1 **The Many Definitions of Long-Distance Travel – a Discussion**
2

3 **Miriam Magdolen**
4 Institute for Transport Studies
5 Karlsruhe Institute of Technology, Karlsruhe, Germany, 76131
6 Email: miriam.magdolen@kit.edu
7 ORCiD: 0000-0003-0452-2474
8
9 **Bastian Chlond**
10 Institute for Transport Studies
11 Karlsruhe Institute of Technology, Karlsruhe, Germany, 76131
12 Email: bastian.chlond@kit.edu
13 ORCiD: 0000-0003-2688-2251
14
15 **Peter Vortisch**
16 Institute for Transport Studies
17 Karlsruhe Institute of Technology, Karlsruhe, Germany, 76131
18 Email: peter.vortisch@kit.edu
19 ORCiD: 0000-0003-1647-2435
20
21
22 Word Count: 6,992 words + 2 tables (250 words per table) = 7,492 words
23
24
25 *Submitted August 1st, 2023*

Magdolen, Chlond, and Vortisch

1 **ABSTRACT**

2 Long-distance travel describes a crucial part of the travel behavior of individuals. While most travel
3 behavior studies concentrate on everyday travel patterns, long-distance travel accounts for large parts of
4 individual travel performance and travel-related emissions. However, despite the agreement that this part
5 of travel behavior is important to be analyzed, there is a lack of consensus regarding the definition of long-
6 distance travel. Researchers investigating long-distance travel inevitably encounter the challenge that
7 although many studies refer to long-distance travel, there is no consistent definition of this segment of travel
8 behavior. A literature review promptly reveals the existence of various definitions that can substantially
9 differ from each other, resulting in difficulties when comparing different studies and findings. Most
10 commonly used definitions are based on distance, trip purpose, journey duration, travel time, or
11 combinations thereof. In addition, the concept of 'tourism' is considered in this review, as it addresses the
12 identification of non-routine behavior. Thus, this concept overlaps with the intended research objective in
13 most long-distance travel studies. This paper systematically examines the diverse definitions used in the
14 literature, discusses the reasons behind them, identifies commonalities, and highlights key differences. By
15 outlining the advantages and disadvantages of the different criteria, this paper presents insights into the
16 implications of each long-distance travel definition for research findings. It thus provides guidance for the
17 selection of long-distance travel definitions in future studies.
18
19 **Keywords:** Long-distance travel, Travel surveys, Travel behavior, Tourism, Non-routine behavior;

INTRODUCTION

Empirical travel behavior research deals with the travel behavior of individuals through the collection of data, analysis of this data, and its interpretation. The insights gained serve a deeper understanding of travel behavior, which is relevant for deriving forecasts and estimating the potential effects of policy measures. The examination of individuals' travel behavior has primarily focused on everyday travel in the past, meaning that the daily behavior, including the traveled trips and the means of transportation used on an everyday basis, is analyzed (*1; 2*). In contrast, there is limited data and knowledge about non-routine behavior and especially about long-distance travel behavior (*3*), even though long-distance travel is growing faster than other travel segments (*4*). In several countries, a large part of the travel performance is explained by long-distance travel, e.g., in Germany 45% (*5*), in Great Britain 30% (*6*), and in Europe overall approximately 50% (*7*). Particular consideration must be given to the fact that, depending on the delimitation, only a few events are classified as long-distance travel. Often, it is only 1 to 2% of all trips (*4*). This demonstrates the significance of long-distance travel for the transport sector, reinforced by the used means of transportation, as those commonly used in long-distance travel are associated with high specific emissions (*8*). Knowledge of the volume of long-distance travel is thus crucial for assessing the environmental impact of travel. Although the Covid-19 pandemic caused a sharp drop in vacation and business travel, the latest statistics show that demand has recovered to the pre-pandemic level, as shown, for example, in the data from the International Air Transport Association (*9*). Overall, due to the high climate relevance of the transport sector and the increasing discussion in recent years about the sources of emissions, there is a strong need to investigate and understand individual long-distance travel (*7; 10*).

That being said, the question arises as to how long-distance travel is defined, what do the respective studies refer to, and why is it distinguished from everyday travel? A literature review quickly reveals that there is no uniform or standardized definition of long-distance travel (*11*); instead, various definitions are created for individual study purposes. The review of studies shows that distance, duration, specific travel purposes, and irregularity are usually used for the definition. However, some studies use combinations of these aspects, some use only one dimension for the definition, and even for only distance-based definitions, the range of the thresholds used is large between the studies (*4*). The many different definitions become problematic when comparing the results and indicators with each other, as even minor differences in definitions can lead to significant discrepancies. This paper aims to shed light on why individual definitions are used and the advantages and disadvantages of each definition. Commonalities between the criteria are identified, and differences are highlighted. Next to definitions from travel behavior research, the definition of 'tourism' is included in this review. The concept of tourism is based on the identification of non-routine behavior outside an individual's usual environment in which daily life happens. Hence, this definition overlaps with the research objective of most studies focusing on long-distance travel. This paper aims to provide guidance on which definition should be applied in which situation and when it should be omitted to distinct long-distance travel with a specific definition.

The paper is structured as follows: Based on a literature review revealing the importance of studying long-distance travel, this paper's core is an overview of existing definitions of long-distance travel (and tourism) in empirical surveys and studies. A systematical description and comparison of the criteria used in the definitions follow. The paper continues with a discussion of the advantages and disadvantages of each definition. Last, recommendations are derived, and future work is identified.

LITERATURE REVIEW

The literature review is based on a thorough collection of literature, including surveys that collect data on long-distance travel and studies with analyses of long-distance travel. Besides literature from the field of transportation research, the following review also contains studies from tourism research. Touristic travel does not necessarily include trips with long distances but refers to non-routine behavior outside someone's usual environment (*12*). For simplification, 'long-distance travel' is used in the following to refer also to such tourism studies. A detailed discussion of the differences is presented below.

Surveying long-distance travel

The methodological complexity in surveying long-distance travel is a primary reason that there exist such a variety of definitions. In their book 'Capturing Long-Distance Travel', Axhausen et al. (*13*) present a comprehensive collection of surveys and studies on long-distance travel as of 2003. All studies presented face the difficulty of capturing long-distance travel because long-distance travel events tend to occur infrequently and irregularly in the behavior of individuals. Thus, capturing such events involves a considerable effort (*13; 14*) and needs longitudinal data collection (*4; 10*). Cross-sectional surveys with typically short survey periods are limited in capturing the rarely occurring long-distance travel events because, especially in the case of trips of longer duration, respondents are not reached on the day(s) of the survey. To overcome this, a big survey sample would be needed which results in high survey costs (*10; 11; 15*). Many surveys that are not longitudinal instead include a survey module with a retrospective questioning of past overnight trips, e.g., in the last three months (*14; 16; 17*). However, this approach does not allow to gain insights into the regularity and frequency of certain types of journeys. It is additionally strongly dependent on the memory of the respondents.

In the project Mobi*drive*, the overall mobility of individuals was surveyed during an extended survey period of six weeks. Although the project focused on understanding everyday travel behavior, it was found that some people took a short vacation during the survey period. At the same time, the study concluded that even with a six-week survey, the geographic dispersion of activities collected is limited, and the majority of activities occur within the hometown of the participants (*18*). These findings highlight the temporal extent that would be required for a survey to capture both everyday routines and infrequent long-distance travel.

Another challenge in surveying long-distance travel is that seasonality plays a significant role: Journeys are unevenly distributed throughout the year depending on the travel purposes. This reinforces the need for an extended survey period, which would, however, be burdensome for participants and costly. Long-distance surveys with extended survey periods and multiple reporting dates showed sharply declining participation rates (*3; 19*). The advantage of such approaches is that the collected data can map travel behavior on an intrapersonal longitudinal basis. This was, for example, demonstrated by the project INVERMO (*20; 21*). In this project, a microscopic simulation model was developed that models long-distance travel demand at the person level, considering the characteristics of the persons and trips (*22*). The motivation for the chosen longitudinal approach was primarily to characterize travelers in terms of their mode choice. The repeated survey of the same respondents at different times of the year also made it possible to take seasonal effects into account. In addition, INVERMO revealed an uneven distribution of long-distance travel events in the population: only a small part of the population is responsible for a large part of long-distance trips. Especially these highly mobile individuals are relevant to the climate impacts of passenger transport with their high travel demand and travel-related emissions. At the same time, these individuals are difficult to reach and recruit for surveys (*13*).

Due to the difficulties in capturing long-distance travel, some surveys focus on singular travel purposes, for example, overnight vacation trips (*23*), with no links to other travel purposes or everyday mobility (*5*). Overall, a differentiated analysis of the long-distance travel demand of individuals is complicated because for most countries no comprehensive data source exists (*5*). Due to insufficient data, the determinants of long-distance travel have been studied less (*3; 24*).

Official statistics are another data source besides travel surveys that provide key figures, such as the number of passengers at airports. However, it remains unclear to what extent the numbers relate to the residential population and how the numbers are distributed among different travel purposes, sociodemographic groups, and, in particular, individuals, which makes it again difficult to compile the information from the different data sources.

Specifics of long-distance travel

The choice of means of transportation for infrequent long-distance trips is subject to different decision parameters than for routine trips in everyday life. For example, other means of transportation are available for long-distance travel (*4*). Furthermore, travel time tends to play a smaller role in the choice of

means of transportation for long-distance travel than for everyday travel due to the usually longer stay at the destination (*25*). It was found that long-distance travel is distinct from the daily routine and thus should be modeled separately (*26*). For vacation travel, the means of transportation and the destination are not chosen independently because, for example, some destinations can only be reached by plane. Therefore, approaches are used in the modeling of vacation travel behavior that consider mode choice and destination choice as a joint decision process (*27*).

Especially during the Covid-19 pandemic, long-distance travel was seen as being substitutable by online meetings in case of business trips or by choosing closer destinations in case of leisure trips. Most long-distance travel was seen as negligible, and long-distance trips were canceled or postponed. However, traveling can be important for individuals and their well-being. Trips to visit family and friends can originate from social obligations to maintain the relationships and thus be obligatory for an individual. Further, trips for leisure can be important for someone's identity even though they are seldom or irregular (*28*). These may be reasons for the resilience and fast recovery of such travel behavior (*29*).

As mentioned above, long-distance travel is characterized by an unequal distribution across the population (*4; 20*), meaning that some groups of people account for major parts of the long-distance travel demand. Thus, information about the intra-individual behavior with a longitudinal perspective is necessary to analyze who is traveling with which frequency. Sociodemographic factors related to long-distance travel demand are, for example, education level, income, gender, and place of residence (*26; 30–32*).

All aspects mentioned above contribute to the need to capture and study long-distance travel as a special part of travel behavior. However, few studies present combined investigations of everyday and long-distance travel, providing insights into interdependencies. For example, it was shown with data from a German NHTS that people from large cities travel more frequently and further than people from smaller communities. In addition, it was determined that people who behave multimodally in everyday life and therefore cause fewer travel-related emissions than monomodal car users compensate for this by traveling more frequently and further in long-distance travel (*31; 33*). Similar results were found by Czepkiewicz et al. (*30*) and Magdolen et al. (*17*). The results of a study in Great Britain reinforce the need to investigate the overall mobility of individuals because evidence of a positive relationship between car ownership and annual car use with air travel was found (*34*). The studies highlight the significant role of long-distance travel in the mobility of individuals. In addition, they show that long-distance travel can be related to everyday travel and should not be considered an isolated part of mobility on the individual level.

Definitions of long-distance travel

Considering the aspects described above, the definition of long-distance travel can be seen as an instrument of delimiting routine everyday behavior from exceptional behavior. This is why studies on tourism are included in this paper, as the definition of tourism directly addresses the non-routine behavior of individuals. The United Nations World Tourism Organization (UNWTO) defines tourism as the movement of visitors outside their usual environment, defined as the geographical area within which they conduct their life routine. Thus, it is a definition that is individual for each person. The maximum duration of a trip belonging to tourism is one year, and it can have personal, leisure or business purposes, but commuting is excluded (*35*).

Long-distance travel is defined when the intention is to target this specific part of travel in surveys or studies. In surveys, the definition serves to describe the participants which events they should report. For this, a definition is often chosen that is easy to understand and communicate. Table 1 presents an overview of rather large-scale surveys collecting data on long-distance travel and shows which criterion or combination of criteria was used to define the research objective.

Table 1 List of selected surveys on long-distance travel and national travel surveys containing long-distance travel modules

Survey (Reference)	Survey Year(s)	Countries / Survey Area	Distance	Trip Purpose	Journey Duration	Travel Time	Usual environ-ment	Combi-nation logic
Reiseanalyse (RA) (*23*)	Since 1971	Germany		holiday (personal)	min. 1 overnight			and
American Travel Survey (ATS) (*36*)	1995	U.S.	> 100 miles	excluding commuting trips				and
Nationwide Personal Transportation Survey (NPTS) (*37*)	1995	U.S.	> 75 miles					
Eurostat tourism statistics (*12; 38*)	Since 1995	European countries		excluding commuting/ life routine	min. 3 hours; max. 1 year		outside usual environ-ment	and
MEST (*19*)	1996/97	Sweden, UK, Portugal, France	> 100 km crow-fly					
DATELINE (*39*)	2001/02	EU-15*	> 100 km crow-fly					
NHTS U.S. (*40*)	2001/02	U.S.	> 50 miles					
INVERMO (*41*)	2001-2003	Germany	> 100 km					
KITE (*11*)	2008/09	Czech Republic, Portugal, Switzerland	> 100 km crow-fly					
Flash Euro-barometer (*42*)	2016	European countries			min. 1 overnight			
Mobilität in Deutschland (MiD) (*43*)	2017	Germany			min. 1 overnight			
Mikrozensus Mobilität und Verkehr (*44*)	2021	Switzerland			min. 3 hours (day tours); min. 1 overnight		not part of the daily routine	and

Sorted by year of survey; if distance criterion is not further specified, the distance refers to one-way network distance or no specification was made in the original literature;
*EU-15: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, UK

It needs to be mentioned that the list is not comprehensive, and especially in the nineties, several national travel surveys had modules surveying long-distance travel (*45*). However, the list aims to provide an overview of the diversity of different definitions used in surveys. It should also be mentioned that several national travel surveys have no specific section capturing long-distance travel and collect all travel during the reporting period. Thus, to some extent, long-distance travel events are collected in such surveys and can

1   be analyzed after data collection as a 'subset' of the data. However, as mentioned above, the probability of
2   collecting such seldom and rare events is relatively low, mainly because respondents are not reached during
3   multi-day journeys, and large sample sizes or observation periods would be necessary to capture long-
4   distance travel appropriately (*11*). The study of Kuhnimhof et al. (*46*) revealed that travel surveys with
5   travel diaries capture more trips in medium-distance (up to 200 km) than specific long-distance travel
6   surveys. However, long-distance travel surveys were better in data collection for trips with a minimum
7   distance of 400 km.
8   Table 2 provides an overview of studies that investigate long-distance travel. Their data basis is
9   either one of the surveys listed in Table 1, other national travel surveys that collect to some extent long-
10 distance travel in their reporting period or include own, rather small-scale, surveys on long-distance travel.
11 In addition, the table also contains studies that do not use data from questionnaires but from other data
12 collection methods, e.g., mobile phone data.
13
14 **Table 2 List of studies analyzing long-distance travel**
15

Authors	Year	Countries / Survey Area	Distance	Trip Purpose	Journey Duration	Travel Time	Usual environ-ment	Combi-nation logic
United States Department of Transportation (*36*)	1995	U.S.	> 100 miles	leisure purpose				and
LaMondia, Snell and Bhat (*27*)	2010	Countries in EU		holiday travel				
Dargay and Clark (*6*)	2012	Great Britain	>= 50 miles					
Rich and Mabit (*7*)	2012	European Countries	> 100 km					
Aamaas, Borken-Klefeld and Peters (*8*)	2013	Germany	> 100 km					
McKenzie (*47*)	2013	U.S.		commuting trips		>= 60 minutes		and
Frick and Grimm (*5*)	2014	Germany	> 100 km					
LaMondia et al.* (*26*)	2014	U.S.		personal, leisure and business	min. 1 overnight			and
Harvey et al. (*3*); Aultmann-Hall et al. (*10*)	2015	Mainly California, Alabama, Vermont			min. 1 overnight			
Moeckel et al. (*25*)	2015	U.S.	>= 50 miles					
Reichert and Holz-Rau (*33*)	2015	Germany	>= 100 km		min. 1 overnight			and
Winkler and Mocanu (*48*)	2017	Germany	> 100 km					

Reference	Year	Country	Distance	Purpose	Journey duration	Usual environment	Comb.
Christensen [+] (*14*)	2018	Denmark			min. 1 overnight		
Davis et al. (*49*)	2018	California	>= 50 miles				
Janzen and Axhausen (*50*)	2018	Switzerland	>= 50 km				
Janzen et al. (*51*)	2018	France	>= 80 km				
Magdolen et al. (*52*)	2020	Germany				individual non-routine behavior	
Mattioli, Morton and Scheiner ° (*34*)	2021	UK		Leisure, holidays or visiting friends and relatives			
Pukhova et al. (*1*)	2021	Germany	> 40 km	excluding commuting trips			and
Dütschke et al. (*2*)	2022	Germany	>= 400km	excluding business purposes	min. 1 overnight		and
Magdolen et al. (*17*)	2022	Germany (Berlin and Munich)		private purposes		outside usual environment	and

Sorted by year of publication; If distance criterion is not further specified, the distance refers to one-way network distance or no specification was made in the original literature
*This study also used modes in their definition of long-distance travel, e.g., intercity rail, intercity bus, and air travel, as well as international travel besides the overnighting criterion
[+]This study used international travel in combination with overnighting
°This study focused on air travel in combination with private purposes

From the reviewed articles and surveys, it can be derived that several dimensions of travel are used to distinguish long-distance travel from other parts of travel. These are primarily distance (e.g., minimum distance traveled), purpose (e.g., vacation), journey duration (e.g., overnight stay), travel time (e.g., minimum duration on the road) and unfamiliarity (e.g., outside usual environment), or combinations thereof.

COMPARISON OF CRITERIA
The presented definitions all have advantages and disadvantages as evidenced by the lack of a standardized definition. In the following comparison, each criterion used in the definitions (distance, trip purpose, journey duration, travel time, and usual environment) is discussed in detail.

Distance:
- If applied during data collection: Easy to understand, but may be difficult to assess if a trip exceeded the distance threshold, especially when close to the threshold or if traveled with special means of transportation, e.g., ship or plane
- If applied by researchers after data collection: Easy to identify for simple trips (e.g., only one destination) and easy to analyze in survey data

- Difficult to understand why one trip close to the threshold is not long-distance travel, e.g., 79 miles trip is everyday travel, but 80 miles trip is long-distance travel
- Difficult to select the threshold as it has different impacts in different environments, for example, in different cultures, e.g., 80 miles is more likely to be part of day-to-day travel in rural areas than in dense urban areas
- For trips with multiple stops, it can be challenging to identify the main or the furthest destination.
- Differences between crow-fly and network distance need to be considered or clarified
- Contains all purposes of travel, e.g., also long-distance commuting next to vacation trips which are very different in terms of their routinization

Trip purposes – personal (vacation/recreational/leisure trips) or business travel:
- If applied during data collection: Easy to understand and easy to report by the participants
- If applied by researchers after data collection: Easy to identify and easy to analyze in survey data

- Except for the trip purpose 'vacation', this definition needs another dimension, e.g., overnighting, to plausible define long-distance travel
- Trips to visit family, e.g., to take care of a family member, may not fit in the 'vacation' or 'leisure' trip purpose as it has no meaning of recreation for the participants

Journey Duration - overnight stays:
- If applied during data collection: Easy to remember and easy to report by the participants
- If applied by researchers after data collection: Easy to identify and easy to analyze in survey data

- One-day excursions, e.g., one-day trips to the mountains, are not captured and thus missing in this definition of long-distance travel
- Overnight stays can take place at often visited places, e.g., visiting friends and relatives, and can also be close to home. Both aspects deviate from other common definitions of long-distance travel

Travel time:
- If applied during data collection: Easy to remember and easy to report by the participants
- If applied by researchers after data collection: Easy to identify and easy to analyze in survey data

- Definition addresses the travel burden of individuals and is mostly applied in studies on long-distance commuting. This approach is often used for identifying the negative effects of long travel times on well-being and quality of life (*4*)
- In many cases, people can remember travel time easier than distance traveled, e.g., hours of car trip or duration of flight. However, travel time can deviate strongly even for the same trips or journeys (traffic situation, stops on the way, transits)

Leaving the usual environment - tourism:
- If applied during data collection: Can be both difficult and easy; On the one hand, it is difficult to understand and participants may assess similar events in a very different way, e.g., a trip to the zoo can be both within the usual environment when it is close to home and outside the usual environment if the person visits the zoo very seldom. On the other hand, it can be easily assessed as there is no objective right or wrong and the decision is made subjectively by the participant/ can be an intuition of the participant

- If applied by researchers after data collection: Difficult to identify and needs longitudinal data

- Definition is well-defined, published, and applied by the UNWTO and thus transferable
- The idea of leaving the usual environment aligns with the rationale to define long-distance travel in many studies. The aim is to identify the non-routine part of travel behavior with exceptional travel choices compared to routine behavior in everyday life (*12*).
- This definition is on an individual level, which means that the shape and size of the usual environment of each person is different, which probably corresponds most closely to reality
- The identification is difficult both for participants and also for researchers. Longitudinal data must be available for researchers to identify the typical patterns and define an individual's usual environment (*52*)

It has to be considered that for some trips, all definitions would identify them as long-distance travel. For example, a long vacation trip to another continent likely exceeds a distance criterion, includes overnight stays, has a long travel time, and is outside the individual's usual environment. However, especially for trips that are close to everyday travel, the identification varies between the definitions. For example, long-distance commuting likely exceeds a distance criterion but does not involve an overnight stay.

To complete the list of criteria, it should be added that the study of LaMondia et al. (*26*) also used typical long-distance travel modes for the definition, namely air travel, intercity train, and intercity bus. As this works well for some modes, there is the problem, for example, for personal cars and other motorized vehicles that there is the need to provide an additional criterion (distance or journey duration) to capture long-distance travel. In addition, the study used international travel as a criterion to define long-distance travel. While this is useful for islands and large countries, this definition is inappropriate for small countries and countries with dispersed territory. It can be assumed that due to the mentioned limitations, most other studies rely on the other criteria presented. However, it should not be neglected that, especially for the comparison with external statistics, international travel and mode use can be helpful information, e.g., for comparisons with passenger volumes in air travel.

DISCUSSION

From the literature review above it becomes clear that no definition prevails as the best practice. The surveys and studies listed in Table 1 and Table 2 show the diversity of criteria used and clearly show that no international standard exists. Studies that aim for a combination of different data sources face the problem of a lack of comparability and compatibility between the different data sources, even if using data from one country only (*5; 32*).

The section above described the advantages and disadvantages of the different criteria used in the definitions and shows that multi-dimensional aspects must be evaluated before applying one of the criteria. The definitions differ in terms of their research objective: Distance-based definitions are mainly used in transportation research, whereas the delimitation with the usual environment of a person is mainly used in tourism research. The latter is standardized and tourism statistics usually follow this convention. However, in the transport sector, the definitions vary strongly (*15*). Using a distance criterion is especially useful when distances traveled and related emissions should be analyzed because distances traveled are more or less proportional to emissions (*24*). By considering trips above a threshold, mainly those trips involving high emissions are analyzed. However, there is no distance criterion prevailing in literature and even for the same distance, no standard exists if it is crow-fly or network distance.

The criterion of overnighting has the great advantage that people are very likely to remember such trips and the overlap with trips with long distances is substantial (*3*). This leads to another important aspect: The usefulness of specific definitions depends on the reporting period. If respondents have to recall their long-distance trips for 12 months, they are likely to remember only the most significant trips, e.g., with longest durations or longest distances or air travel, rather than remembering one-day excursions for the whole last year (*11; 46*). This is mainly dependent on a person's overall behavior, i.e., frequent travelers

might easily forget single trips in between all their travel. In these cases, it could be helpful to question the frequency of travel, e.g., with a Likert Scale as described by LaMondia et al. (*26*). However, with a category such as 'multiple times a month' neither total distances, nor travel-related emissions can be calculated. Hence, this kind of questioning is only helpful in determining the overall travel behavior of people.

The use of trip purpose to define long-distance travel is mainly used with other criteria. Most examples use 'vacation/ recreational/ leisure' or 'business' in combination with a minimum distance or overnighting. While this is helpful to stimulate the memory of the participants, the reason for this definition is mainly a specific research interest for the analyses (either on private or business travel). The criterion of travel time is mainly used in the context of long-distance commuting and aims at identifying commuters with a high travel burden in their everyday travel. However, long-distance commuting is a special subset of travel behavior because although long distances are traveled, the behavior and the circumstances of travel decisions are similar to everyday travel. This is why several studies treat long-distance commuting as everyday travel (*1*).

There is one main common ground in all the long-distance travel definitions applied in the literature: They have a great consensus in addressing the special part of travel behavior that occurs rarely and irregularly and can also involve the use of special means of transportation, e.g., long-distance train. It was shown that the travel decisions in these exceptional events have to be distinguished from everyday travel (*26*), which is why long-distance travel needs special consideration. Due to the short reporting period, long-distance travel events are typically not collected (comprehensively) in traditional travel diaries. All definitions presented above thus aim at considering explicitly this seldom and 'difficult to capture' part of travel, which is exceptional but at the same time plays an important role in an individual's behavior. For this reason, this study included the definition of tourism, which is defined as non-routine travel outside an individual's usual environment and, thus, outside an individual's daily life. This definition is thereby very close to the core interest of most travel behavior researchers, who want to understand and quantify exceptional behavior by collecting long-distance travel data. For identifying an individual's routine and non-routine behavior, longitudinal travel is needed so that repetitions, such as frequently visited places, can be identified. One example is the study of Magdolen et al. (*52*) that presents a method for identifying the usual environment and non-routine behavior based on three weeks of travel diary from a German NHTS. This approach needs information on the overall travel behavior, including all distances, all trip purposes, all journey lengths, and all travel times. However, collecting such comprehensive, longitudinal data of an individual means a high response burden and involve much effort and, of course, costs.

The definition of long-distance travel should only be considered a necessary tool, i.e., when no overall travel behavior can be collected. Only if results on a very particular part of long-distance travel are of interest should a definition be provided during the data collection process, as it limits the possibilities for later analyses and likely confuse the respondents, e.g., if multiple trip purposes are combined during one journey. If a travel survey needs a definition, it should be selected depending on the aim of research, but even more important depending on the effects on the respondent and the data reported. It should be used consistently, proportional to the reporting period, and help the respondents remember their trips. While the combination of different criteria seems helpful in defining the specific research objective, it can lead to confusion among the respondents and, thus, to response bias.

This study identified two main reasons why defining long-distance travel during the data collection process should be evaluated carefully: First, respondents have difficulties assessing the provided definition to their individual behavior. This is either because of the definition itself, e.g., an exact distance of a past journey is difficult to assess, or because of recall effects in retrospective surveys. Second, to compare the outcomes of the data collected with other existing studies, flexibility in applying different definitions on the data is needed. In addition, long-distance travel should not be seen as a stand-alone part of travel. Several studies identified that individuals behaved differently in their everyday and long-distance travel. Hence, the overall intrapersonal behavior is of interest, as everyday travel cannot be extrapolated to long-distance travel. A deeper understanding of these interrelationships is necessary to derive influencing measures and assess their effectiveness.

Data from smartphones, such as app or GPS data, are promising data sources for capturing longitudinal and continuous data. No recall effects occur with such survey methods and the data quality does not depend on the respondents' memory (*15*). With this kind of survey methods overall travel can be collected and there is no need to define the research objective during the data collection process. The data collected promise flexibility to apply different definitions afterward, for example, to compare the results with other existing data sources.

More as a side note, but still relevant when studying long-distance travel: long-distance travel happens across borders and depending on the country and the geographical characteristics, major parts of long-distance travel happen abroad. This is especially relevant for assigning transport-related emissions. However, although most surveys collect at least the main destination of journeys abroad, most transport models stop at the border of the countries. Thus, travel demand and associated emissions are only considered within the borders. This goes in line with the fact that most transport statistics capture travel volumes within the own territory, understandably because most statistics serve national interests, e.g., as a basis for investments in national infrastructure. However, considering the aim of understanding individual travel behavior, all travel should be captured and assigned to the traveling individuals regardless of where the travel takes place.

CONCLUSIONS

Analyzing long-distance travel is essential for understanding travel patterns beyond everyday travel and assessing the environmental impact. In addition, it is crucial to understand who is traveling and for what reasons because, especially in long-distance travel, social inequality in travel demand depending on characteristics such as income and education level is present. Knowledge about long-distance travel patterns is important to derive measurements and policies targeting the specific population groups with high travel-related emissions. However, before deriving such ideas to influence travel, long-distance travel must be measured quantitatively. With the current existing variety of definitions, no comprehensive picture of long-distance travel demand can be drawn and it is challenging to compare different studies and data sources. In addition, by focusing only on long-distance travel and often only on one specific part of this travel, most studies neglect existing interdependencies between everyday and long-distance travel behavior.

The literature review reveals that most studies use distance-based definitions, but even for this criterion, different thresholds are used. Other studies define their research subject with overnighting, travel time thresholds, or specific trip purposes, e.g., vacation trips. Furthermore, many studies apply combinations of these criteria their definitions.

In summary, no convention for the definition of long-distance travel exists. With the description of the 'usual environment', tourism research uses a standardized definition that addresses travel outside an individual's usual environment and thus outside daily life. This definition thereby approximates the underlying rationale of why transportation researchers define long-distance travel: To focus on non-routine behavior besides everyday travel, which is difficult to collect in traditional travel surveys. Thus, the differentiation between routine and non-routine behavior should get greater consideration in future long-distance travel research.

Researchers should aim to collect data on individuals' overall travel to capture all parts of travel behavior. By this, the data allow a flexible application of different long-distance travel definitions and for comparisons with other existing data sources. However, this results in the need to collect the individual travel behavior in a longitudinal perspective, e.g., to be able to identify the more routine from the less routine behavior in the data and to allow analyzing the relationship between everyday and long-distance travel and vice versa. The authors are confident that with the more common travel data collection via smartphone, the possibilities to generate such flexible data are growing. Prospective research should address the difficulties associated with the collection of data with mobile devices, e.g., data protection issues and the interpretation of such data. It needs to be evaluated whether a mix of survey questioning and collecting data with mobile devices is useful. The underlying motivations behind travel should not be ignored, as they are relevant to understand behavior and to derive targeted instruments for influencing individual behavior.

Further, it should be evaluated for which period of time data collection is necessary to allow distinguishing between routine and non-routine behavior.

Last, it should be highlighted that long-distance travel does not stop at territorial borders, which means that especially long-distance trips are likely to take place outside a resident's country. For this reason, studies should not only focus on capturing travel within one country but should also capture travel across borders. Sustainable long-distance travel should not be seen as a national challenge but as a global one. Projects and ideas that consider travel relations beyond borders and between countries are relevant and should be supported by institutions and policymakers in the future.

AUTHOR CONTRIBUTIONS

The authors confirm contribution to the paper as follows: study conception and design: Magdolen; data collection: Magdolen, Chlond, Vortisch; analysis and interpretation of results: Magdolen, Chlond, Vortisch; draft manuscript preparation: Magdolen. All authors reviewed the results and approved the final version of the manuscript.

REFERENCES

1. Pukhova, A., A. T. Moreno, C. Llorca, W.-C. Huang, and R. Moeckel. *Agent-Based Simulation of Long-Distance Travel: Strategies to Reduce CO2 Emissions from Passenger Aviation. Urban Planning*, Vol. 6, No. 2, 2021, http://dx.doi.org/10.17645/up.v6i2.4021.

2. Dütschke, E., L. Engel, A. Theis, and D. Hanss. *Car driving, air travel or more sustainable transport? Socio-psychological factors in everyday mobility and long-distance leisure travel. Travel Behaviour and Society*, Vol. 28, 2022, pp. 115–127, http://dx.doi.org/10.1016/j.tbs.2022.03.002.

3. Harvey, C., L. Aultman-Hall, J. LaMondia, J. Sullivan, E. Greene, and C. Ritter. *Conducting a Longitudinal Survey of Overnight Travel: Methods and Preliminary Findings,* TRC Report 15-003, 2015.

4. Mattioli, G. *Long-distance travel*. Accessed July 4, 2023.

5. Frick, R., and B. Grimm. *Long-Distance Mobility - Current Trends and Future Perspectives*, 2014. https://www.ifmo.de/files/publications_content/2014/ifmo_2014_Long_Distance_Mobility_en.pdf.

6. Dargay, J. M., and S. Clark. *The determinants of long distance travel in Great Britain. Transportation Research Part A: Policy and Practice*, Vol. 46, No. 3, 2012, pp. 576–587, http://dx.doi.org/10.1016/j.tra.2011.11.016.

7. Rich, J., and S. L. Mabit. *A Long-Distance Travel Demand Model for Europe*, 2012, http://dx.doi.org/10.18757/EJTIR.2012.12.1.2946.

8. Aamaas, B., J. Borken-Kleefeld, and G. P. Peters. *The climate impact of travel behavior: A German case study with illustrative mitigation options. Environmental Science & Policy*, Vol. 33, 2013, pp. 273–282, http://dx.doi.org/10.1016/j.envsci.2013.06.009.

9. International Ait Transport Association (IATA). *Air Passenger Market Analysis,* IATA Sustainability & Economics, April 2023. https://www.iata.org/en/iata-repository/publications/economic-reports/air-passenger-market-analysis-april-2023/.

10. Aultman-Hall, L., C. Harvey, J. J. LaMondia, and C. Ritter. *Design and Response Quality in a One-Year Longitudinal Survey of Overnight and Long-Distance Travel. Transportation Research Procedia*, Vol. 11, 2015, pp. 136–153, http://dx.doi.org/10.1016/j.trpro.2015.12.012.

11. Frei, A., T. G. Kuhnimhof, and K. W. Axhausen. *Long distance travel in Europe today: Experiences with a new survey*, 2010.

12. Eurostat. *Methodological manual for tourism statistics. Version 3.* Publications Office, Luxembourg, 2014.

13. Axhausen, K. W., J.-L. Madre, J. W. Polak, and P. L. Toint, eds. *Capturing long-distance travel.* Research Studies Press, Baldock, Hertfordshire, 2003.

14. Christensen, L. *Considerations on a survey method to collect long distance travel data when only asking about the two latest journeys. Transportation Research Procedia*, Vol. 32, 2018, pp. 553–562, http://dx.doi.org/10.1016/j.trpro.2018.10.024.

15. Gerike, R., and A. Schulz. *Workshop Synthesis: Surveys on long-distance travel and other rare events. Transportation Research Procedia*, Vol. 32, 2018, pp. 535–541, http://dx.doi.org/10.1016/j.trpro.2018.10.032.

16. Follmer, R., and D. Gruschwitz. *Mobility in Germany - short report.* FE no. 70.904/15, Federal Ministry of Transport and Digital Infrastructure, 2019. www.mobilitaet-in-deutschland.de. Accessed July 26, 2023.

17. Magdolen, M., S. von Behren, B. Chlond, and P. Vortisch. *Long-distance travel in tension with everyday mobility of urbanites – A classification of leisure travellers. Travel Behaviour and Society*, Vol. 26, 2022, pp. 290–300, http://dx.doi.org/10.1016/j.tbs.2021.10.010.

18. Haupt, T., A. Zimmermann, A. Kübel, K. J. Beckmann, G. Rindfüser, T. Wehmeier, J. Beckmann, M. Düsterwald, K. W. Axhausen, S. Schönfelder, A. König, R. Schlich, A. Simma, and E. Fraschini. *Mobidrive - Dynamik und Routinen im Verkehrsverhalten: Pilotstudie Rhythmik*, 2001.

19. Axhausen, K. W., and M. Youssefzadeh. *MEST survey work. In Capturing long-distance travel,* K.W. Axhausen, J.-L. Madre, J.W. Polak and P.L. Toint, eds. Research Studies Press, Baldock, Hertfordshire, 2003, pp. 85–108.

20. Manz, W., and D. Zumkeller. *Microscopic modelling of long-distance passenger transportation in a longitudinal perspective. World Conference on Transport Research (WCTR),* Berkeley, 2007.

21. Zumkeller, D., B. Chlond, J. Last, and W. Manz. *Long-Distance Travel in a Longitudinal Perspective: The INVERMO Approach in Germany. TRB 85th Annual Meeting Compendium of Papers,* Washington, D.C., 2006.

22. Manz, W. *Mikroskopische längsschnittorientierte Abbildung des Personenfernverkehrs.* Inst. f. Verkehrswesen d. Univ, Karlsruhe, 2005.

23. FUR. *Reiseanalyse 2022 - Erste ausgewählte Ergebnisse der 52. Reiseanalyse,* Forschungsgemeinschaft Urlaub und Reisen e.V., 2022.

24. Mattioli, G., and M. Adeel. *Long-Distance Travel. In International Encyclopedia of Transportation.* Elsevier, 2021, pp. 272–277, http://dx.doi.org/10.1016/B978-0-08-102671-7.10695-5.

25. Moeckel, R., R. Fussell, and R. Donnelly. *Mode choice modeling for long-distance travel. Transportation Letters*, Vol. 7, No. 1, 2015, pp. 35–46, http://dx.doi.org/10.1179/1942787514Y.0000000031.

26. LaMondia, J. J., L. Aultman-Hall, and E. Greene. *Long-Distance Work and Leisure Travel Frequencies: Ordered Probit Analysis Across Non–Distance-Based Definitions. Transportation Research Record: Journal of the Transportation Research Board, No.* 2413, 2014, pp. 1–12.

27. LaMondia, J., T. Snell, and C. R. Bhat. *Traveler Behavior and Values Analysis in the Context of Vacation Destination and Travel Mode Choices. Transportation Research Record: Journal of the Transportation Research Board*, Vol. 2156, No. 1, 2010, pp. 140–149, http://dx.doi.org/10.3141/2156-16.

28. von Behren, S., M. Puhe, and M. Magdolen. *Social aspects of long-distance travel - a study of two survey designs. 12th International Conference on Transport Survey Methods,* Lisboa, Portugal, 2023.

29. Brunel, J. *The recovery of long-distance mobility after COVID-19: What can we expect? In Transportation Amid Pandemics.* Elsevier, 2023, pp. 331–338, http://dx.doi.org/10.1016/B978-0-323-99770-6.00025-9.

30. Czepkiewicz, M., J. Heinonen, and J. Ottelin. *Why do urbanites travel more than do others? A review of associations between urban form and long-distance leisure travel. Environmental Research Letters*, Vol. 13, No. 7, 2018, http://dx.doi.org/10.1088/1748-9326/aac9d2.

31. Reichert, A., and C. Holz-Rau. *Mode use in long-distance travel. Journal of Transport and Land Use*, Vol. 8, 2015, http://dx.doi.org/10.5198/jtlu.2015.576.

32. Magdolen, M., B. Chlond, A. Schulz, C. Nobis, J. Blechschmidt, J. Reher, C. Thaller, G. Liedtke, C. Jödden, A. Sauer, M. Führer, S. Kotzagiorgis, and R. Frick. *Options for action for an ecological design of long-distance mobility in passenger and freight transport*, 2022. https://www.umweltbundesamt.de/sites/default/files/medien/479/publikationen/texte_53-

2022_options_for_action_for_an_ecological_design_of_long-distance_mobility_in_passenger_and_freight_transport.pdf.

33. Holz-Rau, C., J. Scheiner, and K. Sicks. *Travel Distances in Daily Travel and Long-Distance Travel: What Role is Played by Urban Form? Environment and Planning A*, Vol. 46, No. 2, 2014, pp. 488–507, http://dx.doi.org/10.1068/a4640.

34. Mattioli, G., C. Morton, and J. Scheiner. *Air Travel and Urbanity: The Role of Migration, Social Networks, Airport Accessibility, and 'Rebound'. Urban Planning*, Vol. 6, No. 2, 2021, pp. 232–245, http://dx.doi.org/10.17645/up.v6i2.3983.

35. World Tourism Organization (UNWTO). *Understanding Tourism: Basic Glossary*, 2007. http://cf.cdn.unwto.org/sites/all/files/docpdf/glossaryenrev.pdf.

36. United States Department of Transportation. *1995 American Travel Survey: Long Distance Leisure Travel in The United States,* Bureau of Transportation Statistics, 1995.

37. Bricka, S. *Variations in Long-Distance Travel,* Transportation Research E-Circular - Personal Travel - The Long and Short of It E-C026, 2001.

38. Eurostat. *Tourism statistics in the European statistical system - 2008 data.* Publications Office of the European Union, Luxembourg, 2010.

39. Erl, E., G. Sammer, F. Gomes, G. Moriz, N. Cus Babic, N. Thorpe, A. Di Guardo, P. Davidson, C. Schnabel, N. Karasmaa, H. van Evert, P. G. Papaioannou, and K. W. Axhausen. *Design and Application of a Travel Survey for European Long-Distance Trips Based on an International Network of Expertise (DATELINE)*, 2004.

40. United States Department of Transportation. *America on the Go… Findings from the National Household Travel Survey,* Research and Innovative Technology Administration; Bureau of Transportation Statistics, 2006.

41. Zumkeller, D., W. Manz, J. Last, and B. Chlond. *Die intermodale Vernetzung von Personenverkehrsmitteln unter Berücksichtigung der Nutzerbedürfnisse (INVERMO) - Schlussbericht,* Institut für Verkehrswesen (IFV), 2005.

42. European Commission. *Flash Eurobarometer 432 - Preferences of Europeans towards tourism*, 2016. https://europa.eu/eurobarometer/api/deliverable/download/file?deliverableId=54207.

43. Follmer, R., and D. Gruschwitz. *Mobility in Germany - short report,* infas, DLR, IVT and infas 360 on behalf of the Federal Ministry of Transport and Digital Infrastructure (BMVI) (FE-NR. 70.904/15), 2019.

44. Bundesamt für Statistik / Bundesamt für Raumentwicklung. *Mobilitätsverhalten der Bevölkerung. Ergebnisse des Mikrozensus Mobilität udn Verkehr 2021*, 2023.

45. Youssefzadeh, M. *Long-distance diaries today: Review and critique. In Capturing long-distance travel,* K.W. Axhausen, J.-L. Madre, J.W. Polak and P.L. Toint, eds. Research Studies Press, Baldock, Hertfordshire, 2003, pp. 27–44.

46. Kuhnimhof, T., R. Collet, J. Armoogum, and J.-L. Madre. *Generating Internationally Comparable Figures on Long-Distance Travel for Europe. Transportation Research Record: Journal of the Transportation Research Board*, Vol. 2105, No. 1, 2009, pp. 18–27, http://dx.doi.org/10.3141/2105-03.

47. McKenzie, B. *Out-of-State and Long Commutes: 2011,* American Community Survey Reports ACS-20, U.S. Department of Commerce, 2013.

48. Winkler, C., and T. Mocanu. *Methodology and Application of a German National Passenger Transport Model for Future Transport Scenarios. European Transport Conference*, 2017.

49. Davis, A. W., E. C. McBride, K. Janowicz, R. Zhu, and K. G. Goulias. *Tour-Based Path Analysis of Long-Distance Non-Commute Travel Behavior in California. Transportation Research Record: Journal of the Transportation Research Board*, Vol. 2672, No. 49, 2018, pp. 1–11, http://dx.doi.org/10.1177/0361198118778926.

50. Janzen, M., and K. W. Axhausen. *Measuring long-distance travel*, 2018.

51. Janzen, M., M. Vanhoof, Z. Smoreda, and K. W. Axhausen. *Closer to the total? Long-distance travel of French mobile phone users. Travel Behaviour and Society*, Vol. 11, 2018, pp. 31–42, http://dx.doi.org/10.1016/j.tbs.2017.12.001.

52. Magdolen, M., L. Ecke, T. Hilgert, B. Chlond, and P. Vortisch. *Identification of Non-Routine Tours in Everyday Travel Behavior. TRB 99th Annual Meeting,* Washington D.C., 2020, http://dx.doi.org/10.5445/IR/1000105265.