent system-integrations have not been covered in the literature to date.

The highlighted articles are seminal papers that have policy relevance and have influenced new research trajectories. Nevertheless, several important debates, themes, and studies could not be included here. Topics related to walking, air travel, freight, mobility practices related to tourism and migration, the growing connection between art and transport, and social movements connected to transport and mobility questions are just some examples of work that was not involved. We critically acknowledge a selection focus of studies primarily produced in and focussing on North-Western Europe. Although scholars from these geographical regions have dominated the field, this focus constitutes a limitation to our literature overview. Yet, we think this bibliography characterises some of different avenues of scholarship and debates within the field and we hope readers are inspired to seek out in-depth knowledge and further literatures on transport and mobility that were not included here.



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