

Proceedings of 7th Transport Research Arena TRA 2018, April 16-19, 2018, Vienna, Austria

Turnaround succeeded! Analysis of impacts of sustainable transport policies in Vienna and four other European capital cities

Oliver Roider a*, Roman Klementschtz a
Regine Gerike b, Rico Wittwer b, Charlotte Halpern c

on behalf of the CREATE consortium

^a *Institute for Transport Studies, University of Natural Resources and Life Sciences, Vienna (BOKU),
Peter-Jordan-St 82, 1190 Vienna, Austria,*

^b *Institute of Transport Planning and Road Traffic, TU Dresden,
Hettnerstraße 1, 01069 Dresden, Germany*

^c *Sciences Po, Centre d'études européennes,
27, Rue Saint-Guillaume, 75337 Paris*

Abstract

Some of the economic advanced European cities appear to have decoupled the correlation between economic growth and car ownership. The research project CREATE funded by the European Commission is aimed at identifying the reasons and framework conditions for this turnaround by analyzing historic data of five European capital cities. The City of Vienna, for example, changed their transport policies from a car-oriented transport masterplans in the past to a push-and-pull strategy by improving the public transport supply, and at the same time implementing pedestrian areas and parking restrictions in the city. The mode share of car use decreased from 40 % early in the 1990'ies to 27 % in 2014. This paper presents in particular the analysis of cause and effects in the City of Vienna and a cross-comparison among European cities analyzed in the CREATE project.

Keywords: transport policies, sustainable transport, city development plan, travel behavior

* Corresponding author. Tel.: +43-1-47654-85617; fax: +43-1-47654-85609.
E-mail address: oliver.roider@boku.ac.at

1. Introduction

Economic growth is often seen as key driver for raising living standards and improving the well-being of citizen, but associated growth in car ownership and car use caused negative economic, social and environmental impacts in turn. Recently, however, some of the economic advanced European cities appear to have decoupled the correlation between economic growth and car use and have been successful in achieving a change in mobility of their inhabitants towards a more sustainable behavior (Newman and Kennworthy 2011, Goodwin, 2012). Cities such as Vienna or London are succeeding in reducing car-traffic and are becoming very attractive places with very high rankings in international satisfaction surveys.

The research project CREATE (Congestion Reduction in Europe, Advancing Transport Efficiency, www.create-mobility.eu), funded by the European Commission's Horizon 2020 research and innovation program under grant agreement No. 636573, is aimed at identifying the reasons and framework conditions for this turnaround in five European capital cities (Berlin, Copenhagen, London, Paris, Vienna) by analyzing changes of mobility patterns of road traffic and car use as well as success factors behind the observed decreasing modal shares of car traffic (e.g. technical, political, economic or social impacts).

The scope of this paper is to present the development of transport policies and effects on mobility behavior over the time based on the example of historic data of the City of Vienna. A cross-comparison shows the similarity with other economic advanced European cities.

2. The 'Transport Policy Evolution Cycle'

There is a growing tendency in the transport literature to account for car reduction and changing mobility patterns in cities by focusing on transport policies and initiatives from public authorities, e.g. investments in public transport, the pedestrianization of inner-city areas, traffic calming zones or shared spaces, pricing schemes etc. (Banister, 2005, Goodwin 2012). The "Transport Policy Evolution Cycle" approach constitutes a first attempt at modeling the process through which changes in the transport policy may be conducive to changes in car use. In this approach, the shift towards sustainable cities policies is considered as a major explanatory factor in order to account for the decrease in car use. Three stages of transport policies in European cities are identified (Jones 2012, Jones 2016):

(1) Stage One: Support traffic growth

Rapid urban economic growth leads to a fast growth in car ownership and use, and a general support for car-oriented transport policies, e.g. by construction of new roads, often linked to street designs which discourage walking and cycling. The desired outcomes of this stage are a good 'level of service' on highways and reductions in motorized road traffic delays.

(2) Stage Two: Mitigating the impact of car traffic

Problems arising from the growing levels of car use begin to become apparent (e.g. road congestion, air and noise pollution, traffic accidents). Transport policies are aimed at the development of better modal alternatives to car use, e.g. by investments in public transport improvement. The desired outcomes are the improvement of public transport provision and performance, high levels of passenger satisfaction and the stabilization in car modal share.

(3) Stage Three: Create livable cities

A growing emphasis is set on the urban quality of life as part of the sustainable urban development strategies through (i) reallocating road space to sustainable transport modes and to street activities by providing a high quality public realm, (ii) congestion pricing or parking restrictions, and (iii) providing enhanced public transport. The desired outcomes are improved street environment encouraging people to increase walking and cycling, and greater street activity.

The three stages primarily represent an evolution in thinking, on the part of the politicians and the public, about what cities are for and what types of mobility and activity should be encouraged. The five European capital cities of 'CREATE' are now broadly adopting 'Stage 3' policies (Halpern 2017, forthcoming). One main goal is the

analysis of historical knowledge gained while going through the Transport Policy Evolution Cycle and the transferability to ‘Stage 1’ cities to enable them to pass more rapidly and to avoid wasted investments (figure 1).

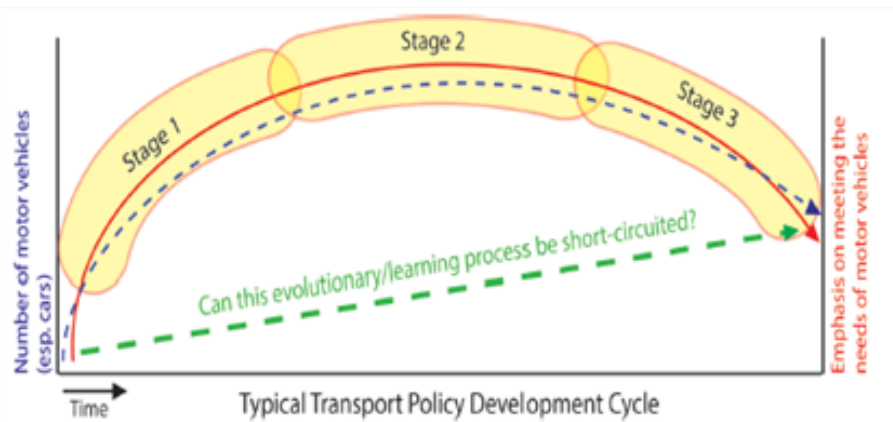


Fig. 1 Transport evolution cycle (Jones 2013, Jones 2016, Halpern 2016)

3. Conceptual framework for understanding travel behavior

In recent years new definitions of network “level of service” have been developed to cover alternative modes to car, including public transport passengers (TRB 2010). For walking and cycling, this uses a combination of speed, density and delay, and for public transport also considers service frequency, reliability and crowding. Recent Australian research (Green and Epsada 2015) goes further and includes not only measures of ease of movement in “level of service” standards, but also provision for movement, in terms of roadside information, condition of pavements, security, etc.

The general conceptual framework used in ‘CREATE’ considers the explanation of travel behavior changes based on different transport measures and systems implemented. In order to analyze the Transport Policy Evolution Cycle in the five European capital cities a set of relevant travel indicators has been developed to be mapped over time. Figure 2 presents the conceptual framework used for the analysis. It focuses on car ownership, car use (trip rates and mileage), and the interrelation with city specific framework conditions. However, indicators describing the overall travel behavior including all transport modes are considered as well. Governance structures are the basis for actively shaping the transport systems by the various involved stakeholders. Different determinants of travel behavior interact within this framework given by the governance structures. The supply side includes all parts of the built environment such as spatial structures, densities of population or work places; it also includes the transport system with all the different modes.

The demand side can only partly be shaped actively by transport policies. Socio-demographic characteristics of the population might e.g. change over time thanks to general societal developments from outside the transport sector. Mind-sets are very important drivers for travel behavior. These can be influenced e.g. by education policies but they might also change again due to general societal developments. Contextual factors include e.g. the topography or the weather conditions. They need to be considered especially for promoting active travel. All these different components have impacts first on car ownership as a mediating variable and on the individual travel behavior (Gerike and Wittwer, 2016).

The data collection was mainly based on statistical data and on the analysis of household travel surveys (HTS) which are available in each city, ideally from the 1970s (‘Stage 1’ condition). Moreover, workshops and face-to-face interviews with stakeholders of the cities were organized in order to gain an insight view of the transport policy framework conditions of today and the past.

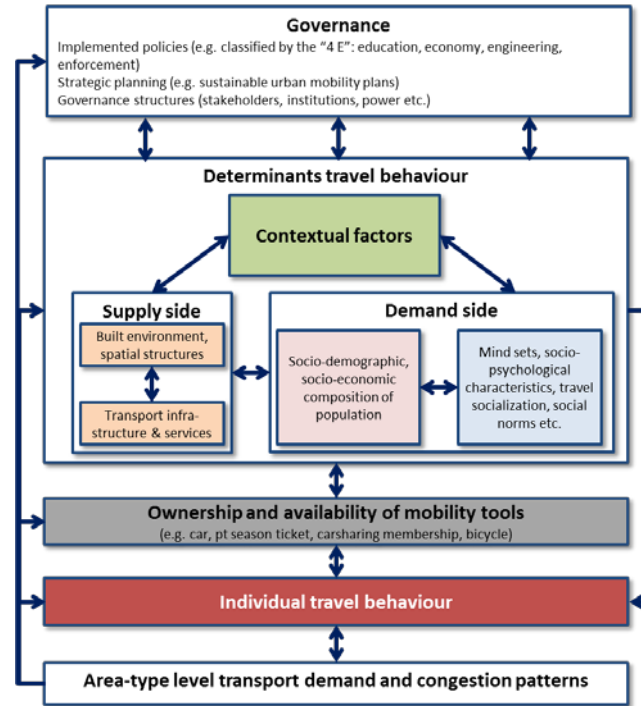


Fig. 2 Conceptual framework of data collection and analysis (Gerike and Wittwer, 2016)

4. Case study example Vienna

4.1. Characteristics of the city

Vienna is the capital city of Austria and the largest city in the country. In 1970 Vienna was home to 1.62 million people. Until 1987 the population decreased to 1.48 million inhabitants, mostly due to lower numbers of births than of deaths. The dissolution of the Soviet Union and the war in former Yugoslavia caused an increase in the city's population. This trend was mitigated by stricter migration policies in the mid-nineties (Municipality Department 24, 2010), but reversed at the beginning of these millennium. The population increased to 1.76 million inhabitants in 2014 and is still growing. Two million inhabitants are expected by 2030 causing the future challenges of the city administration (figure 3a). At the beginning of the 1970s, there were approximately 690,000 employed persons, of which 89 % were fully-employed, in Vienna. The unemployment rate was low at 1.5 %, but increased steadily after the first oil crisis in 1973 and reached 11.6 % in 2014 (Public Employment Service Austria, 2016). The number of residents in part-time employment rose by 220 % over the last 40 years. Corresponding to the increased education level the number of students quadrupled until 2014 (figure 3b).

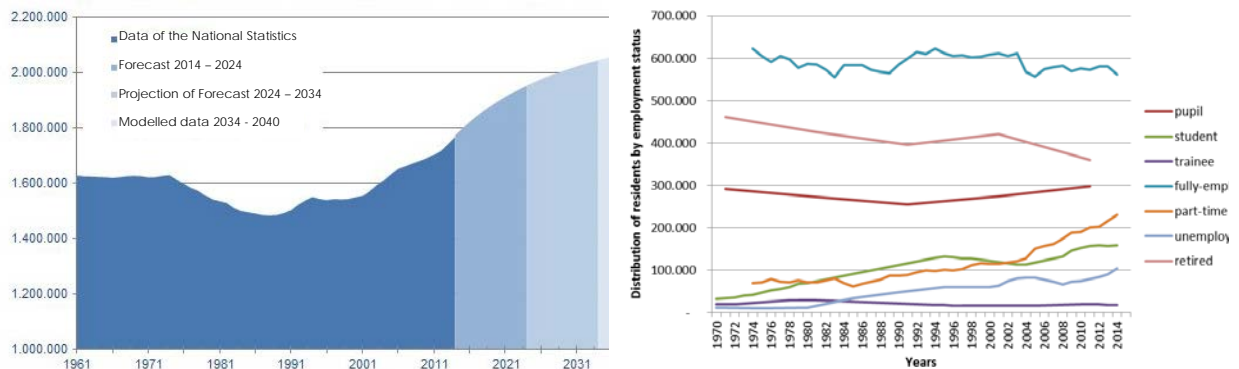


Fig. 3 (a) Historic development and forecasts of the population in Vienna (Municipality Department 23 2014, Illustration provided by the city government, <https://www.wien.gv.at/statistik/bevoelkerung/prognose>); (b) City-wide development of the distribution of residents by employment status and area type (Municipality Department, various years 1970 to 2014), (Statistics Austria, 2016), (Public Employment Service Austria, 2015)

4.2. History of transport policies

With the support of the funds granted under the Marshall Plan and following the country's restored autonomy in 1955, the City of Vienna entered a period of economic growth and prosperity. In transport planning and policies car was the dominant mode and seen as symbol for overcoming the disaster of the war times, however, in the 1950's Vienna had still one of the largest tram network of the world (City of Vienna 1956). The first urban development plan published in 1952 was deeply influenced by the developments in other western cities, including the priority given to the construction of roads. An arterial road system, including inner-city motorways, was developed (Austrian National Council 1971). There were little attempts to strengthen the urban dimension of public transport, apart from the joint decision at the end of the 1960's to develop a metro network, but at this time, mainly in order to create more space for road traffic.

As part of the development of the metro system crossing the city center, the first pedestrian zones were introduced in 1974. The oil crisis as well as growing environmental concern within the local population contributed to raising awareness among local residents regarding the negative externalities of car. Additionally, population growth projections highlighted the need to develop more restrictive policies against car use in the city center due to limited space for car traffic. The transport masterplan published in 1994 defined the improvement of the quality of life in the city as averaging goal. (Re-)organisation of public spaces, environmental issues and traffic safety were explicitly mentioned. A share of 45% public transport trips in the modal shift was defined to be reached by 2010 (figure 4a). The parking management system, which would later become the trademark for the Viennese approach to car reduction, was introduced from 1993 onwards (see chapter 4.3). An integrated spatial planning and mobility management approach was adopted in 2014, which includes some 50 sustainable transport measures and seeks to strengthen sustainable mobility policies across transport modes and user groups. A ratio of 80/20 in favor of sustainable transport modes was defined as main goal of the city development plan for 2025 (Municipality Department 18 2015, figure 4b).

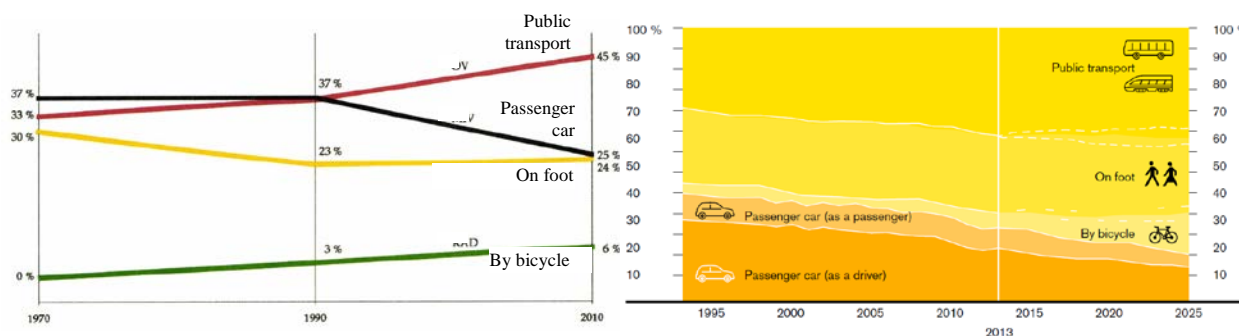


Fig. 4 (a) Development of the modal split defined as goal of the Transport Master Plan 1994 (Hiess et al. 1994); (b) Development of the modal split defined as goal of The transport Master Plan 2025 (Municipality Department 18 2015)

4.3. Push-and-Pull strategy

The current transport policy in the City of Vienna is mainly based on a push-and-pull strategy (Sammer 2009). On the one hand the public transport system is extended and improved and on the other hand car-restrictive measures, such as parking management or pedestrianization, are implemented. The following paragraphs describe two key-elements of the recent transport policy in the City of Vienna.

Public transport supply

One of the backbones of sustainable transport in the City of Vienna is the high-quality public transport supply, mainly based on the metro network. In 1993, 11,884 million seat-kilometers were scheduled for the public transport network of the main public transport supplier (Wiener Linien) including metro, tram, and bus services. Through network expansions and higher frequency of service the supply increased to 12,400 million seat-kilometers until 2014 (figure 5). Currently the length of the metro network is about 83 km (including an extension opened in 2017); further extensions have been decided already. The bus service has been expanded by 31% while the tram service stayed stable at about 4,186 million seat-kilometers during the last two decades, however, further tram extensions are already decided as well.

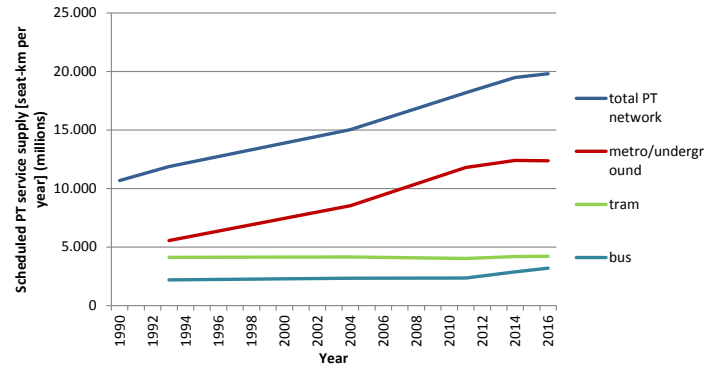


Figure 5 City-wide development of scheduled (offered) public transport service supply (Wiener Linien, various years 1993 to 2015)

Priority for public transport particularly at intersections has become a principle for Viennese transport policies. In 2014 the traffic light circuit at several specific intersections in Vienna was adapted to tram and bus journeys (Magistratsabteilung 53, 2015). Additionally, separated public transport infrastructure is being expanded to further increase travel speed. To increase public transport use in Vienna, the government subsidizes its operation by 40 %. This annual subsidy amounts to 500 million €. Without the governmental subsidy the price of the annual public transport ticket might be double its current price of 365 €. A bonus-malus regulation has also been introduced, and will be implemented in 2017 to ensure lasting compliance. The regulation evaluates the actual transport supply as well as quality criteria such as customer satisfaction, accessibility, cleanliness and safety (Die Presse, 2015).

Parking management

In 1993, the entire first district – Vienna's city-centre – was turned into a short-term parking zone. In subsequent years short-term parking zones were extended in specific sections in inner- and outer-city areas and are still to be extended (figure 6). The price for one hour parking in a short-term-parking zone was 0,87 € which even decreased to 0,80 € in 2002 due to the conversion from the Austrian Schilling to Euro. In 2002 the price was increased to 1.20 €, a few years later to 2 € and currently an hour parking costs 2.10 €, which means that the prices were increased significantly in the last decade (Wien-konkret, 2013). Residents of the districts with parking management can purchase an annual parking ticket. Apart from the reduction of motorized individual traffic and the improvement of parking situation of residents as well as commercial traffic (e.g. delivery), more income is generated to be used for implementing sustainable transport measures in the city. According to the Viennese "Parking Meter Act" the revenues from short-term parking charges are earmarked for this kind of measures (Dorner 1997). Main impacts of parking management in the City of Vienna are a reduction of parking space load and a reduction of traffic searching for parking-space. Studies show that the recent extension caused a drop from 83% to 60% parking space load. 56% of non-residents trips with destination in these areas shifted to public transport trips after the implementation of the parking management (Sammer et al. 2014, Sammer et al. 2012). However, the final decision of implementing parking restrictions is made on district level. Two Viennese districts organized a public referendum among the inhabitants about the implementation of the parking management in their district. Here, the majority voted against (figure 6).

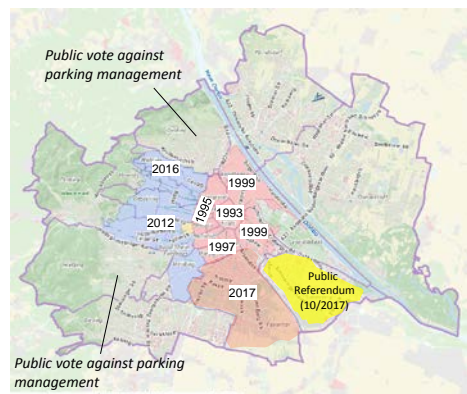


Fig. 6 Development of the area with parking management (own illustration based on <https://www.wien.gv.at/stadtplan>)

4.4. Transport supply and demand

As it is not possible to analyze the impact of each particular measure implemented in the last 40 years having an influence on the mode choice of transport users, the authors decided to focus on milestones in the development of the transport system, although the whole transport system is always influenced by a bundle of bits and pieces. The city government started to implement environmental friendly transport measure, however, car use still increased due to the booming economic situation. Even the implementation of the paid-short-term parking zone in the first district had no significant influence on this development. A turn-around was achieved by the extension of the paid-short-term parking zone to all inner-city districts at the end of the 1990's and at the same time the opening of further extensions of the metro network. A noticeable development can be identified in the recent years. In 2010 the Green Party became part of the government of the city, in a coalition with the socialist party, and provided the councilor for transport. A bundle of sustainable transport measures was implemented within short time (extension of pedestrian zones and cycle and metro network, but most important seems to be the reduction of the annual public transport ticket price (from 450 € to 365 €) and further extensions of paid-short-term-parking zones to the outskirts of the city. Unfortunately, the survey methods were changed in 2010, so that the figures of the past are not fully comparable with the recent ones, but a general trend can be identified. Due to the bundle of measures, the share of public transport trips increases to 39% (an all-time high value since the 1980's), whereas the share of car trips dropped to 26%. Together with the extension of cycling facilities the bundle of measures mentioned above seemed to influence the use of bicycles as well. From 2005 to 2014, the share of cycle trips increased from 3% to 7% (figure 7). Similar conclusions can be found in Buehler et al. (2017).

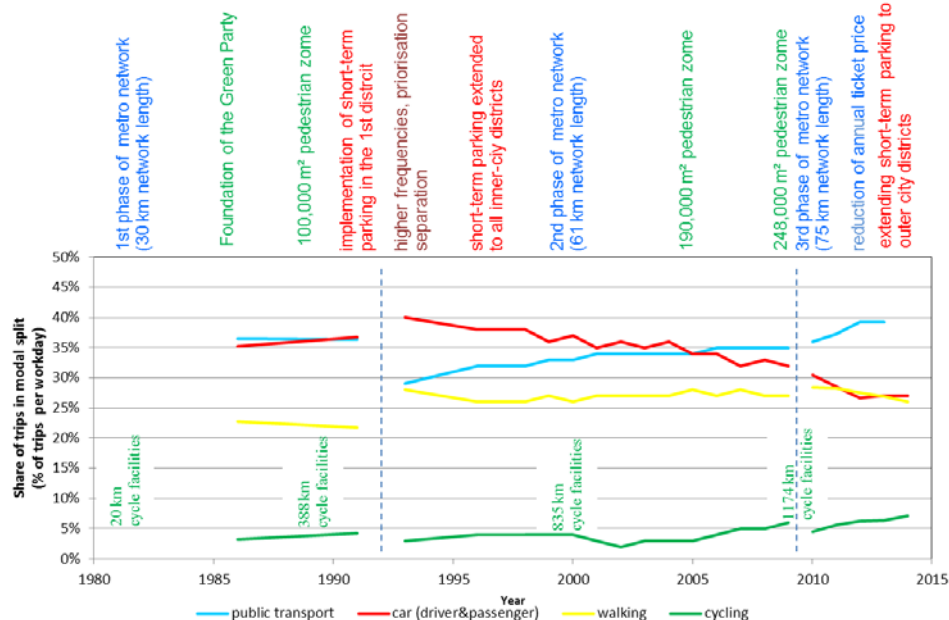


Fig 7 Development of modal split of inhabitants (workday) [% of trips] (dotted line indicates change of survey methods) Sources: (Herry and Snizek, 1993) (Socialdata, 1993-2009), (Omnitrend, 2010 - 2014)

5. Cross-site comparison among five European capital cities

The analysis of the historic transport policies and data of five advanced Western European capital cities shows that different strategies were implemented to achieve a more sustainable transport network. As described above, the City of Vienna changed their policy late in the 1990's to a push-and-pull strategy, mainly based on the extension of the metro network and the implementation of parking restrictions. The City of London implemented congestion charging in the inner city districts in 2003, the City of Copenhagen fosters bicycle use, Paris' transport policies focus on integrated transport planning and urban development schemes, while the City of Berlin is faced with the challenge to combine eastern and western transport networks of the city in a sustainable way after the fall of the Berlin wall. However, in most cases, strategies primarily refer to the strengthening of public transport and other environmental-friendly modes in combination with car-restrictive measures; altogether packed into an integrated city development approach strongly supported on political level. In addition, different forms of policy instrumentations are developed across cities and across time in order to implement these policy

goals. Some similarities are observed, but in most cases, heterogeneity rules are applied. This confirms that there is no one best way towards the livable city (Halpern 2016), but all cities have passed the ‘peak-car’ and reached a significant drop of car use recently (figure 8).

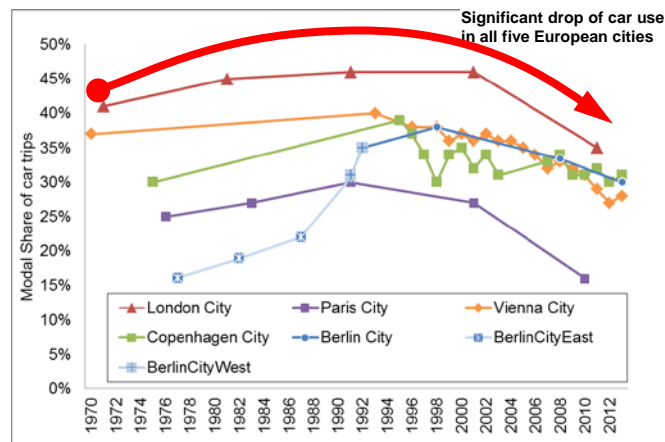


Fig. 8 Comparison of the development of mode share of car use in five European cities

One research question of ‘CREATE’ is to examine whether causes of car use reduction differ from city to city due to differences in contextual framework conditions, transport supply and demand factors, mobility cultures, governance structures, etc.; or whether similar drivers can be identified for the observed developments. Micro data of repeated cross-sectional household travel surveys (HTS) are the fundament of these analyses. Core variables have been defined for micro data analysis and a complex and elaborate process of data harmonization was carried out dealing with differences in survey coverage, definitions of variables, area type, and an additional data treatment for reducing methodological impacts. Finally, micro data were merged in one pooled database. The ex-post data harmonization effort allows comparing travel indicators at micro level (individual level). The whole process and the methodology of data harmonization are described comprehensively in Wittwer et. al. (2017).

Changes in mobility cultures and mind sets (also habits) have most probably contributed to changes in travel behavior although those effects can only be indirectly assessed by analyzing revealed travel behavior data collected by HTSs. Therefore, Age-Period-Cohort (APC) analyses were carried out which allow partly separating different causes from each other. The challenge of APC analysis is to disentangle the three time-related components into aging, time-period and cohort components. As a result, HTS data analyses for the ‘Stage 3’ cities within ‘CREATE’ show interesting developments in terms of the observable car peak phenomenon. There are clear indications, that the main drivers of shaping the typical ‘banana’ curve of car use are changes in travel behavior of employed people in all five examined urban areas. These changes are not only caused by improved transport supply of alternative transport modes (modal shift), but also by changing employment situations (i.e. clear increase of part-time employment during the recent decades). This leads to less trip rates of employed people for mandatory purposes and therefore simply avoiding transport necessities. Additionally, there are opposing effects within the population in terms of car access. The current younger generations (i. e. younger than 40 years of age) show the clear tendency to less car access compared with previous generations across all five European capital cities. The clear drop of car trip rates for mandatory activities, which constitute the main part of travel patterns on workdays for these citizens are the driver for the car peak phenomenon. Pensioners show nowadays the opposite trend in travel behavior. Increasing car access and car orientated travel socialization in their past result in increasing car use, but from a relatively low starting point in the 1970s. Due to the fact that pensioners are in many cities an increasing population group but compared to employed people still outnumbered they ‘only’ damp the clear tendency of less car use of all other population groups (figure 9).

In the City of Vienna, all the above mentioned causes are observable. In particular, clear modal shifts have taken place within the recent decades. Nowadays, more than 50% of all mandatory activities are accessed by metro, bus or tram. As a consequence of sustainable transport policies, Viennese employees of all age cohorts currently drive less with cars than in the early 1990s. With this in mind one can argue, that push-and-pull strategies of transport planning show the desired results.

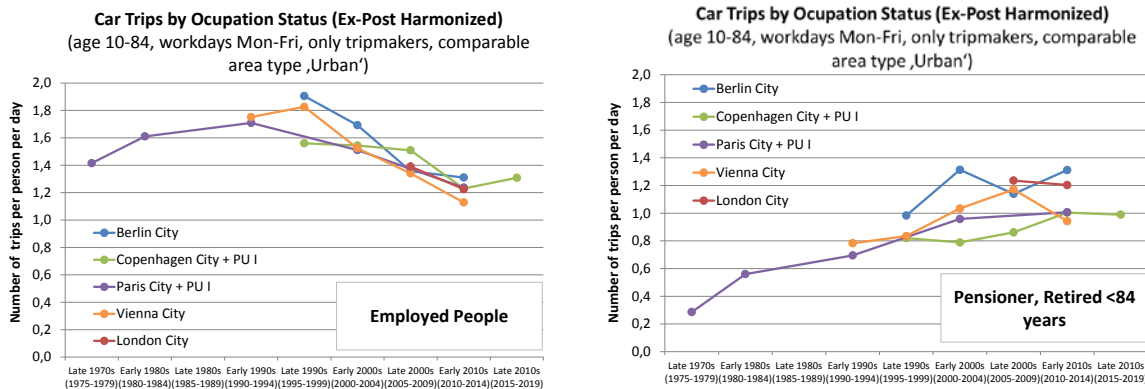


Fig. 9 Comparison of the number of car trips of employed and retired people (aged 10-84), workdays Mo to Fr, only trip-makers, comparable area type 'Urban'

6. A (new) promising approach: Exchange of experiences

Within 'CREATE' a mutual visits of staff are organized. Staff in charge of policy development and sustainable mobility in the Turkish City of Adana explored the core elements in the City of Vienna for two days. Excursions and workshops with city representatives, transport planners, public transport operators etc. were organized. In turn, delegates of the 'CREATE' consortium visited Adana for three days given the opportunity to discuss their ambitions, exchange experience and work on recommendations for a smooth implementation.

Despite different framework conditions the goals of the city administrations are comparable between the two cities, in fact, to reach a more sustainable transport system. For example, the city governments of Adana works on the re-organization of the public transport system in the old historic city center, which is one of the busiest areas of Adana, mostly overcrowded and especially during winter time often polluted. The area is consistently subject to traffic congestion as private minibus operators are using the area as hub place and, thus, causing high volume of traffic. Additionally on street parking problems appears due to the high demand of the private transport vehicles. There is almost no pedestrian environment and the sidewalks are occupied by cars and retailers. Thus, the transport masterplan for the city center includes the implementation of a conventional bus system having seamless connections to the minibus system at the outskirts, in order to reduce the amount of cars and to have more space available for pedestrianization.

During the mutual visits strategies were discussed how to implement a reliable and convenient public transport system in the city, e.g. by providing well-designed and equipped bus stations, bus priority systems and intensive information campaigns to promote the advantages of the new system for the passengers as well as for private minibus operators who are afraid of losing business. Promotion campaigns, public transport information systems as well as push-and-pull strategies implemented in Vienna and London served as basis for the discussions. It is obvious, that current 'stage 1' transport situations cannot be changed within the lifetime of 'CREATE', however, the exchange of experiences and strategies of transport policies in Vienna or London provides examples of well-operating sustainable transport systems in order to convince local stakeholders and decision makers of the advantages of a more sustainable transport policy.

7. Conclusion

It is obvious, that shifting car users to environmental-friendly modes of transport is not depending on particular single measures, but on a bundle of transport measures aiming at making these modes more attractive for the inhabitants. In doing so, the acceptance of car-restrictive measures among inhabitants is increased as people are getting aware of alternatives realizing the positive impacts. The analysis of the City of Vienna and four other economic advanced western European capital cities shows that decoupling economic growth and increased car use is possible and leads to livable cities. However, policy transition towards sustainable transport strongly depends upon the ability of local authorities to effectively mobilize sustained internal and external support in favor of reshuffling policy goals, but more important, policy resources.

Acknowledgements

The authors gratefully acknowledge the support of the CREATE consortium, in particular, the representatives of the five European ‘Stage 3’ cities for collecting and providing data of their city.

8. References

- Austrian National Council (1971) Bundesgesetzblatt 286/71 (Federal Law Gazette 286/71) published at the website of the City of Vienna (<https://www.wien.gv.at/stadtentwicklung/projekte/verkehrsplanung/strassen/bundesstrassen/bundesstrassen-1971.html>), accessed on 30 August 2017.
- Banister, D., 2005, *Unsustainable transport. City transport in the new century*, London: Routledge.
- Buehler R., Pucher J., Altshuler A. (2017) Vienna’s path to sustainable transport. In: Taylor and Francis (ed.), *International Journal of Sustainable Transportation*, 11:4, Abingdon (UK).
- City of Vienna (1956) Public transport network of the City of Vienna in 1956 published by Straßenbahnjournal-Wiki! (Tram Journal Wiki) (http://www.strassenbahnjournal.at/wiki/index.php?title=Datei:Wien_Tram_1956.jpg) accessed on 30 August 2017.
- Dorner A., Herry M., Schuster M., (1997). Parkraumbewirtschaftung in Wien (Parking Management in the City of Vienna), Municipality Department 18 (ed.), Vienna (Austria).
- Gerike, R., Parkin, J. (2015): *Cycling Futures – From Research into Practice*. Ashgate Publishing Limited, Farnham, Burlington, 287p.
- Gerike, R., Wittwer, R. (2016). Congestion Reduction in Europe: Advancing Transport Efficiency (CREATE). Detailed analysis scheme for WP3 (D3.1). Internal Report, Dresden (Germany)
- Goodwin P., 2012, ‘Peak Travel, Peak Car and the Future of Mobility: Evidence, Unresolved Issues, Policy Implications, and a Research Agenda », Discussion Paper No. 2012-13, International transport Forum Prepared for the Roundtable on Long-Run Trends in Travel Demand, 29-30 November 2012, Paris (France).
- Green, D. and Espada, I. (2015). ‘Level of Service Metrics (for Network Operations Planning).’ Austroads Research Report AP-R475-15, Sydney (Australia).
- Halpern C. and Persico S. (2016). Technical Report on WP4 Qualitative Analysis of Process (internal report). Paris (France).
- Halpern C. ed. (2017), Qualitative analysis of historical transport policy developments across 5 European capital-cities, CREATE project, Paris (forthcoming).
- Herry, M., & Snizek, S. (1993). *Verkehrverhalten der Wiener Bevölkerung 1991* (Mobility behavior of Viennese inhabitants). Wiener Verkehrskonzept, Band 40 Vienna (Austria)
- Hiess H. et al. (1994) *Verkehrskonzept Wien* (Viennese Transport Masterplan), Municipality Department 18 (ed.), Vienna (Austria).
- Jones, P. (2012). ‘The role of an evolving paradigm in shaping international transport research and policy agendas over the last 50 years’. Keynote Paper published in the Selected Proceedings of the 12th International Association for Travel Behavior Research Conference. Chapter 2 in Pendyala, R. and Bhat, C. (eds). ‘Travel Behaviour Research in an Evolving World’. pp. 3-34. ISBN 978-1-105-47378-4.
- Jones, P. (2013). ‘Integrating TDM within a wider policy framework to influence long-term traffic growth trajectories’. Keynote Plenary Paper to the 6th International Symposium on Travel Demand Management, Dalian, China, August.
- Jones, P. (2016). ‘Long-term Trends in Urban Transport Policy Development in Advanced Western Cities – a model with wider application?’. Submitted to *Journal of Transport Policy*.
- Municipal Department 18 et al. (2015) *Step 2025, Urban Mobility Plan Vienna*, Vienna (Austria)
- Municipality Department 23 (2014). *WIEN WÄCHST... Bevölkerungsentwicklung in Wien und den 23 Gemeinde- und 250 Zählbezirken* (Vienna is growing...Demographic developments in Vienna and the 23 districts and 250 registration district). Vienna (Austria).
- Municipality Department 24. (2010). *Wiener Sozialbericht 2010* (Viennese Social Report). Vienna (Austria)
- Newman P and Kenworthy J (2011) ‘Peak Car Use’: Understanding the demise of automobile dependence, World transport policy and practice, 17.2, June OECD, Strategic transport infrastructure needs to 2030, Paris (France)
- Omnitrend. (2010 - 2014). *Mobilitätsbefragung 2010 – 2014* (Mobility Survey 2010 to 2014). Vienna (Austria)
- Public Employment Service Austria. (2015). *Vorgemerkte Arbeitslose* (recorded job-seekers). Vienna (Austria)
- Public Employment Service Austria. (2016). *Registerarbeitslosenquote in Wien 1950 bis 2015* (unemployment quote in Vienna 1950 to 2015). Retrieved May 21, 2016, from <https://www.wien.gv.at/statistik/arbeitsmarkt/arbeitslosigkeit/>
- Sammer G., Röschel G., Gruber C., Sammer G., (2012). *Entscheidungsgrundlagen für die Ausweitung der Parkraumbewirtschaftung in Wien* (Decision basis for the extension of the parking management zones in Vienna). Vienna (Austria).
- Sammer G., Röschel G., Gruber C., Sammer G., (2014) , *Ausweitung der Parkraumbewirtschaftung in Wien. Evaluierung der Auswirkung der Ausweitung der Parkraumbewirtschaftung auf die Parkraumnachfrage* (Extension of the parking management zone in Vienna. Evaluation of the impacts). Vienna (Austria).
- Sammer G., Saleh W. (2009) *Travel Demand Management and Road User Pricing: Success, Failure and Feasibility*, published by Taylor & Francis Ltd, Ashgate (UK).
- Socialdata. (1993-2009). *SOCIALDATA: Mobilitätsdaten: Verkehrsmittelwahl. (Mobility data, Mode Choice)* (I. f.-u. GmbH, Editor) Retrieved May 6, 2016, from <http://www.socialdata.de/daten/modechoice.php> Statistics Austria (2016).
- TRB (2010). ‘Highway Capacity Manual 2010’. Transportation Research Board, Washington DC (USA)
- Wiener Linien. (various years 1993 to 2015). *Betriebsangaben* (operating data). Vienna. Retrieved May 1, 2016, from <http://www.wienerlinien.at/eportal3/ep/channelView.do/pageTypeId/66526/channelId/-46746>
- Wien-konkret. (2013). *Parkgebühren. (Bezirks-) Parkpickerl in Wien 2013* (parking fee, parking management in Vienna). Retrieved May 24, 2016, from [Wien-konkret: http://www.wien-konkret.at/verkehr/auto/parken/parkgebuehren/](http://www.wien-konkret.at/verkehr/auto/parken/parkgebuehren/)
- Winters, M., Davidson, G., Kao, D. and Teschke, K. 2011: Motivators and deterrents of bicycling: comparing influences on decisions to ride. *Transportation*, 38 (1), 153-168.
- Wittwer, R., Hubrich, S., Wittig, S., Gerike, G. (2017). Time Series Analyses of Travel Behaviour for five ‘Car-Peaked’ European Capital Cities: Methodological and Behavioural Insights. Conference Proceedings of the 11th International Conference on Transport Survey Methods (ISCTSC), Québec (Canada)