FACTORS INFLUENCING MOTORISTS’ ACCEPTABILITY OF TRANSPORT DEMAND MANAGEMENT MEASURES: A REVIEW

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ABSTRACT
Rising car ownership and use worldwide is in several respects a threat to the environment. Transport researchers and policymakers have suggested and implemented policy measures to reduce car use and encourage pro-environmental travel behaviour. A thorough understanding of motorists’ acceptability is essential in selecting appropriate policy measures while successful implementation process requires knowledge of factors influencing the acceptability of TDM measures. This article reviews the factors influencing motorists’ acceptability of TDM measures on the premise that reducing car use can help to mitigate congestion, noise, accidents and also improve air quality. Moreover, if people switch to other modes, there may be improvements in public health and increased economic productivity.

Keywords: Acceptability, Car use, Sustainable transport, Travel demand management.


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1. INTRODUCTION
Trips by private cars in urban areas around the world constitute about 50% of all trips and are estimated to reach 6.2 billion in 2025 twice its value in 2005. A higher share of the growing trend will be in the developing nations (Verma et al, 2016). According to Wu et al (2016), by
the year 2030, the rate of car use and car ownership in urban areas of China is estimated to reach 22.8 billion and 14.7 billion respectively. Car use has been associated with negative effects which include congestion, use of public spaces, noise, heat, emission of greenhouse gases, air pollution, lack of physical activity, stress due to driving time, lower psychological wellbeing and cognitive decline (Dons et al, 2012; Nieuwenhuijsen and Khreis, 2016; Bakarina et al, 2017). To reduce the negative impact of car use, researchers have recommended the use of transport Demand Management measures which may be used to target the car use influencing factors and in turn change travel behaviour (Pendyala, Kitamura, Chen and Pas (1997)

TDM is an array of actions to influence travellers to be able to use alternative mobility choice and to reduce congestion (Meyer, 1999). Besides, Simunovic et al (2013) described TDM as measures aimed at promoting sustainable travel behaviour by reducing car use and encouraging the use of non-car modes.

2. TRAVEL DEMAND MANAGEMENT AND ITS CLASSIFICATION

There are different classifications of transport demand management measures. Garling and Schuitema (2007) and Steg (2003) identified legal policies, economic policies, measures charging physical context and informational/Educational measures. Legal measures involve the use of laws, regulations etc to enforce car use reduction. Economic measures are aimed at increasing the cost of car use. Physical context change measures are meant to make non-car modes more attractive while Information and education measures are aimed at modifying motorists’ perceptions, attitudes, beliefs, values and personal norms about car use.

Javid et al (2014), Simunovic (2013), Vlek (1996) divided TDM into structural or hard measures (i.e. measures to change the context of motorists) and psychological or soft measures (i.e. measures aimed at increasing awareness/knowledge). In their classification of TDM, Steg & Vlek (1997), Javid et al (2014), Habibian & Kermanshah (2011, 2013), mentioned push measures and pull measures. Push measures are intended to reduce the benefits of car use (e.g. banning car use in city centres, increasing the tax on fuel, road pricing schemes) while Pull measures are aimed at improving alternative travel options (e.g. Public transport improvement, improving the infrastructure for cycling or walking, information).

Furthermore, Lim (1997) classified TDM into “carrots or incentives” such as high-occupancy vehicle lanes for carpools and “sticks or disincentives” such as road tolls and parking levies. Robinson (1997) classified the types of TDM as infrastructure-based, economic-based, employer-based and public awareness. Another classification in literature is coercive and less-coercive; coercive measures are called push measures while less-coercive measures are referred to as pull measures (Loukopoulos, 2005). Broaddus et al (2009) categorized TDM measures into three groups (i) improving mobility options (public transport improvement) (ii) economic measures (congestion pricing, parking pricing, fuel tax etc) (iii) smart growth and land use policies (transit-oriented development, parking management, and car-free planning). An improvement on the push and pull classification was suggested by researchers viz: push (road and gasoline tax, parking charges), pull (public transport improvement), psychological (education and awareness programmes, traffic information), (Javid et al, 2013).

3. ACCEPTABILITY OF TRAVEL DEMAND MANAGEMENT MEASURES

Acceptability is referred to as the prospective evaluation of measures to be implemented in the future (Schade, 2017). Public acceptability of Transport Demand Management is the degree of positive or negative evaluation of Transport Demand Management strategies that
may be introduced in the future (Schade, 2003; Eriksson et al, 2006). Acceptability of TDM measures is an indication of readiness to act pro-environmentally (by reducing car use and embracing sustainable modes e.g. public transport, cycling, walking etc. (Eriksson et al, 2006).

To reduce car use, TDM measures must be effective, acceptable to motorists and politically feasible (Garling and Schuitema, 2007). The importance of motorists acceptability of TDM measures arises because the lack of public acceptability is a barrier to implementation (Garling & Loukopoulous, 2007). According to Schade (2003), the efficacy of TDM measures in changing car use behaviour depends on public acceptability of the policy measures. Push TDM measures (coercive policies restricting car use through economic, legal and physical measures) are not easily implemented due to political restraint arising from lack of public support (Garling & Schuitema, 2007). Consequences of low acceptability of TDM measures include strong public resistance and loss of votes during the election on the part of politicians and the ruling class (Schade, 2017). Investigation of factors influencing the acceptability of TDM measures will increase the understanding of the TDM strategies (Eriksson et al, 2006). The factors influencing the acceptability of TDM measures according to the literature are presented below:

3.1. Attributes of Travel Demand Management Policy
Acceptability of travel demand management measures is influenced by attributes and characteristics of policy measures (Steg & Schuitema, 2007). The attributes mentioned in the literature include Policy characteristics, level of coerciveness, level of charge (in case of pricing measures), degree of coverage, and consistency with other policies. Policy characteristics might be level of coerciveness. Coercive measures have lower acceptability than non-coercive measures. Also, pricing measures with Small charges will not be effective and high charge may not be acceptable (Schade, 2017). In terms of coverage, motorists who reside within the road pricing area are more in support of the policy than those residing outside the charge area. Finally, a policy should be consistent with other policies being implemented in order to be acceptable (Steg, 2016). Evidence from the literature confirms the influence of policy attributes on motorists’ acceptability of transport demand management measures such as transport pricing (Judith et al, 2012; Steg, 2016; Schade, 2017).

3.2. Allocation of Revenue
This has to do with the degree of compensation for motorists due to possible negative effect of TDM measures. Allocation of revenue influences the acceptability of TDM measures. For example money realised from road pricing can be used to decrease road or fuel tax which will increase the acceptability of road pricing (Garling and Schuitema, 2007). To increase acceptability revenue can be used for improving public transport, lower car taxation or exiting car ownership tax for the benefit of the car user (Ubbel & Verhoef, 2006). According to Steg & Tertoolen (1999), parking charges will be more acceptable if the revenue from the charges is used to provide good and secure parking lots. Results from previous studies demonstrated that acceptability of transport pricing is influenced by revenue allocation. Having a clear plan on revenue spending and using the revenue for improving the transport system or subsidising existing fuel taxes will increase the acceptability of transport pricing measures (Steg & Tertoolen, 1999; Jones, 2003; Ubbels & Verhoef, 2006; Schuitema & Steg, 2007; Odioso & Smith, 2008; Rentziou et al., 2011; Pridmore & Miola, 2011; Schade, 2017).
3.3. Individual Characteristics
Research has revealed the importance of individual characteristics when considering the acceptability of transport policy measures. Such characteristics include socio-economic and demographic factors, general and specific policy beliefs (Schade, 2017; Eriksson et al, 2006). Results from the literature indicated that motorists’ acceptability of road pricing is influenced by individuals’ socio-demographic characteristics (Ubbels & Verhoef, 2006; Rentziou et al., 2011; Schade, 2017)

3.4. Problem Awareness
This has to do with motorists’ awareness about present and future problems of car use. Once the public is sure about the need for policy measures to solve the problems, such policies will be acceptable (Kim et al, 2013). It is therefore important for the people to be aware of the benefits of implementing transport policy measures and the consequence of a laissez-faire policy (Steg, 2016). Evidence from the reviewed studies demonstrated that motorists’ acceptance of road pricing is influenced by perceived consequences of traffic congestion, social problem awareness, perception of individual problems caused by transport (congestion, parking problems, air pollution) noise annoyance and perception of social problem (e.g. noise, traffic safety) Rienstra et al., 1999; Eriksson et al., 2006; Eriksson et al., 2008; Rentziou et al., 2011; Pridmore & Miola, 2011; Schmocker et al., 2012; Steg, 2016)

3.5. Personal Norm
Personal norm is described as a sense of moral responsibility to behave pro-environmentally by reducing car use to decreases the negative effects on the environment (Eriksson et al, 2006). Results from the literature revealed that personal norm increases the acceptability of transport pricing measures (Eriksson et al., 2006; Eriksson et al., 2008; Cools et al., 2011; Pridmore & Miola, 2011)

3.6. Perceived Effectiveness
Transport policy measures are implemented to mitigate the negative impacts of car use, as such one of the important factors for acceptability is a public perception that the measure can solve the problems associated with transport (Eriksson et al, 2008). The degree of perceived effectiveness of a measure is related to the level of acceptability. TDM measures are opposed by the motorists if they think it is ineffective in mitigating the most important problems arising from care use (e.g. congestion, pollution, accident etc) (Garling and Schuitema, 2007). Numerous studies have shown that perceived effectiveness is positively connected with motorists’ acceptability of transport pricing strategy (Rienstra et al., 1999; Bamberg and Rolle, 2003; Jones, 2003; Schade & Schlag, 2003; Ubbels & verhoef, 2006; Garling and Schuitema, 2007; Cools et al, 2011; Schmocker et al., 2012; Kim et al, 2013)

3.7. Perceived Fairness
This refers to the feelings of people about how fair they will be treated if a TDM measure is implemented and this may affect their acceptability of the policy measure (Garling & Schuitema, 2007). Perceived fairness is based on the principles of equality, equity and need. The principle of equality means that the TDM measure should apply to everyone, while the principle of equity implies that the implementation of the TDM measure should be based on the ability to pay or the proportion of contribution to the problem of car use. The principle of need means that motorists who drive more should be less affected than those who need to drive less (Garling & Schuitema, 2007). What is perceived as fair differs between people. However, most people believe that a TDM policy is fair if the majority will benefit from the
policy (Jakobsson et al., 2000). Reviewed researches revealed a positive relationship between fairness and acceptability of TDM measure e.g. Jakobsson et al., 2000; Bamberg and Rolle, 2003; Eriksson et al., 2006; Cools et al., 2011; Pridmore & Miola, 2011; Schmocker et al., 2012; Kim et al., 2013)

3.8. Perceived Freedom
This relates to the perception that the TDM policy constrains individual’s freedom to travel using the car. (Eriksson et al., 2006). Coercive transport measures are likely to reduce freedom to drive by car; hence they are less acceptable (Garling & Schuitema, 2007). The aim of TDM measures cannot be achieved without limiting individual’s freedom to drive. However, car users expected greater advantages from the TDM policy to override the disadvantages of restriction of freedom to drive. In terms of pricing policies, the infringement on liberty to drive is associated with the financial burden which limits individual’s mobility. Previous studies show that perceived infringement of freedom influences motorists’ acceptability of road pricing Jakobsson et al., 2000; Bamberg and Rolle, 2003; Eriksson et al., 2006; Garling and Schuitema, 2007; Schmocker et al., 2012; Kim et al., 2013)

3.9. Social Norm
Social norm refers to car users assumptions about whether significant others or important referent individuals or group support the performance of a behaviour (in this instance accept TDM policy measures). As such, a more favourable perceived social norm leads to a strong individual’s acceptability of TDM strategies (Schade & Schlag, 2003). TDM measures that are in line with important values and norms are more acceptable to motorists. For example, if the norm supports driving, car use restriction measures will be less acceptable. (Jakobsson et al., 2000). The analyses of literature show that social norm is positively connected with acceptability of pricing strategy Schade & Schlag, 2003; Pridmore & Miola, 2011; Judith et al., 2012; Steg (2016)

4. ACCESS TO ALTERNATIVE MODE
To increase the acceptability of a TDM measure, there should be enough alternative travel options so that a behavioural change is feasible. As such, it is important to combine TDM measures facilitating alternative travel options (Pull measures) with car use restrictions (Push Measures). The alternative travel option should not only be feasible and accessible but their quality should be comparable to that of the car. Steg (2016) identified availability of alternative modes as one of the factors influencing the acceptability and effectiveness of transport pricing

4.1. Trust in Government
This involves the level of trust people have in the government that is introducing the TDM measures. Motorists who have trust in government will most likely trust the TDM policy as being fair and effective; as such their acceptability level will be higher than those who do not trust the government. The trust should also be in terms of usage of the revenue in the way it is proposed in the TDM policy (Schmocker et al., 2012). Reviewed studies identified public trust in government as a determinant of acceptability of road pricing (Pridmore & Miola, 2011; Schmocker et al., 2012; Kim et al., 2013).

4.2. Outcome Expectation
This relates to the perceived advantages of the TDM policy expected by car users after the introduction of the policy. The more the perceived advantages the higher the acceptability of
the policy. Schade & Schlag (2003) examined factors influencing acceptability of urban transport pricing strategic (road pricing). The results show that personal outcome expectation is positively associated with acceptability of pricing strategy.

4.3. Feeling of Responsibility
This represents the need for people to feel personally responsible for the negative impacts of car use and that they can contribution to the solution through acceptability of TDM measures. Car users must be ready to drive less and accept car use restriction policies. (Steg, 2016) identified feeling of responsibility as a determinant of acceptability of TDM measures.

4.4. Attitude towards Car Use.
Attitude towards car use relates to the perceived advantages or disadvantages of driving a car. The more positive motorists’ attitudes towards car use, the lower the acceptability of car use restriction measures. (Steg, 2016) identified attitude towards car use (perceived disadvantages of car use or consequences of road pricing for individual drivers) as a determinant of motorists acceptability of transport pricing.

4.5. Public Transport Improvement
One of the ways of increasing motorists’ acceptability of transport demand management measures is by implementing supportive measures such as improvement of public transport when prohibition or pricing measures are implemented. This will ensure the availability of feasible alternatives for car users which will not only increase the support of motorists for TDM measures but also facilitate the actualisation of car use reduction goals (Garling & Schuitema, 2007). Reviewed studies indicated that acceptance can be increased through public transport improvement (Odioso & Smith, 2008).

4.6. Trip Characteristics
Trip characteristics have to do with departure time, trip duration between home and workplace and the distribution of daily trips. Rentziou et al (2011) examined the influence of attitude towards traffic congestion, travel mode choice and allocation of revenue on acceptability of congestion pricing. They found that trip characteristics (flexible timing, trip purpose etc), socio-demographic characteristics, perceived consequences of traffic congestion (problem awareness) and allocation of congestion pricing revenue influence public acceptance of congestion pricing. Khalilikhah et al (2016) explored acceptability of increasing petrol price as a TDM pricing policy in Tehran. The study showed that trip-related characteristic of people (departure line, trip duration between home and work, distribution of the daily number of trips) influences acceptability of petrol price increase.

4.7. Value of Time
Value of time represents car user's willingness to pay for time gain. The value of time of high-income earners is higher value of time than lower-income earners and as such high income earners are less likely to oppose pricing measures. Ubbels & Verhoef (2006) investigated motorists’ acceptability of road pricing and revenues use in the Netherlands. The authors found that road pricing is more acceptable when revenues generated are used to subsidise existing car taxation or to reduce fuel taxes. Personal characteristics of respondents (level of education), value of time and perceived effectiveness of measures influences acceptability of road pricing.
4.8. Believe about Perceived Consequences of Policies
This relates to car users’ belief about the outcome of proposed TDM policies including the positive (reduced parking challenges, reduced traffic congestion and lesser pollution) and the negative (increased financial travel cost). Schuitema et al (2010a) examined the differences in motorists’ acceptability before and acceptance after the introduction of a congestion charge in Stockholm. The study found that acceptability of congestion charge was influenced by the belief about likely consequences for one’s car use and financial costs (decreased parking problems, congestion and pollution increase financial /travel cost).

4.9. Media Influence
This refers to the role of the media in influencing public opinion thereby influencing acceptability level of car users. Pridmore & Miola, (2011) reviewed motorists’ acceptability of sustainable transport measures (pricing, non-car alternatives, new technology and fuels). It identified problems awareness (public awareness), allocation of revenue (wide benefits and impacts), trust in government, social norm, personal norm, perceived fairness and media influence.

5. CONCLUSION
Private car has become too attractive to such an extent that its negative impacts have outweighed its benefits. The negative impacts constitute a threat to the environment and a sustainable future. Consequently, there is a need for a change in travel behaviour towards sustainable travel modes.

Transport researchers have advocated the introduction and implementation of Transport Demand Management (TDM) measures. However, one of the requirements for successful implementation is motorists’ acceptability of the TDM measures. A thorough understanding of motorists’ acceptability is essential in selecting appropriate policy measures while successful implementation process requires knowledge of factors influencing acceptability of TDM measures. This article reviewed previous studies on the factors influencing motorists’ acceptability. The review revealed that motorists’ acceptability is related to: Attributes of policy, Allocation of revenue, Individual characteristics, Problem awareness, Personal norm, Perceived effectiveness, Perceived fairness, Perceived freedom, Social norm, Access to alternative modes, Trust in government, Outcome expectation, Feeling of responsibility, Attitude towards car use, Travelling with family and friends, Public transport improvement, Trip characteristics, Value of time, Perceived consequences of policies and Media influence.

Considering the frequency of appearance in results of reviewed articles, the most frequent factors are perceived effectiveness (9 times), problem awareness (8 times), allocation of revenue (8 times), perceived fairness (8 times) and perceived freedom (8 times).

REFERENCES


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