Transitions towards car-free cities

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ABSTRACT

As various cities around the world are implementing car-free policy, the need to understand it from a dynamic point of view becomes more pronounced. This paper sheds more light on the reasons to go car-free as forces of change, while further analyzing the inhibitors and dynamics of transitions towards car-free cities. Reasons to drive can be conceptualized as intrinsic and extrinsic, each with its own relevance in the light of transitions. At the same time, the dynamic processes of enabling and implementation are conceptualized in order to move towards a more realistic view of the complexities of these transitions.

Keywords

Car-free cities, urban mobility, transitions.

INTRODUCTION

In most climate change scenarios related to transportation, there is a heavy reliance on *efficiency* and *alternative fuels*, as well as other sectors if these technological fix scenarios do not play out (see Creutzig et al., 2015). At the same time, reducing urban automobility through Low-Emission Zones (LEZs), pedestrianization and larger-scale car-free urban areas have become more important topics with cities such as Madrid and Oslo actively starting to implement a fine-grained car-free area and a single, larger-scale car-free area, respectively. In this paper, the Oslo-type of car-free area will be investigated in terms of how transitions from current cities towards could potentially unfold. The factors that will be investigated are in the form of socio-cultural, material, and institutional factors, as well as those related to human practices. This leads to the following research question:

What factors facilitate and inhibit transitions towards car-free cities, and how do such transitions take place?

THEORETICAL BACKGROUNDS

Enabling and implementation

This paper analytically distinguishes between the processes of enabling and implementation, being mentioned rather implicitly by prior authors (e.g. Nieuwenhuijsen et al., forthcoming). Enabling is the process of meeting the requirements for the implementation of specific car-free policy, which is itself a tedious process. The complex nature of the implementation process makes enabling not a binary process ex-ante. Rather, enabling increases the likelihood of the successful implementation of car-free cities. Elucidation of the process of enabling a city to turn car-free will be pursued here. Prior authors have set out a start on the process of enabling, by mapping the requirements for a city to turn car-free. These authors have essentially created binary models, forming flowcharts or checklists. This paper will seek to move beyond such simplistic views of these requirements, towards a more realistic and complex framework.

METHODOLOGY

In order to answer the research question, a non-structured literature review was set out. Firstly, reasons to go car-free were mapped. While Nieuwenhuijsen & Khreis (2016) mapped reasons to go car-free in health terms, the triple bottom line of sustainability was used here in order to identify the effects in environmental, economic and social terms. From the literature, the most frequently coined negative effects of automobility and reasons to go car-free were selected. A framework was created in order to understand how these reasons shape reality, as the social construction of these indicators is turned into reality.

Next to this, reasons to drive were outlined, in order to understand to what extent they can be overcome, following a distinction made between intrinsic and extrinsic drivers by Mokhtarian, Salomon and Singer (2015). Similarly to the previous part, the most reported reasons to drive were classified from the literature.

Thirdly, the theory of enabling and implementation was developed by scrutinizing prior literature in the field and combining it with complexity and transition literature.

A final note is that seven semi-structured interviews were conducted, in which these issues were discussed with experts in the field. The insights from these interviews are mentioned rather explicitly in the findings and were used for theory development. The findings of these interviews are available upon request.

REASONS TO GO CAR-FREE

There is a wide variety of reasons to move towards car-free cities that can be identified in the literature (see Figure 1). The spatial impact of car-free policy can be subdivided into these three effects. Through social construction, the effects are valued by urbanites, planners, and policymakers in certain ways, which determines visions of what good urban design looks like, thereby shaping policy and planning alike. This makes it impossible to quantify the importance of the indicators, although some general remarks can be made about the expected effects and the relative importance of the indicators.

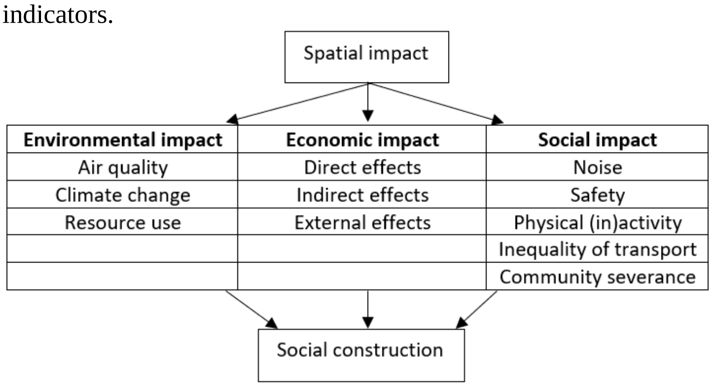

Figure 1: social construction of reasons to go car-free.

Spatial impact

Automobility is the most space intensive form of transportation in urban areas. For example, urban land-use in the USA would increase by 37% if public transport (PT) was to be replaced by automobility (Gallivan et al., 2015), despite low levels of PT use.

Land used by automobiles can be converted into three other types of land-use: infrastructural, private, and public land use. The first type is required to some extent, as public and active transportation (walking and cycling) also require infrastructure. As high densities are a requirement for the viability of public and active transport, the conversion of land into private space can bring both economic and transport benefits. At the same time, the conversion towards public space has positive impacts on economic, environmental and social indicators (Beck, 2009). Depending on the specifics of the city before conversion, making an area car-free will thus have a positive effect on all three indicators from a spatial point of view.

Environmental impact

The negative environmental effects of automobility on air quality are well-documented, increasing the likelihood of a variety of diseases (Nieuwenhuijsen & Khreis, 2016), itself being a reason for the implementation of LEZs all over Europe. As electric vehicles still emit non-exhaust emissions, which could potentially pose greater health risks than exhaust emissions and are emitted in greater quantities by electric vehicles (Kole et al., 2017), air quality can be a strong reason to go car-free.

Climate change is a less straightforward reason to go car-free, as the elimination of automobility will lead to the rebound effect, where carbon is emitted as the money spent on automobility is now spent otherwise. Carbon rebound is estimated to be below 30% for personal travel (Druckman, Chitnis & Sorrell, 2011) and empirically found to be 55% in Vienna (Ornetzeder et al., 2008), car-free areas are expected to reduce the total climate impact of individuals.

Economic impact

The economic impact of car-free policy is more complicated in nature. Empirical evidence is only present in smaller pedestrianization schemes, which are often found to result in a positive impact. Even larger-scale automobility reduction policy in Groningen did not seem to result in economic decline (Tsubohara, 2007). Within the EU, the external costs of automobility are not covered by earmarked taxes (Becker, Becker & Gehrlach, 2012), even less so in cities. Although car-free policy is less economically sound than congestion pricing, it can be expected to be more equitable (based on Lucinda et al., 2017). Although the specific economic impact is impossible to predict, the impact is not necessarily negative, especially under conditions of congestion.

Social impact

Both the amount of noise produced in Groningen as well as the number of people considering noise a 'serious nuisance' has been shown to halve with the implementation of automobility reduction policy in Groningen (Tsubohara, 2007). Next to a nuisance, noise has serious health consequences (see Nieuwenhuijsen & Khreis, 2016, for a discussion).

Although the specific safety effect of car-free areas is indeterminate because of the specific nature of safety issues, it is to be expected that car-free areas are substantially safer in terms of traffic than most areas with cars (based on Green, Haywood & Navarro, 2016).

Another important social effect is physical inactivity, which is the fourth leading cause of chronic diseases worldwide, accounting for approximately 3.2 million deaths per year. Although forbidding driving for this reason can be seen as too paternalistic, increased physical activity is a desirable side-effect of car-free areas.

Inequality of transport can lead to social isolation, as well as unemployment, with the effects falling disproportionally on already disadvantaged groups. Car-free areas need to remove all automobility-related social exclusion in order to be viable, thereby essentially nullifying these effects.

The community severance effect, where social interaction is reduced by infrastructure and vehicles, stems mainly from automobility, although also being caused in part by PT. As more space is required by cars than PT, a reduction of this effect is to be expected in car-free areas. This way, social interaction in these areas is expected to increase through car-free areas.

THE PRACTICE OF URBAN AUTOMOBILITY

A useful analytical distinction to understand the need for automobility and its ability to change is that between intrinsic and extrinsic reasons to drive (Mokhtarian et al., 2015). Intrinsic reasons refer to autotelic factors that do not contribute to the trip purpose, while extrinsic factors refer to the purpose of the trip. Importantly, the intrinsic factors related to the car must be given up inside the car-free area, while the extrinsic factors can be imperfectly replaced by the extrinsic factors of other modes. Below, these factors will be briefly elaborated upon.

Intrinsic reasons to drive

In this paper, six intrinsic reasons to drive are discussed: comfort, protection, flexibility, autonomy, status, and fun. In terms of comfort, the ability to control the environment in the car both in social, audio and climate terms is valued by motorists (e.g. Beirão & Cabral, 2007). Relatedly, the car provides a form of shielding, in protecting the environment from not only acute threats but overall uncertainty, not only for the driver but also for passengers. Flexibility, in intrinsic terms, refers to the feeling of not being squeezed into timetables, while the car provides a form of active control that is valued. Autonomy is related to this flexibility, in that it gives people the ability to control their own lives, giving people an unprecedented ability to control where they live, work, and recreate (Lomasky, 1997).

Status is a social construct that has become related to the car. After the house, the car is the major status item one can possess, with a variety of sign values attached to it. Next to this, the car provides a socially acceptable form of transport, due to its flexibility, lack of need to get sweaty (as when walking and cycling), and sign values (Kent, 2016).

The fun of driving has been found to be important by many authors in the field (e.g. Beirão & Cabral, 2007). Importantly, the fun of driving should be held against the light of the fun of public and active transportation. The latter has shown to be seen as more fun by those who use it more, although whether this is due to ex-ante or ex-post favoring of the mode is unclear (Beirão & Cabral, 2007).

Extrinsic reasons to drive

Extrinsic reasons to drive are formed by trips that cannot reasonably be completed using other modes than a car, resulting in car-dependence. As cars are generally not faster than other modes in urban areas, especially in those that are contenders to become car-free, there are two major extrinsic reasons left: the transportation of goods and people and spatiotemporal coverage.

The transportation of goods and people is well-reported in the literature. Several types of trips, such as escorting children, shopping, and waste disposal (Mattioli, Anable & Vrotsou, 2016) have shown to have high car modal shares. This form of car-dependence should thus be taken into account in car-free cities.

The second aspect is spatiotemporal coverage, or the ability to go anywhere at any time. PT has limited spatiotemporal coverage, and although it is highest in potentially car-free urban areas, a lacking spatiotemporal coverage can still result in car-dependence, for example, for those traveling at night. While active transportation has greater spatiotemporal coverage, its limited range means that it can only cover a distance of several kilometers. Low spatiotemporal coverage can lead to increased time spent waiting or having to take detours, thus resulting in a form of time-related car-dependence.

A third aspect is that of trip-chaining. If any shackle in a trip chain is car-dependent, the whole chain becomes car-dependent. At the same time, a chain of multiple not car-dependent trips can itself be car-dependent, as the addition of several reasonably large goods can become too large to transport, or the extra time spent waiting for transfers can become too large. This way, trip chains have some of the highest levels of car-dependency and are thus crucial to consider for car-free cities.

Bundles of practice

Extrinsic reasons to drive are important merely through sustaining other practices so that the practice of driving 'bundles' (Shove, Pantzar & Watson, 2012) with these practices. Depending on the extent of social change, it is possible that some of these trips are given up in transitions towards car-free cities. However, there are clear limits to the amount of social change and the extent to which the practical benefits of urban automobility can be given up. Below, some bundles of practice will be illustrated in the light of the transitions at hand.

Car-dependent bundles

For the purpose of this paper, two examples are used: that of going bulk grocery shopping once a week and that of working night shifts.

Going grocery shopping once per week in bulk arose with the combination of refrigeration technology and automobility, as large amounts of goods could be transported and stored for longer periods of time. Using cargo bikes, a significant amount of food can be transported, too. However, in cultures where (cargo) cycling is not prevalent, transporting a week's worth of food is not possible using PT or on foot. Thus, more time needs to be spent on grocery shopping. The question, then, is whether people are willing to spend more time on this activity at the cost of others.

Working night shifts, on the other hand, is an activity that can generally not be sustained using PT, as it often stops running at night. Active transport is only possible over a shorter distance and is not safe enough at night in many cities. This way, those who work night shifts are threatened in their livelihoods. Clearly, solutions should be sought to overcome such issues.

These two examples illustrate the idiosyncratic nature of car-dependent practices. Many more such trips can be identified, such as a freelance double bass player moving around the city (see Mattioli et al., 2016). Either way, the majority of trips needs to be sustained in car-free cities, for which technical and institutional solutions should be sought. That said, there is a certain possibility to spend more time on trips, such as going grocery shopping, although this time elasticity is strongly limited.

Enabling

In contrast with previous authors, it is argued here that requirements to go car-free are not binary, but interact in non-linear, complex ways. More specifically, it is argued here that material, institutional, and socio-cultural enabling interact to shape the extent of enabling, constituted by the mobility practice and underlying social values. Although practice and enabling are highly related, they are not the same; a city that is enabled to go car-free is, in practice, not car-free yet. Below, the importance of these three factors will be substantiated.

Enabling

Material enabling is the first factor, which is important mainly through its shaping of extrinsic factors. The by now famous 5 D's, namely Density, Diversity, Design, Destination accessibility, and Distance to transit, are all important in shaping the ability for trips to be sustained without automobiles. In order to enable the city to go car-free, it should be optimized for active and public transportation.

At the same time, institutional enabling should take place. In order to enable the city to go car-free, extrinsic reasons to drive should be sustained, for example through PT accessibility using prams and large goods (Mattioli et al., 2016), as well as the avoidance of PT crowding and increased spatiotemporal coverage (Nieuwenhuijsen et al., 2018). Pricing is also important, as PT should at least be accessible to all those that currently drive around the city, and better still to all.

A third factor is socio-cultural enabling. Of the three factors, this is the hardest factor to intervene in. Normalization should shift away from the car towards other modes, so that, for example, obtaining a driver's license is not the norm anymore. Even though intervention, such as cycling campaigns, can be successful, effectively steering socio-cultural change has not been shown to be possible thus far.

In terms of dynamics, enabling is a slow and path-dependent process. Material enabling can take numerous decades under full dedication, as in highly car-based cities (e.g. Houston), a large part of the housing and infrastructure should be replaced. Similarly, establishing a 'cycling culture' takes years, while effectively replacing a car culture altogether has not been witnessed so far and is expected to take decades. Institutional enabling can take place faster than the other two, but support for such policy should be in place, which requires certain levels of material and socio-cultural enabling.

Implementation

After the enabling process, implementation of car-free policy can take place but this requires the power to implement such policy to be with actors willing to implement the policy. The implementation is analytically a messy process taking place 'in the streets', where those implementing have limited knowledge as of whether the policy will succeed. Media, individual opinions and the bandwagon effect all shape the implementation, both in terms of its success and the amount of redirection required.

An important question that requires more discussion, is the amount of participation required. A full discussion of the desirable form of participation is beyond the scope of this paper.

CONCLUSION

Reasons to go car-free were found to be manifold. On the environmental side, the benefits are clear and measurable, while the social benefits have been mapped over the last few years, too. In economic terms, car-free policy is not necessarily negative, and more research is required into the specific impacts.

At the same time, there are clear reasons to drive in cities, some of these intrinsic. Although these factors cannot be quantified they should not be left out of consideration as they are highly important. Nevertheless, cars sustain a variety of trips and lifestyles, and even in areas that have the potential to go car-free, there are car-dependent trips. Such trips should be studied more extensively, as they limit the ability to go car-free and the extent of the area.

The dynamics of the transitions at hand here are poorly understood. In moving beyond binary models of car-free transitions, this paper proposed material, socio-cultural and institutional enabling should take place alongside each other. These variables should not be viewed as deterministic, as the outcome of the implementation of car-free policy is unpredictable. In moving beyond deterministic models, the inherent trade-offs and complexity of these transitions can be understood in more detail. Still, further research is required to better understand the complex topic of car-free cities.

ROLE OF THE STUDENT

This research was conducted under the supervision of Prof. dr. Hans Jeekel. The topic was formed by the undergraduate student together with the supervisor. All other parts were done by the student, albeit while being provided with feedback by the supervisor.

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