The role of societal resistance in transportation innovation

Eleni Chalkia, Beate Mueller, Alain l'Hostis

The role of societal resistance in transportation innovation

Eleni Chalkia[1], Beate Mueller[2], Alain L'Hostis[3]

[1]CERTH, hchalkia@certh.gr
[2] VDI/VDE Innovation und Technik GmbH, Beate.Mueller@vdivde-it.de
[3] IFSTTAR, alain.lhostis@ifsttar.fr

Abstract

This paper focuses on the description of societal trends related to mobility and on the way that these trends can be perceived from the society, when implemented. This action represents the starting point of the European project Mobility4EU that focuses on creating an action plan for the coherent implementation of innovative transport and mobility solutions in Europe. In Mobility4EU we have defined a set of possible societal aspects that might lead to societal resistance to the implementation of the future transport megatrends that have been defined. This paper aims to highlight the possibility of societal resistance to a wider implementation of innovative transport solutions, related to foreseen megatrends for the 2030. In consequence the list has not the ambition to be comprehensive, but rather provide a first overview of the societal reaction to widespread diffusion of foreseen solutions.

Keywords: *Mobility, societal resistance, megatrend in transport.*

1. Introduction

Since the publication of the 'Brundtland report' in 1987 (Brundtland, 1987), there is a consensus that sustainable development is built around 3 axes: environment, economy and society. Additionally, global socio-economic and environmental megatrends are urging for a paradigm shift in mobility and transport that involves disruptive technologies and multimodal solutions. In all transport developments up to now, the environmental and economic aspects have been broadly viewed and researched. In contrast, the social aspects of sustainable transport, as well as their impacts, are often neglected and remain under-examined in comparison to economic and environmental ones. Thus, the social ramifications of transport developments are unclear and the social factors supporting unsustainable instead of sustainable transport are often forgotten.

The Mobility4EU project aims at producing a roadmap for mobility in 2030, taking into account all modes of transport, as well as a multitude of societal drivers encompassing health, environment and climate protection, public safety and security, demographic change, urbanisation and globalisation, economic development, digitalisation and smart system integration. The overall objective, related also to the current paper, consists in linking present and future societal trends and needs to existing and emerging transport and mobility solutions and providing also possible societal barriers to their implementation.

Since the main domain of study of the project is mobility and logistics, Mobility4EU has provided a comprehensive vision of societal drivers having an impact on mobility, aiming to

establish a basis for the understanding of societal trends, in the broad sense, and the baseline for the development of these trends is presented at this paper. Thus, one of the scopes of this paper is to identify the interaction between societal trends and mobility and, the way society might react in future transportation innovative solutions implementation related to those trends and which is the outcome of its resistance in some cases. Most importantly, how this impact is shaping future requirements on transport from an individual and end-user level, will be studied. Thus, the changes in mobility and transport needs related to recent developments, such as e.g. urbanisation, mitigation and also impact of climate change, demographic change, sharing economy etc., will be assessed regarding the way they influence society.

2. Mobility and Societal challenges

2.1 The approach

Global socio-economic and environmental megatrends are urging for a paradigm shift in mobility and transport that involves disruptive technologies and multimodal solutions. The individual transport sectors face diverse technical and non-technical requirements and rather individual, sometimes contradicting challenges. An action plan for the coherent implementation of innovative transport and mobility solutions in Europe is thus urgently needed and should be sustained by a wide range of societal stakeholders. The approach we follow in MOBILITY4EU project is to work towards the development of such a plan taking into account all modes of transport, as well as a multitude of societal drivers encompassing health, environment and climate protection, public safety and security, demographic change, urbanisation and globalisation, economic development, digitalisation and smart system integration.

Figure 1: *Relation of societal factors with Mobility4EU project*

A first step towards the achievement of such an "Action Plan for Future Mobility in Europe", is to identify and assess societal challenges that will influence future transport demand and supply, as well as to find and categorise promising cross-modal technical and organisational transport solutions to address these challenges. In order to achieve these objectives, a thorough methodology has been developed creating a participatory framework that has involved all partners of the consortium (L'Hostis, 2017). The following section describes the basic

outcomes of this exercise that takes into account the relevant societal drivers due to current megatrends, such as health, climate and environment protection, safety & security, demographic change, urbanisation, economic development, digitalisation and smart system integration. Additionally, it takes into account in particular the user needs, reflecting the contribution of new mobility concepts to transport efficiency in all modes, highlight the implications of these new concepts on policy, anticipate potential societal resistance to new solutions. The aim is to propose an, as complete as possible, view on the societal factors, in the broad sense, that influence mobility and logistics and categorise them in megatrends clusters.

2.2 The Societal megatrends related to mobility

Mobility of passengers and freight is broadly considered as a key feature of modern societies. For this reason many existing and future mobility drivers have roots in societal aspects. Transport refers to technical and organisational solutions to address mobility needs and it involves vehicles, infrastructures, operators and users. Societal aspects will influence all these dimensions of transport, and reciprocally the interaction between transport supply and demand will have direct effects on behaviours, lifestyles and hence deep societal implications.

The acknowledgement that mobility is of crucial importance for our societies represents a broad consensus in scientific literature and in policies. And this trend is not seen as losing importance: according to a study by the International Transport Forum in 2011 (Wilson 2011), by 2050 passenger mobility should increase by a staggering 200-300 % and freight activity by as much as 150-250 %.

Society and mobility are so closely linked, that some authors proposed to replace the study of society by the study of mobility (Urry 2007). In this spirit, Mobility4EU has chosen not to separate society from mobility and transport but rather consider them in an integrated approach, following the concept depicted at the figure below.

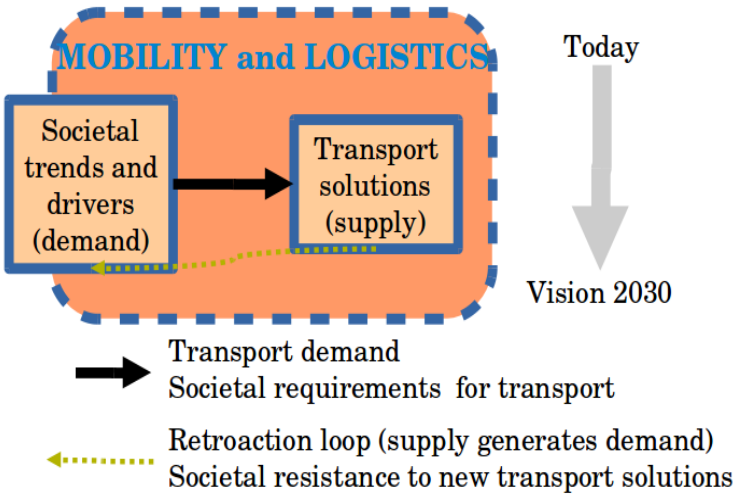

Figure 2: *General concept of Mobility4EU project*

That being presented, it makes obvious that almost all societal trends have effects on mobility and logistics demand and supply. In an economical approach, transport is studied as a demand supply paradigm. Nevertheless, a retroactive loop exists where new supply is able to generate a new demand that was not expressed before. In addition, the emphasis on society in our approach allows us to include in the retroaction loop the societal resistance to the implementation of new transport systems.

In Mobility4EU, the term societal drivers, covers an emerging pattern, movement, evolution in society that leads to change and potentially has implications for mobility and transport (e.g. ageing, social networks). Societal trends have impact in transport demand and its evolutions, thus, they can be considered as societal drivers for transport. Societal drivers includes societal trends, political trends, economic trends, technological trends and legal trends.

In Mobility4EU approach, a trend has an unequivocal impact on mobility. In comparison to related exercises in European researches our approach is rooted in the study of societal trends as opposed to a more classical transport demand analysis as for example in TransForum (Anderton, Åkerman, et al., 2015), in TRANSvisions (Petersen et al., 2009), in FUTRE (Bernardino, Vieira & Garcia, 2013), in RACE2050 (Sena e Silva et al., 2013, 20), in EUTransportGHG (Sessa and Enei 2009) or in ORIGAMI (Lemmerer & Pfaffenbichler, 2012). These approaches tend to separate trends along classical transport modes and transport markets, without going one step beyond, in the study of societal trends, as in the Mobility4EU project (L'Hostis, 2017). As opposed to these approaches we have started by an analysis of societal dynamics in a broad sense, and in a second stage identifying those trends that have an interaction with mobility and logistics. Societal trends are for us entry points instead of transport solutions and markets. Our approach is hence complementary to these projects. In addition, as opposed to more thematic approaches having also studied societal trends like for instance CITYLAB on freight (Dablanc et al., 2016) or TransForum on a few targeted transport sectors (Anderton & Åkerman, et al., 2015), our analysis intends to cover all transport modes, all geographical scales and freight as well as passenger transport.

The outcome of this methodology is a list of trends that depict the present situation and with a temporal horizon of 2030. In consequence, our description of trends aims at capturing the present situation and the dynamics of these trends in the future. This list can be seen as the shortest possible set of trends that allows describing present and emerging societal factors, in a broad sense, that have impacts on mobility, both for freight and passengers' mobility. The list is composed of 29 trends organized in 9 larger megatrend fields. Below the megatrends are described while the detailed trends are going to be presented in a future paper.

1. Economic megatrend: Lifestyles and economic development

The late modern society (Rosa, 2003) adds to the modern individualism and to the post-modern fluidity, the new dimensions of the social networks and the pervasive use of ICT. The so-called generations Z and Y exemplify these evolutions with a lower use of cars than their predecessors. The theme of the shared economy is strongly favoured by these trends. Direct implications for transport involve e-commerce (and the issue of the last mile) and the impact on the employment in the transport sector. Nevertheless, the trend of universal use of ICT comes with refractory groups, those unable to use them and that must be considered. In addition the trend will develop

more carbon-neutral vehicles reduce the dependency of Europe on the import of (expensive) crude oil and as such sustain economic development on a macro-economic scale.

2. Inclusive society, personalisation, accessibility

The main current and future demographic trends are aging society and migration. The aging issue will have the strongest implications for the organisation of transport systems. The percentage of Europeans aged over 65 is projected to rise from 16% in 2010 to 29% by 2060. The European population aged over 80 is set to rise from 4.1% in 2010 to 11.5% in 2060 (according to an assessment of ILC-UK in 2014). Europe's population is also growing, with the EU population set to increase by 18 million people by 2050. The older European population of the future will have different transport requirements, and current transport and mobility enablers need to adapt to meet these challenges.

3. Urbanisation

Urban space has become the dominant European geography. As the share of Europeans living in urban areas is expected to increase between now and 2050 from 74% to 84%, transport movements occur increasingly in an urban context (UN, 2010). Growing and extending cities lead to the emerging concept of city-regions, which combines several spatial scales and transport modes. In the context of an artificial land cover increase by 3.4% in Europe between 2000 and 20064, the 50-years lasting car based urban sprawl is more and more seen as an issue by urban and regional planners because of the associated externalities (land consumption, energy, traffic congestion) with proposed alternatives like urban intensification, compact development, Transit Oriented Development (TOD) and, to some extent, smart cities. Regarding urban logistics, it should mentioned5 that freight is an important traffic component in cities (10 to 15% of vehicle equivalent miles), load factors for delivery vehicles in cities are very low (e.g. 38% for vans in London) and urban freight is responsible for 25% of urban transport related CO2 emissions and 30 to 50% of other transport related pollutants.

4. Environmental protection: climate change, pollution and resource and energy efficiency

Transport has since long time been linked to ecological issues like pollution and noise, with mitigation measures being e.g. ecological corridors. More recently, the impact on climate change raised public concerns and the related mitigation measures became a matter of policies. In 2012, emissions from transport constituted one fifth of all European CO_2 emissions and are the only source that is still on the rise (European Parliamentary Research Service Blog). The related countermeasures refer to increasing the energy efficiency of vehicles and reducing the carbon footprint of the energy mix by the use of energy from renewable sources in transport which is enabled by the use of electricity as the energy carrier.

A transition towards the usage of renewable energy in the transport sector will additionally avoid the current depletion rate of fossil fuels and the environmental impacts induced during the sourcing of alternative fossil fuels such as tar sand oil and shale gas. However, when optimising the carbon footprint of transportation, a full system perspective is needed, including other life cycle stages and impact categories in order to avoid shifting the environmental burden (for instance toxicity aspects of mining activities for the production of a specific component should be accounted for.

Furthermore, the growth of transport activities is a serious problem, particularly in freight. The design of sustainable logistic systems depends not only on transport policies and on logistics service providers, but also on decisions made by shippers and manufacturers and even the end customer. Indeed, dematerialisation, 3D-printing, postponement of final product assembly, reshoring and local sourcing may all significantly contribute to transport reduction. Moreover, sustainable supply chains can also be influenced by governmental regulations. In addition, the increasing awareness of society about the operations behind product and services can lead consumers towards more responsible and sustainable choices, with an impact on the sustainability of the whole supply chain.

5. Digital society and internet of things

Improved environment perception due to advancements in camera and sensor systems as well as methods of sensor data fusion will enable higher degrees of automation in vehicles. Wireless communication among vehicles and between vehicles and the infrastructure add to this trend (V2X). Highly automated functionality, widely applied in aeronautics, is entering the automotive worlds now and will be available in other modes as well. It will increase traffic safety and fleet management significantly, and will sustain traffic control systems. However, new issues arise as well, e.g. related to privacy of data. A major trend for logistics with a 2050 vision is Physical Internet (PI). The aim of PI is to move, store, produce, supply and use physical objects throughout the world in a manner that is economically, environmentally and socially efficient and sustainable. PI aims at extrapolating the way Internet works into the logistics environment, achieving an open global logistic system founded on physical, digital, and operational interconnectivity, enabled through encapsulation of goods, standard interfaces and protocols.

6. Novel Business models and innovation in transport

The transport sector is witnessing the emergence of new players, new business models interacting with – if not fuelled by – new behaviour. New business models are closely related to the previously mentioned megatrend of Digital Society, Internet of Things and big data. The main issue regards the challenge over the currently dominating individual vehicle ownership model, as well as other cases where new players and new business models emerge, in batteries, in data, in freight. These business models are already here and will emerge greatly by 2030, having the potential overcome typical traditional existing business models in transport.

7. Safety in transport

No transport mode is exempt of safety issues and many public policies aim at addressing this problem. Road is mainly concerned with traffic safety; despite a continuous reduction of road fatalities, still 26.000 people died from road accidents in 2013 in the EU (Paradowska M., 2016), which makes it a major societal issue. Smart integration and digitalisation of road vehicles implies the development of new safety measures. Despite significant improvement of the levels of safety, especially in the road transport domain, and encouraging perspectives, linked to automation, we perceive no sign that transport safety in general would become less an issue in the future than it is now.

In the perspective of the long term promise of a decrease of road casualty through the introduction of automated cars, a new safety issue emerge with the coexistence of automatic

and non-automatic vehicles creating complex networks and environment. Safety will become a far more complex issue than today with insurance and liability necessary adjustment.

8. Security in transport
Terrorism is a growing concern in our societies and for governments. Attacks often target transportation means and hubs, and hence the interaction between this trend and mobility and freight is straightforward. More security is expected which raises the security/accessibility tension: the provision of more security in transport by introducing controls/barriers reduces accessibility. Urban transit, rail and aviation also have to deal with security and from the operators' point of view resilient operations is a constant objective.

9. Legislative framework
The legislative dimension translates societal demand by means of the production of laws and rules by public authorities and also by means of jurisprudence. Nevertheless, beyond the mere role of translation of societal demand, it carries a self-dynamic that enlists it as a societal trend in the broad sense. We identify three trends that exert influence in the domains of mobility and logistics.

3. Societal resistance in mobility

The implementation of the aforementioned megatrends, and then the detailed trends, is closely related with the different social barriers that might occur and from the resistance of the society towards their implementation. Societal resistance refers to the societal opposition to different dominant forms of social norms and values. Societal resistance includes also the opposition to governmental political and social actions and policies, as well as to the adaptation of new technologies or solutions that may implement and support these actions or policies.

Since the publication of the 'Brundtland report' in 1987, there is a consensus that sustainable development is built around 3 axes: environment, economy and society. In transport developments, the environmental and economic aspects have been broadly viewed and been researched. In contrast, the social impacts of sustainable transport are often neglected and remain under-examined in comparison to economic and environmental impacts. Thus, the social ramifications of transport developments are not clearly described and understood and the social/psychological factors supporting unsustainable instead of sustainable transport are often forgotten.

Understanding and defining the social impacts that the implementation of a transport innovative solution might have is not an easy task, since there are a lot of diverse, overlapping and competing ones (Geurs et al., 2009). Since the social impacts of transport have been vigorously neglected, or only been poorly taken into account, the knowledge about the reaction of society to the transport solutions that are proposed and implemented is vague. Thus, sometimes the implemented solutions might merge with the social norms and some other times they might be rejected, since the society cannot incorporate them and resists to its use. This societal resistance to the changes in transport is built upon specific pillars.

3.1 Job related resistance

New transportation trends are emerging and new innovative models are implemented to meet the needs of the society. These models always affect in a way the life of the people that live in the area where these models are implemented at. The bigger the change, the greater the resistance; especially in the beginning of the implementation. One of the biggest challenges of all occurs if fear exists that this new transport solution threatens job and especially the own job in any manner.

According to related studies, most unemployed people want full-time employment, even when they disliked the job they previously held (Coffield, 1983). Thus, feeling threatened from a change at their working routine would make them unwilling to accept this solution. One example of this is the resistance of the society and specifically the taxi drivers to accept UBER (car sharing model). Of course UBER and all the other vehicle-sharing models have the potential to greatly benefit economy (people would buy fewer cars), environment (converting parking spaces to new and environmentally sound uses) and safety (reduce drunk driving and other accidents), but the societal resistance due to the fear of loss of the current employment in some countries, lead to its extinction.

3.2 Accessibility

Accessibility is a very important part of mobility, since mobility is the access of people to goods and services. Thus, any new transportation solution should bear in mind to enhance the accessibility of all the people that is targeting to serve. The accessibility features do not only restrain at the physical accessibility, but also expand to accessibility of the design. For example there are lots of bus lines that have been designed and implemented, but neither the vehicles are accessible (without bus ramps), nor the information given (no verbal feedback on the bus stops).

But when referring to accessibility, we do not restrict ourselves only to people with disability or elderly. One of the solutions with the highest market penetration (Swapnil & Rachna, 2015) is the Advanced Driver Assistance Systems (ADAS). According to most recent reports (Chisult Insight, 2015), in 2014 the largest penetration rates of ADAS market was still in Europe, with a penetration rate of around 9.86%. This solution though excludes most of the car drivers since ADAS are mainly implemented in upper class vehicles, which the average car buyer cannot afford.

3.3 Technophobia and personal data protection

New transportation technologies are emerging, to meet the transportation challenges of our times, including connected and autonomous vehicles, keyless fleet management, local zoning, new technology for on-road communications, real-time traffic management, etc. It is clear now that ITS is poised to transform transportation, but as Adams said in 1999 (Adams, 1999), “Even if the harmful environmental consequences of current and projected levels of mobility could be eliminated by technological advances, significant social problems would remain”. And this problem is twofold. On the one hand there are people who are do not know how to use technology (they are afraid to use it - technophobia) and on the other hand there are people who don’t want to use it because despite its impact at the quality of life, it also creates all kinds of problems, including distress, confusion, pathology, and conflict. An example of resistance to

technology is the RFID ticketing or the mobile ticketing. This solution has great benefits to the average people, but lacks of benefit to the people who do not possess smart mobile phones or they don't know who to use these specific functionalities.

A consequence of the technology is also the great amount of data gathering in our times. This big data gathering and their treatment is an additional barrier for many. People do not like their personal information to be collected in any way or saved to a Cloud, that most people are not aware of its meaning or existence.

3.4 Habit

Human beings usually behave in a sensible manner, meaning that they take account available information and implicitly or explicitly consider the implications of their actions (Ajzen, 1985). Most, of these activities that a person does in order to achieve a task have been designed in advance and their execution occurs as the plan unfolds. As a matter of fact, a certain sequence of these actions can become so habitual or routine that it is performed almost automatically, as in the case of driving from home to work or playing the piano (Ajzen and Fishbein, 1980). Habit is one of the most persistent human characteristics, since it requires less consciousness thought; the force of habit and social patterns. Once people create a habit over a form of travel behaviour or of organisation, they tend to stick to it. Habits or patterns of behaviour, of either individuals or group of people, are slow to change since, once established, they are extremely resistant to change precisely because of their self-reinforcing loop.

When changing a habit is required, energy consumption is needed and with no extreme extraneous impetus (legislation, death of a friend in a road accident, etc.), it is unlikely that someone who has a strongly developed pattern of car-driving for example, will change behaviour, even if presented with alternatives which are more appealing in terms of cost and more friendly to the environment. This explains heavily the resistance of some people to change, in relation to transportation mode use and this is the most difficult societal resistance bone to break since it is difficult to make counterbalance with specific incentives either economic, or environmental or even societal.

4. Conclusions

This paper focuses on the description of societal trends related to mobility and on the way that these trends can be perceived from the society, when implemented. This action represents the starting point of the European project Mobility4EU that focuses on creating an action plan for the coherent implementation of innovative transport and mobility solutions in Europe is thus urgently needed and should be sustained by a wide range of societal stakeholders.

During this effort, it has proven difficult to dissociate clearly societal trends from political or technological ones. In order to deal with this difficulty, we have chosen to cluster and categorize the trends in 9 big megatrends that covering multiple detailed mobility trends. These megatrends are the following:

1. Economic trends: wealth and labour market developments
2. Inclusive society, personalisation, accessibility

3. Urbanisation
4. Environmental protection: climate change, pollution and resource and energy efficiency
5. Digital society and internet of things
6. Novel Business models and innovation in transport
7. Safety in transport
8. Security in transport
9. Legislative framework

The aforementioned megatrends provide a triggering point to our work on the detailed trends definition that will follow in a future publication. This stepwise and scientifically sound approach has allowed us to involve a large group of stakeholders in the process of identifying, evaluating and prioritising future trends and new transport concepts, implications, as well as potential societal resistance and adoption. This is one critical objective of this paper that has focused on the ways the society resists possible changes on its already established ways of transport.

Despite the widely acknowledged significance of the societal impacts of transport in everyday life, as well as their distributional effects across various segments of society, this issue has received less policy attention relative to respective economic and environmental impacts. That being said, in Mobility4EU we have defined a set of possible societal aspects that might lead to societal resistance to the implementation of the megatrends described. This societal resistance to the changes in transport is built upon four specific pillars: job loss resistance, affordability of technology, technophobia and habits.

This paper aims to highlight the possibility of societal resistance to a wider implementation of innovative transport solutions, related to foreseen megatrends for the 2030. In consequence the list has not the ambition to be comprehensive, but rather provide a first overview of the societal reaction to widespread diffusion of foreseen solutions.

Acknowledgements

This work has been developed under the EU funded project Mobility4EU

5. References-Bibliography

Adams, J. (1999). The social implications of hypermobility. In, OECD Working Party on Pollution Prevention and Control, Working Group on Transport, Project on Environmentally Sustainable Transport. The Economic and Social implications of sustainable transport: Proceedings from the Ottawa workshop. Paris: OECD. NV/EPOC/PPC/T(99)3/FINAL/REV1

Ajzen, I. (1985), From Intentions to Actions: A Theory of Planned Behavior, In Kuhl, J. and Beckmann, J. (Eds.), Springer Series in Social Psychology, pp. 11-39, Springer, Berlin.

Ajzen, I. and Fishbein, M. (1980), Understanding Attitudes and Predicting Social Behavior, Prentice-Hall, Eaglewood Cliffs, New Jersey.

Anderton, K., Jonas Å., Ralf B., Cécile Ch., Merethe D. L., Henrik G., Yannick C., et al. (2015). 'Strategic Outlook TRANSFORuM D6.3'. European Comission. http://www.transforum-project.eu/resources/library.html.

Bernardino, J., Vieira J. and Garcia H., (2013). 'FUTRE Deliverable 3.1: Factors of Evolution of Demand and Pathways'. European Comission. http://www.futre.eu/Publications/Deliverables.aspx.

Brundtland G., Khalid M., Agnelli S., et al. (1987) Our Common Future ('Brundtland report')

Coffield, F. (1983). "Learning to live with unemployment: What future for education in a world without jobs?" In F. Coffield & R. Goodings (Eds.), Sacred cows in education. Edinburgh: Edinburgh University Press.

Dablanc, L., Blanquart C., Combes F., Heitz A., Klausberg J., Koning M., Liu Z., and Seidel S. (2016). 'CITYLAB Observatory of Strategic Developments Impacting Urban Logistics (2016 Version)'. Deliverable 2-1 CITYLAB European Project. http://www.citylab-project.eu/deliverables/D2_1.pdf.

Eagly, A. and Chaiken, S. (1993), The Psychology of Attitudes, Harcourt, Brace, Jocanovich, Fort Worth, Texas.

European Parliamentary Research Service Blog, (2015) "Reducing CO2 Emissions From Transport". Available at https://epthinktank.eu/2015/10/22/reducing-co2-emissions-from-transport/

Funded by DG TREN, Copenhagen, Denmark. http://81.47.175.201/flagship/attachments/2009_02_transvisions_report.pdf.

Geurs, K. T, Boon, Wouter and Van Wee, Bert (2009) 'Social Impacts of Transport: Literature Review and the State of the Practice of Transport Appraisal in the Netherlands and the United Kingdom' Transport Reviews, 29: 1, 69 – 90.

Hartmut R. 2003. Social Acceleration: Ethical and Political Consequences of a Desynchronized High Speed Society, Constellations, 10, no 1: 3-33.

L'Hostis, A. (2017). Mobility4EU project deliverable D2.1 - Societal needs and requirements for future transportation and mobility as well as opportunities and challenges of current solutions.

Lemmerer, H., and Paul P. (2012). 'ORIGAMI Deliverable 3.1 Current Travel Behaviour, Future Trends and Their Likely Impact'. Edinburgh: European Commission. www.origami-project.eu.

Mobility4EU project, available at http://www.mobility4eu.eu/

New Market Research on Global & China Advanced Driver Assist Systems (ADAS) Industry-2015, Chisult Insight-2015.

Paradowska M. (2016) Comparison of Road Safety Policy Objectives in Poland and in the European Union. In: Bąk M. (eds) Transport Development Challenges in the Twenty-First Century. Springer Proceedings in Business and Economics. Springer, Cham

Petersen M.S., Enei R., Hansen C.O., Larrea E., Obisco O., Sessa C., Timms P.M., Ulied A. (2009). Report on Transport Scenarios with a 20 and 40 year Horizon, Final report,

Sessa, C. and Enei R. 2009. 'EU Transport GHG Report EU Transport Demand: Trends and Drivers'. European Commission. http://www.eutransportghg2050.eu/cms/assets/EU-Transport-GHG-2050-Task3-Paper-EU-Transport-Trends-and-Drivers-22-12-09-FINAL.pdf.

Swapnil, S., Rachna, S. (2015). "World Advanced Driver Assistance Systems (ADAS) Market - Opportunities and Forecasts, 2013 – 2020".

United Nations (2010). World Urbanization Prospects. The 2009 Revision. Department of Economic and Social Affairs, Population Division.

Urry, J. (2007). Mobilities. Polity.

Wilson, S. (2011). 'Transport Outlook 2011: Meeting the Needs of 9 Billion People'. Text. http://www.itf-oecd.org/transport-outlook-2011-meeting-needs-9-billion-people.