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CHARACTERISTICS OF EVERYDAY LEISURE TRIPS BY CAR IN SWEDEN – IMPLICATIONS FOR SUSTAINABILITY MEASURES

ABSTRACT

In search for measures to reduce greenhouse gas emissions from transport, insights into the characteristics of all sorts of trips and specifically trips by car are needed. This paper focuses on everyday leisure trips for social and recreational purposes. Travel behaviour for these purposes is analysed considering individual and household factors as well as properties of the trip, based on Swedish national travel survey data. The analysis reveals that everyday leisure trips are often of joint character and that the average distance travelled per person and day increases with, for example, income, cohabitation, children in the household and residence in rural areas. The result also shows that the studied characteristics vary between studied trip purposes, influencing the sustainability potential of a reduction in car use and suggested measures. For instance, the largest share of passenger mileage comes from social trips, whereas trips for exercise and outdoor life have the largest share of car trips below 5 km. Several characteristics indicate difficulties in transferring trips by car to, for example, bicycle or public transport due to convenience, economy, start times, company etc. The study indicates that there is a need to take a broader view of the effective potential.

KEYWORDS

leisure travel; travel behaviour; passenger transport; car mileage; climate change.

1. INTRODUCTION

To reach global climate goals, a substantial reduction of greenhouse gas emissions is required [1]. Transport is one of the most challenging sectors, responsible for almost 25 percent of global energy-related carbon dioxide emissions [2]. Also, the share of emissions from transport is increasing globally [1, 3]. In Sweden, the share of emissions from domestic transport is even greater than in most European countries, primarily since electricity is mostly based on water and nuclear power and thus less dependent on fossil fuels. The emissions from road transport have been reduced over time, however not in line with the reduction needed to meet the targets set, and this trend is common for the majority of countries worldwide [1].

One major contributor to total emissions from transport in Sweden is trips to leisure activities. Such trips account for a significant proportion of the overall passenger mileage by car, and thus also for a substantial share of the greenhouse gas emissions. In Sweden, leisure travel (including holiday trips) makes up 43 percent of the total distance travelled by car per year, based on data from 2011 to 2014 [4].

During 2019, the COVID-19 pandemic rapidly led to some of the most revolutionary changes in private and professional life affecting mobility around the world (e.g. [5, 6]). Leisure trips were affected as well [7]. To cope with the mobility disruptions caused by COVID-19, many leisure activities were cancelled, moved to digital alternatives or carried out at other locations [8, 9]. Whether this behaviour will continue when restrictions on life and travel are lifted is yet unknown. In a study conducted in Australia [10], the top mentions on what was mostly missed about travel during the

pandemic included visiting family/friends and exploring new places/cultures, followed by having freedom to travel and the ability to take a break from day-to-day routine. In this study, the respondents also stated that they will spend more time in parks and playgrounds when restrictions are lifted, indicating more frequent use of everyday leisure trips. Other studies indicate that the increased use of digital services during the pandemic (e.g. teleworking, virtual meetings and e-shopping) will affect our leisure travel habits in the future. For instance, Le et al. [11] suggest that online shopping makes room for additional activities that could otherwise not fit into the shoppers' time schedules.

The COVID-19 pandemic resulted in a temporary reduction of greenhouse gas emissions. However, worldwide, it is argued that to sufficiently cut greenhouse gas emissions, levels of transport must be reduced permanently, which, considering the large share, also must include leisure trips. That is, efforts made towards a sustainable transport sector and technical solutions to reduce fossil fuels are not considered to suffice [12, 13]. This means that transport behaviour needs to change by switching to less polluting modes and/or reducing overall mileages [14–16].

In reaching for a more sustainable transport system, all trips need to be addressed, but until now most efforts have been directed towards work related trips (e.g. [17]). However, less is known about the car reducing potential in leisure trips or the characteristics of everyday leisure trips for e.g. social and recreational reasons [18]. Further, mode alternatives and policies are rarely designed specifically to fit leisure trips [19]. Such knowledge is needed to be able to find appropriate measures for those to be addressed.

The aim of this study is to analyse the characteristics of everyday leisure travel by car (social and recreational excluding holiday trips) and discuss effective measures for a more sustainable transport system. The paper focuses on a knowledge gap regarding research on leisure trips identified by other researchers (e.g. [18]). The paper consists of an analysis of the magnitude of leisure trips in relation to other trip purposes, but it also seeks to increase the understanding of leisure trips and analyse the characteristics of everyday leisure trips by car, both in relation to trips as well as individual and household characteristics. The novelty of this paper is that this analysis is carried out for social and different recreational trips capturing variations in characteristics between these trip purposes. Further, and based on retrieved results, the paper covers a discussion on potential measures and related challenges in managing everyday leisure trips with the aim of improved sustainability.

To avoid possibly temporary behaviours due to the COVID-19 pandemic, the analysis is based on the Swedish national travel survey carried out during 2011–2016. After a planned break in the data collection during 2017–2018, a new phase of the travel survey was started in 2019 and continued in 2020, but its results were highly influenced by the COVID-19 pandemic. Reports show, however, that besides time periods with disruptive events influencing mobility, such as pandemics, volcano eruptions etc., travel behaviour only changes slowly over time (e.g. [20]). Based on these results, we argue that the data set used gives valuable information also on current everyday leisure trips. Further, while the analysis is provided for the Swedish context, similarities in car use and car ownership with most Western European countries [21] mean that it is also of relevance for other countries seeking effective policy measures to meet their climate targets.

The remainder of this paper is structured as follows: Section 2 gives an overview of research related to leisure travel, and Section 3 presents the methodology used, including a description of the national travel survey in Sweden, the data set and our categorization of trip purposes. In Section 4 the results are presented, and in Section 5 the findings are discussed. In the final section, the conclusions of the paper are presented.

2. BACKGROUND

There is a growing body of leisure travel literature that focuses on holiday travel and further concentrates on long-distance travel to and from a destination, analysing, for example, trip destinations and transport mode choices [22] or environmental impacts [23–25]. Research in leisure travel also concludes that, in an urban context, weekend and holiday trips depend on mobility and accessibility much in the same way as daily travel [26], thus relating this research area to city planning as well. Böhler et al. [24] also stress that we must consider different personal preconditions for travel, as

well as the different extents to which people travel, when discussing measures aiming at reducing the negative environmental impact.

Further, leisure travel is characterized by, in some respects, being less repetitive than trips to work, school and shopping and often takes place to less familiar destinations [27, 28]. When choosing destinations for leisure travel variety seeking, the wish to find new things to see and do, is a factor often affecting the choice [29]. The variation in travel patterns is further enhanced by the fact that leisure activities such as social visits, visits to restaurants and cafés, recreation, sports, cultural events and holidays are diverse, and preferences differ a lot between individuals [30]. Different leisure activities are important for the well-being of different people. Engagement in preferred leisure activities enhances the quality of life in terms of subjective well-being, overall life satisfaction, personal happiness, increased self-esteem and meaning making [31–33]. Partaking in leisure activities further improves physical and mental health, reduces stress, builds resilience, creates social relationships and provides an arena for learning new skills [31, 33].

Leisure trips are primarily driven by pleasure and are therefore harder to give up than trips associated with basic needs or compulsion [34, 35]. A reason why behavioural changes related to leisure trips are more difficult to address is the way they are expressing identity, personal values, status and lifestyle [27]. The general desire is rather to increase leisure trips than to reduce them, which means there is a risk that measures to reduce commuter trips create rebound effects that increases time for leisure trips [35].

So far, this overview indicates that leisure trips are an important part of our daily lives, yet there has been limited research focusing on these trips, especially everyday leisure trips, but also limited discussions on relevant policy measures [18]. To find adequate and sufficient policies for reductions in car mileages for everyday leisure trips, decision-makers need to know about travel behaviour and variations in the population. Achieving reductions in car mileage requires a targeted approach using policies specific for the characteristics of the individuals in a certain category (e.g. regular leisure trip car users), such as incentives for sharing vehicle ownership and fiscal incentives for alternative modes of transport. Further, since the effects of behaviour on attitudes are greater than the reverse, Kroesen et al. [36] and Kroesen and Chorus [37] stress the urgency of finding measures and incentives to change behaviours directly, for example through regulations or pricing mechanisms, rather than, for example, through information campaigns.

Travel behaviour for leisure trips is as general travel behaviour also linked to how attractive different modes of transport appear relative to each other (the relative attractiveness of modes of transport) [38, 39]. The traveller assesses the different modes of travel available in terms of convenience/sacrifice and cost, also considering variations during the day, for example such as varying degrees of congestion and transport service [40, 41].

Travel behaviour is also known to vary depending on socio-economic and demographic factors like income, age and gender [42]. Another factor that affects leisure travel is that such trips are often either carried out in the company of other people, or in other ways depend on the participation of others [18]. For social visits, the destination of the trip is determined by the residential location of friends and relatives in a person's social network. A study by Tilahun and Levinson [43] showed that nearly a third of the respondents' scheduled meetings outside of their work location took place at a residence. Further, if the person being met was a close contact, the distance to the meeting location was increased.

3. METHODOLOGY

This study seeks to analyse the car reducing potential of everyday leisure travel by car (social and recreational, excluding holiday trips) but also to point out factors that may influence the efficiency potential for a sustainable transition. The analyses in this study are based on the most extensive Swedish national travel survey data collected by travel diaries from individuals. Such travel diaries have long been used to collect individual and household travel data for mapping and modelling, as well as for analysing mobility trends over time, and serves as a base for political decisions nationally [44]. The Swedish national travel survey (named RVU Sweden) is conducted on a close to yearly basis, and the same definitions and broadly the same method have been used since the survey was first implemented in 1994. The survey collects information about the number of trips and trip characteristics for each trip, such as trip length, date and time of the trip, modes of transport and trip purpose. It also includes

background data about the individuals, such as gender, age and place of residence, which are used for weighting the collected data to represent the Swedish population between 6 and 84 years. The travel survey used in this study (RVU Sweden 2011–2016) was conducted on a daily basis from 2011 to 2016 through telephone interviews, with the support of a postal diary questionnaire [45]. The database includes a total of 48,628 individuals and information about totally 121,400 trips.

The survey design of RVU Sweden 2011–2016 includes 24 detailed trip purposes. In this study, these are categorized into 9 types based on similarity in purposes and travel characteristics, as seen in *Table 1*. For example, grocery shopping, health care visits and rides to/from child day care are all, together with four more trip purposes, grouped as shopping and service trips. The trip types created are: social trips, exercise and outdoor life, entertainment and culture, other recreational trips, holiday trips, trips to work and school, business and study trips, shopping and service trips and trips with other purposes. Of the 9 trip purposes categorised, the first four are in this paper considered as everyday leisure trips. Social trips include two trip purposes from the travel survey: visit or spend time with relatives and friends and accompanying children at their leisure time activities. The other three types of leisure trips used (considered as recreational trips) are trips for exercise and outdoor life, entertainment and culture and other recreational trips. This categorisation of leisure trips enables us to analyse differences in travel characteristics such as luggage and accompanying persons, possibly affecting mode choice. The trip types included in other recreational trips are trips to restaurants and cafés, hobbies, courses and religious practice. Some of these purposes, e.g. religious practice, could have been categorised as

Table 1 – Classification of trip purposes used in the analysis

Overall trip purposes	Detailed trip purposes	Specification
Everyday leisure trips	Social trips	Visit / Socialize with relatives and friends (including weddings, baptisms, birthday parties, other private parties)
		Participate in (follow at) children's leisure activities
	Recreational trips – Exercise and outdoor life	Exercise / Outdoor life (sports, walking, excursion, sunbathing, swimming, fishing, dog walking)
	Recreational trips – Entertainment and culture	Entertainment and culture (party, dance, museum, concert, cinema, sporting event, exhibition, lecture)
	Recreational trips – Other	Restaurant, café
		Hobbies, music practice, study circle, courses
		Association life, religious practice
		Other leisure activities
Other trip purposes	Holiday trips	Holiday trips (no further specification)
	Trips to work and school	Work at workplace
		Studies / School work in school
	Business and study trips	Business trip / Travel for work
		Study trip / Travel for studies
	Shopping and service trips	Shopping, groceries
		Purchasing, other
		Health care
		Postal / Banking matters
		Booking of tickets / times
		Childcare (pick up and drop off within childcare)
		Other service matters
	Other purposes	Transport (follow) / Pick up another person
		Pick up / Drop off items
		Funeral / Burial
		Other

entertainment and culture, but were in the end considered as being more similar to that of trips to hobbies and courses due to the repetitive behaviour. Holiday travel and shopping and service trips are in this study not defined as leisure trips, even though some shopping trips may be argued as being leisure trips. However, these trips cannot be identified in the data set. Further, the reason for excluding holiday trips is our focus on leisure trips with an everyday character. Compared to certain other studies focusing on leisure trips, our definition excluding holiday trips and shopping and service trips means an underestimation of the magnitude of leisure trips. If such trips had been included, especially shopping and service trips for which the mode share for car is even higher than for the selected trip purposes, the passenger mileage by car would have been even greater.

The analysis of this paper is further made for the following transport modes: car as driver, car as passenger, public transport, bicycle, by foot and other modes, which includes air travel. Based on the definitions presented in this section there are 39,911 everyday leisure trips in the data set, of which 46 percent are made by car (as a driver or as a passenger).

To analyse the car use, and hence the potential for reducing car use, the average values for a number of different units are calculated. The magnitude and travel behaviour of leisure trips by car are described as average number of trips, distance per trip and passenger mileage. Travel behaviour by car can differ either in terms of number of trips or in distance per trip. Combined, the product of the two constitutes the passenger mileage a person performs. In the paper, there is more focus on passenger mileage than on number of trips and distance per trip, since from the point of view of climate change it is more interesting to study passenger mileage. The distances travelled are expressed either as average distance per trip or as average passenger/car mileage per person and day. The latter includes all the people in the population, not only those who made trips on the day of the survey. Figures presented in *Tables 2–4* are rounded. Sums of column/row may therefore differ from the sum of the values of the individual columns/rows.

As pointed out in the background section, there are several factors influencing travel in general and leisure travel in particular. The units calculated per trip purpose are therefore separated on a series of individual and household factors as well as characteristics of the trip, e.g. trip distance, weekday or weekend and start time of the trip. The results are interpreted against background statistics in Sweden regarding population (number, type of household and age structure) in various geographical areas. Statistics from 2016, corresponding to the final year of the travel survey, were used.

4. RESULTS

4.1 Magnitude of leisure trips by car

To understand the overall potential to reduce greenhouse gas emissions for everyday leisure travel by reducing car use, it is important to know the magnitude of these trips in relation to other trip purposes. *Table 2* presents modal shares of passenger mileage for the nine groups of trip purposes

Table 2 – Modal shares of passenger mileage, by trip purpose [45]

Trip purpose	Transport mode share [%]						
	Car as driver	Car as passenger	Public transport	Bicycle	By foot	Other	Total
Social trips	45	29	14	1	1	11	100
Exercise and outdoor life	27	33	10	6	21	4	100
Entertainment and culture	41	34	15	1	1	7	100
Other recreational trips	33	28	9	1	2	27	100
Holiday trips	15	16	6	0	0	63	100
Trips to work and school	58	7	29	3	1	2	100
Business and study trips	44	10	20	0	0	26	100
Shopping and service trips	59	25	9	1	2	4	100
Other purposes	54	28	8	0	1	9	100
All trip purposes	44	20	15	1	2	17	100

in this study. The table shows that car (as a driver or as a passenger) is the dominant transport mode for social and recreational trips, with modal shares ranging from 59 to 76 percent of the total passenger mileage. The lower car shares for number of trips, as mentioned in the description of the data set, are due to the fact that trips by foot or bicycle are on average shorter than trips by car. It can be noted from *Table 1* that car is also the most common transport mode for four of the other five trip purposes. The only exception is holiday trips, where the most common transport mode is other, which includes air travel.

Returning to social and recreational trips, the second and third most common transport modes are public transport and other (once again including air travel). Public transport on average stands for 12 percent of the passenger mileage for these trips, which is about half as much as the average for trips to work and school and for business and study trips. In addition, it can be observed that trips to exercise and outdoor life have a high share of trips by foot and a relatively high share of trips by bicycle. This can be explained by the fact that recreational bicycle tours and walks, such as dog walking or forest hiking, were included in the data collection.

The first four columns of *Table 3* present the analysis for the average daily passenger mileage per person in Sweden for all transport modes, and for car as driver or passenger, respectively. The shares of kilometres travelled for different trip purposes are also presented. In total, a daily distance of 27.2 km per person is travelled by car, of which 8.7 km for trips to work/school and business/study trips (6.3+2.4 km) and a similar 9.1 km for social and recreational purposes (4.7+1.6 +1.2 +1.6 km). Trips that are related to work and school thereby account for 32 percent of the total distance travelled by car in Sweden, whereas the share of kilometres for social and recreational purposes is 33 percent. The last third of the trips are made for several different purposes.

As shown in the last two columns of *Table 3*, two thirds or more of the social and recreational trips are made in the company of others. For social and recreational trips, the car driver on average travels in the company of 0.9 other persons. When the trip purpose is entertainment and culture, this number is significantly higher (1.5) and similar to that of holiday trips, where people also travel in the company of more people. For trips to work and school, as well as for business and study trips, the corresponding numbers of accompanying persons

Table 3 – Average passenger/car mileage per person and day, number of persons travelling together and the share of persons travelling alone, by trip purpose [45]

Trip purpose	All transport modes		Car as driver or passenger		Car as a driver		Number of persons	
	Passenger mileage [km]	Passenger mileage [%]	Passenger mileage [km]	Passenger mileage [%]	Car mileage [km]	Car mileage [%]	Travelling together	Travelling alone [%]
Social trips	6.6	15	4.7	17	2.8	15	1.9	28
Exercise and outdoor life	2.7	6	1.6	6	0.7	4	1.8	31
Entertainment and culture	1.6	4	1.2	4	0.6	3	2.5	16
Other recreational trips	2.6	6	1.6	6	0.8	4	1.8	33
Holiday trips	6.4	14	1.8	6	0.9	5	2.5	12
Trips to work and school	10.1	23	6.3	24	5.6	30	1.2	75
Business and study trips	4.6	10	2.4	9	2.0	10	1.3	70
Shopping and service trips	5.1	12	4.2	15	2.9	16	1.6	43
Other purposes	4.4	10	3.6	13	2.4	12	1.8	37
All trip purposes	44.0	100	27.2	100	18.7	100	1.6	48

are distinctively lower (0.2–0.3), and almost three quarters of these trips are made without the company of others.

This corresponds to the fact that the distribution of car mileage (car as driver) is different than that for passenger mileage by car (car as driver or passenger), as presented in *Table 3*. If looking only at car drivers (columns 5 and 6), and thus car mileage instead of passenger mileage, the share of trips to work and school is higher, 30 percent instead of 24 percent, and the share of social and recreational trips is lower, 27 instead of 33 percent, as compared to passenger mileage. Nevertheless, trips for social and recreational purposes still stand for a considerable share of the total distance travelled by car in Sweden.

4.2 Individual and household characteristics of leisure trips by car

Further, to understand the car reducing potential, the travel behaviour of different groups is of particular interest. This is studied in terms of number of trips, trip distances and passenger mileage. *Table 4* shows that the average passenger mileage by car (as driver or passenger) per person and day differs, not only depending on the leisure trip category but also between societal groups. The unit in *Table 4* is passenger mileage, whereas number of trips per person and day and distance per trip for the four leisure trip categories can be found in *Tables A.1 and A.2* in Appendix A. The travel behaviour differences presented below are mainly focused on passenger mileage.

In *Table 4*, the average passenger mileage (kilometres) per person and day is presented for the studied leisure trip categories and gender, age group, household type, children in family, household income and residence. The overall pattern indicates that for social and recreational purposes household characteristics such as household income, place of residence, household type and whether there are children in the family increase travelled distance.

The results in *Table 4* generally indicate that car travel for leisure purposes per person and day increases with income. This difference, measured as the ratio between the high and the low income

Table 4 – Average passenger mileage per person and day in different societal groups, car as driver or passenger, by leisure trip category [45]

Societal group		Average passenger mileage [km] per person and day				
		Social trips	Exercise and outdoor life	Entertainment and culture	Other recreational trips	All leisure trips
Gender	Man	4.8	1.6	1.2	1.6	9.3
	Woman	4.6	1.5	1.1	1.5	8.7
Age group	6-24	3.6	2.4	1.2	1.2	8.5
	25-44	5.2	1.4	1.1	1.2	8.9
	45-64	4.8	1.4	1.1	1.9	9.3
	65-84	5.1	1.0	1.1	1.9	9.2
Household type	Single household	4.3	1.0	0.9	1.0	7.3
	Cohabitation	4.9	1.8	1.2	1.7	9.6
Children in family	No children	4.7	1.2	1.1	1.7	8.7
	Youngest 0-6	6.0	2.0	1.3	1.1	10.4
	Youngest 7-18	3.9	2.1	1.3	1.5	8.8
Household income	< SEK 300k	4.0	1.4	0.8	0.9	7.1
	SEK 300-600k	4.4	1.2	1.1	1.5	8.2
	> SEK 600k	5.5	2.1	1.2	1.8	10.5
Residence	Urban	4.5	1.5	1.0	1.4	8.3
	Rural	5.4	1.9	1.6	2.0	11.1

groups, is lower for social trips (1.38) compared to, for example, trips for exercise and outdoor life and entertainment and culture (ratio 1.50 for both), indicating that trips to spend time with family and friends are somewhat more equally distributed over income groups, which could be regarded as being more closely related to lifestyle.

The results in *Table 4* also indicate that the residential area affects the distance travelled per person and day. Those living in rural settings (about one quarter of the population) travel on average longer distances per person and day by car for leisure purposes than those living in urban settings (ratio 1.34) where about three quarters of the population in Sweden live [46]. This difference holds for all trip purposes, but more so for trips to entertainment and culture (ratio 1.60). These differences between geographical settings may be a result of availability of alternative modes, where people living in urban areas generally have better access to public transport and higher quality of infrastructure for walking and biking as well as shorter distances.

A third example is that those who cohabitate drive on average longer distances by car per person and day for all leisure trip purposes than those living in single households (ratio 1.32). This holds for all leisure trip purposes, with a larger difference for trips to exercise and outdoor life (ratio 1.80). This may be a result of lower car accessibility in singe households, but also that the share of single households is higher in urban areas in Sweden [46] with, as mentioned earlier, better access to alternative transport modes and shorter distances to destinations.

A final household characteristic in *Table 4* that seems to affect travel behaviour for leisure purposes is whether there are children in the family. Households with children (where the youngest child is 7–18 years old) travel on average a longer distance per person and day for trips for exercise and outdoor life than persons with no children in the household (ratio 1.75). This difference is also to be found when comparing households where the youngest child is 0–6 years and households without children, though to a somewhat lower degree (ratio 1.67). These differences compared to households without children may be seen as a consequence of the fact that trips for children's activities are added to travel distance per person and day that parents carry out for their own activities.

When it comes to individual characteristics, men on average travel somewhat longer distances by car per person and day than women for social and recreational trips, but the differences are small (ratio 1.07). This may be seen as a result of the joint character of leisure trips, where women and men often travel together. The number of trips is equal for all studied leisure trip purposes but social trips, whereas men on average makes longer leisure trips than women (see Appendix A). Finally, *Table 4* shows some differences in travel patterns between the four age groups studied. The difference varies over the studied leisure trip purposes. For instance, the youngest age group (6–24 years) travels on average longer distance by car per person and day for exercise and outdoor life compared to age groups 25–44 years and 45–64 years (ratio 1.71 for both), which is in line with the previously presented results for children in the household, whereas the oldest age group (65–84 years) travels the shortest distance per person and day for this trip purpose. Also, the youngest age group has shorter travelled distance per person and day for social trips than the other three age groups (ratio 0.69-0.75). This may be dependant on the fact that the younger age groups generally more often live in urban areas [46].

4.3 Distance and times of leisure trips by car

In this study, we also analyse the distribution of trip lengths to understand the car reducing potential. The distribution of the number of car trips over distance intervals in *Figure 1a* reveals that about one third of the social and recreational trips by car are shorter than 5 km, ranging from 35 percent for exercise and outdoor life and other recreational trips to 26–27 percent for entertainment and culture and social trips. A substantial share of the trips is also longer than 20 km, especially for entertainment and culture and social trips (41 and 36 percent, respectively). This corresponds to the fact that social trips and trips to entertainment and culture on average are longer (31 km and 28 km, respectively) than trips to exercise and outdoor life and other recreational trips (16 km and 20 km, respectively).

When looking at passenger mileage instead (*Figure 1b*), the pattern is, as expected, reversed, with high shares of passenger mileage in classes with longer distances and low shares in classes with shorter distances. In particular, the longest distance class, trips that are 100 km or longer, stands for just

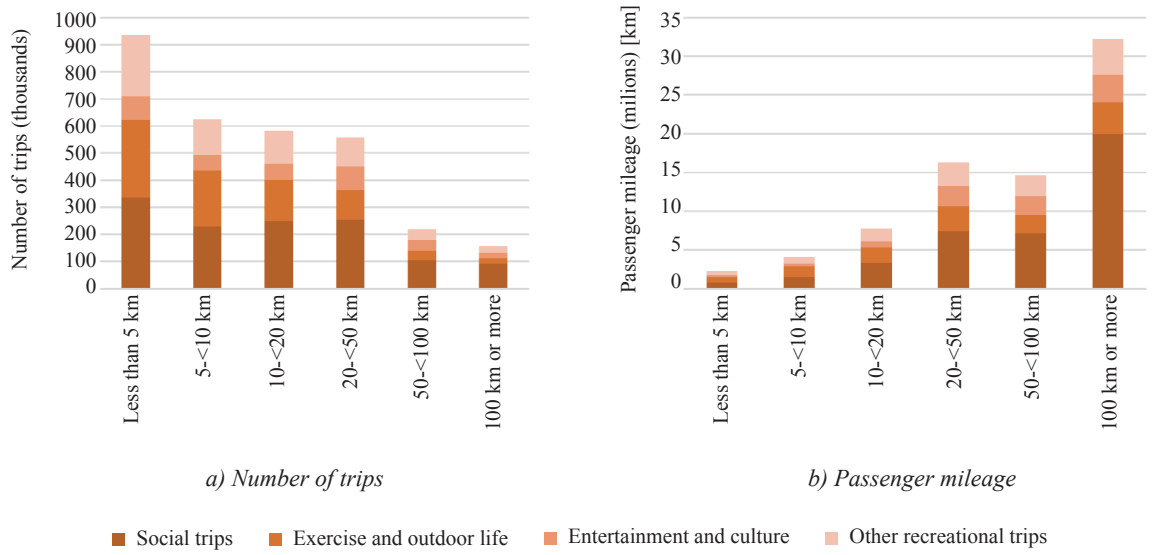

Figure 1 – Number of trips and passenger mileage distributed over distance intervals (distance per trip in kilometres), car as driver or passenger, by leisure trip category [45]

over 40 percent of the distances travelled by car for leisure purposes. Social trips is the most common trip purpose and accounts for over half of the passenger mileage in this group, as well as for trips 20 km or longer.

Analysing the share of passenger mileage by car for different distance classes also gives input to the potential to reduce greenhouse gas emissions by reducing car use (the efficiency potential for a sustainable transition). *Table 5* shows the share of passenger mileage for leisure travel by car in the six distance classes. The first column in the table shows that, even though as much as one third of the leisure trips are shorter than 5 km (as demonstrated in *Figure 1*), trips in the shortest distance class only account for 3 percent of the passenger mileage for leisure purposes. On the contrary, trips in the longest distance class account for only 5 percent of the number of trips but as much as 42 percent of the passenger mileage for leisure trips. Thus, even though numerous trips are rather short, it is the longer trips that contribute more to the mileages travelled by car.

Table 6 shows that both social and recreational trips are on average longer on weekends than on weekdays, especially for exercise and outdoor life and for other recreational trips. Also, the analysis shows that social and recreational trips on average are longer when two or more persons are travelling together. On weekdays, the distance is about twice as long for trips made by three persons compared to trips made alone/without company. This fact is further reflected in *Table 5*, which shows that the average number of persons travelling together increases

Table 5 – Share of passenger mileage by car, number of persons travelling together and share of persons travelling alone, leisure trips, car as driver or passenger, by distance class [45]

Distance class	Passenger mileage by car	Number of persons	
	Share of leisure travel [%]	Travelling together	Travelling alone [%]
Less than 5 km	3	1.7	34
5-<10 km	5	1.8	32
10-<20 km	10	1.8	29
20-<50 km	21	2.1	24
50-<100 km	19	2.2	19
100 km or more	42	2.3	14
All distances	100	1.9	29

Table 6 – Average distance per trip, car as driver or passenger, by leisure trip category, day type and number of persons travelling together [45]

		Average distance per trip [km]			
		Social trips	Exercise and outdoor life	Entertainment and culture	Other recreational trips
Weekdays	Trips with 1 person	19.9	9.0	16.9	10.8
	Trips with 2 persons	29.6	12.5	19.3	17.1
	Trips with 3 or more persons	39.6	17.8	34.3	22.4
	All weekday trips	29.2	12.8	26.1	16.1
Weekends	Trips with 1 person	29.6	10.4	30.2	17.8
	Trips with 2 persons	32.7	18.5	27.1	27.0
	Trips with 3 or more persons	35.9	32.8	33.0	32.6
	All weekend trips	33.3	22.5	30.4	26.8

with the distance travelled. For the shortest trips, the average is 1.7 persons, whereas the corresponding number is 2.3 for the longest trips.

The number of leisure trips is also mapped against their start times to analyse when during the day many car trips are carried out (and hence when there is higher car reducing potential). *Figure 2* shows the number of trips starting at different hours of the day, with weekday trips to the left (*Figure 2a*) and weekend trips to the right (*Figure 2b*). In contrast to weekday commuter trips to work and school (not presented in the figure), there is no morning peak for the studied everyday leisure trips. However, other recreational trips, which includes trips to cafés and restaurants, have a peak towards mid-day/lunch time. In the afternoon, the peak for everyday leisure trips starts later than for commuter trips, for which the peak in Sweden is from 3 p.m. to 6 p.m. (indicated by vertical lines in *Figure 2a*). Further, on weekdays, start times for social and recreational trips last longer into the evening than start times for commuter trips.

The pattern for weekends differs from the results for weekdays. In weekends, the start times of the studied leisure trips are spread out over the day, with few starting in the early morning. Trips for exercise and outdoor life reach their peak during the morning, while the rest of the studied trip purposes

Figure 2 – Distribution of number of trips starting at different hours, from 6 a.m. to 12 p.m., car as driver or passenger, by leisure trip category [45]

reach their peak at lunchtime or in the afternoon. From *Figure 2b* it is also clear that social trips are dominant during weekends.

5. DISCUSSION

As mentioned earlier, research has shown that social and recreational activities are important for our everyday life and well-being [27, 31]. At the same time, leisure travel stands for a large proportion of the distances travelled by car, and for a considerable share of greenhouse gas emissions from travel [4]. In our dataset, everyday leisure trips account for 33 percent of the total passenger mileage by car. Comparisons with other studies on contemporary datasets are difficult due to the limited number of scientific papers focusing on passenger mileage for leisure trips, including social and recreational trips, and because the definition of what is included in leisure trips varies. However, examples of studies carried out on older datasets also indicate the magnitude of leisure trips. Harms [47] showed that leisure travel (excluding holiday trips) constituted 44 percent of the total distance travelled by car in 2005 in the Netherlands, and according to the U.S. 2017 National Household Travel Survey [48], 27 percent of the person miles travelled per day were for social and recreational purposes. This magnitude gives reason for a more thorough understanding of leisure trips by car and careful consideration of where the effective car use reducing potential lies. Our analysis shows that a large proportion of leisure trips by car are trips under 5 km, amounting to 35 percent for exercise and outdoor life and 26–27 percent for entertainment and culture and social trips. However, the calculated figures also reveal that a large share of leisure trips are longer than 20 km, especially for entertainment and culture and social trips. Due to the trip length, leisure trips that are 20 kilometres or longer account for 82 percent of the passenger mileage by car, of which social trips contribute with more than half.

Since leisure travel makes up a third of the total passenger mileage by car, this corresponds to a reduction of about 25 percent of the total passenger mileage by car in Sweden if switching all leisure trips 20 kilometres or longer to public transport. In the sustainable transition point of view, however, it is important to consider the passenger mileage causing climate effects by also considering the number of accompanying persons in the car. Our results indicate that leisure trips often are of joint character with less than a third of the trips made without the company of others. For social trips, the average number of accompanying persons is 0.9 and for entertainment and culture 1.5. Moreover, the results also show that the longer the trip, the more accompanying persons in the car. The joint character of leisure trips also influences the efficiency of the chosen mode, and more persons riding together in the car increases the climate efficiency of the car choice. Seen from this perspective, it is not always the most climate efficient measure to switch from car to bus. Calculations based on the average car and bus fleet in Oslo, Norway in 2016 indicate that it is more climate efficient for one person to go by car (as single occupancy) compared to bus if there are less than 8 persons on the bus (6.3 passengers on the bus with engine technology of Euro 5 and 6) [49]. Also, from the traveller's perspective it may be cost efficient (depending on fare structure and travelling costs considered) to go by car compared to public transport. As Ho and Mulley [50] suggest, using a household car for joint travel is still cheaper than using public transport.

Further, in the study, household characteristics seem to play a larger role than individual characteristics, which supports the fact that decisions governing our travel behaviour are complex and often involves more than one person, all with their specific preferences and needs. This is also in line with the study by Ho and Mulley [50], which shows how the car share increases significantly if travel involves joint household travel, and that the more complex the travel pattern, the more likely a car is used. The authors draw the conclusion that individual tours contribute the most to a change from car to public transport, while complex joint tours contribute the least to modal shifts. The analysis of our paper indicates that individual and household characteristics have a substantial influence on travel patterns for trips to exercise activities and outdoor life. Such trips are more common in the youngest age group (6–24 years) and in families with children. Even though shorter distances are travelled for these purposes, the analysis implies that the travel mode for these trips may be difficult to alter when considering luggage, for example related to small children and bulky or heavy sports equipment. Adding to this dimension is the fact that we do not only make joint leisure trips together with family members with whom we share the household, but also with other

family members, relatives, friends, colleagues and sometimes other people with whom we engage in joint activities.

The characteristics of leisure trips by car make simple conclusions on climate efficiency potential difficult. The high share of number of car kilometres travelled points to a considerable potential, while the fact that a large share of longer leisure trips is performed collectively by car could be interpreted as leisure trips having low climate efficiency potential. Further and as mentioned above, there are, from a traveller's perspective, factors indicating the complexity of these trips and inherent difficulties in changing travel behaviour. However, as the mapping in this study has shown, the number of car kilometres for leisure purposes is extensive and thus needs to be included in reduction efforts to meet climate targets. The study indicates that there is a need to take a broader view of the effective potential. Applying a system perspective could also include trips that make up a lower amount of car mileage as another category of interest. For example, even though a smaller proportion of the total passenger car mileage constitutes trips shorter than 5 kilometres (indicating a low sustainability potential of transferring these car trips to active modes), changing behaviours for these trips may very well result in behaviour change also for the longer trips, which in turn make up most of the passenger mileage by car from leisure trips.

This study indicates further that leisure trips, in general, take place at times when there is available capacity in the public transport system. There is thus a potential to attract car users into the public transport system by adjusting network design, supply and ticket/fee structures based on the characteristics of leisure trips. On the other hand, as social and recreational trips generally are not carried out in peak hours and are spread out during weekends, the incentive to change from car to public transport to avoid congestion is less pronounced.

The destination of leisure trips may also be seen as fixed and difficult to influence. For example, friends and family are not (as) exchangeable, and their choices of residence are most often not changeable, meaning that social leisure trips made for visiting friends and family might be the most rigid trips of all. However, studies of behavioural changes have shown that during COVID-19 more time with friends and family was spent in green areas and parks [8, 9]. In taking a broader view of leisure trips there may thus be reasons to consider our social behaviour as being not so rigid and that we may also vary the location of activities when there are incentives to do so, as adjustments made during the pandemic have taught us.

6. CONCLUSION

The result of this study contributes to the much-needed knowledge base of social and recreational leisure trips to discuss measures and their potential in a transition to a more sustainable transport system. The analysis of travel survey data reveals a series of characteristics indicating car dependency for these trips, such as longer distances travelled per person and day in rural areas due to longer trip lengths and fewer alternatives to the car, that generally there are people accompanying, indicating an economic advantage to take the car, that the starting times of these trips are not corresponding with high supply of public transport, that the travelled distance per person and day increases with income etc. In addition, the result indicates that there is a need to consider various types of leisure trips. The characteristics of social trips differ, for example, from those of exercise and outdoor life trips depending on individual and household factors but also on when they are carried out.

Based on the result that leisure trips account for one third of the total passenger mileage by car, our conclusion is that it is important to take a broader view of everyday leisure trips to include them when looking for ways to increase the climate efficiency potential for a sustainable transport system transition, even if there is a complexity and high car dependence.

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EGENSKAPER HOS VARDAGLIGA FRITIDSRESOR MED BIL I SVERIGE – IMPLIKATIONER FÖR HÅLLBARHETSÅTGÄRDER

SAMMANFATTNING

I jakten på åtgärder för att minska utsläppen av växthusgaser från transporter behövs insikter i egenskaperna hos alla slags resor och specifikt resor med bil. Denna artikel fokuserar på vardagliga fritidsresor för sociala ärenden och olika rekreationsärenden. Resbeteendet för dessa ärenden analyseras med hänsyn till individuella faktorer och hushållsfaktorer samt resans egenskaper, baserat på data från svenska nationella resvaneundersökningen. Analysen visar att vardagliga fritidsresor ofta är av gemensam karaktär och att den genomsnittliga tillryggalagda sträckan per person och dag ökar med till exempel inkomst, sammanboende, barn i hushållet och boende på landsbygden. Resultatet visar också att de studerade egenskaperna varierar mellan studerade resärenden, vilket påverkar hållbarhetspotentialen för en minskning av bilanvändning samt för föreslagna åtgärder. Till exempel kommer den största delen av transportarbetet från sociala resor medan resor för motion och friluftsliv har störst andel bilresor under 5 km. Flera egenskaper tyder på svårigheter att överföra resor med bil till exempelvis cykel eller kollektivtrafik på grund av bekvämlighet, ekonomi, starttider, sällskap etc. Studien pekar på att det finns ett behov av en bredare syn på den effektiva potentialen.

NYCKELORD

fritidsresande; resbeteende: persontransporter; trafikarbete; klimatförändringar.

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APPENDIX A

Table A.1 – Average number of trips per person and day in different societal groups, car as driver or passenger, by leisure trip category [45]

Societal group		Average number of trips per person and day				
		Social trips	Exercise and outdoor life	Entertainment and culture	Other recreational trips	All leisure trips
Gender	Man	0.15	0.10	0.04	0.08	0.37
	Woman	0.16	0.10	0.04	0.08	0.37
Age group	6–24	0.14	0.14	0.04	0.07	0.40
	25–44	0.16	0.09	0.04	0.06	0.36
	45–64	0.15	0.08	0.04	0.08	0.34
	65–84	0.16	0.07	0.05	0.11	0.38
Household type	Single household	0.14	0.06	0.03	0.06	0.29
	Cohabitation	0.15	0.11	0.05	0.09	0.40
Children in family	No children	0.15	0.07	0.04	0.08	0.33
	Youngest 0–6	0.17	0.13	0.04	0.06	0.40
	Youngest 7–18	0.15	0.14	0.05	0.09	0.42
Household income	< SEK 300k	0.12	0.05	0.03	0.06	0.26
	SEK 300-600k	0.15	0.09	0.04	0.08	0.35
	> SEK 600k	0.16	0.12	0.05	0.09	0.42
Residence	Urban	0.14	0.09	0.04	0.07	0.35
	Rural	0.18	0.11	0.05	0.10	0.43

Table A.2 – Average distance per trip in different societal groups, car as driver or passenger, by leisure trip category [45]

Societal group		Average distance per trip [km]				
		Social trips	Exercise and outdoor life	Entertainment and culture	Other recreational trips	All leisure trips
Gender	Man	33.2	16.7	28.4	20.4	25.4
	Woman	29.1	15.6	27.8	19.8	23.5
Age group	6–24	26.4	16.6	28.3	17.0	21.3
	25–44	31.9	15.3	29.3	19.3	25.1
	45–64	32.4	17.4	29.7	25.4	27.1
	65–84	32.9	14.4	24.3	17.9	24.2
Household type	Single household	30.3	18.4	30.1	17.9	25.5
	Cohabitation	31.4	15.8	27.5	20.5	24.2
Children in family	No children	32.4	17.1	29.0	21.7	26.2
	Youngest 0–6	34.4	15.9	31.2	19.1	26.0
	Youngest 7–18	26.3	15.4	25.0	17.3	20.7
Household income	< SEK 300k	33.3	27.7	24.1	14.7	27.0
	SEK 300–600k	28.5	13.2	30.3	20.4	23.3
	> SEK 600k	34.2	16.8	24.4	21.1	25.1
Residence	Urban	31.2	15.4	25.5	19.8	23.9
	Rural	30.8	18.4	35.4	20.8	26.0