Article

Impacts of Commuting Practices on Social Sustainability and Sustainable Mobility

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Abstract: Commuting is an integral part of many people's everyday life providing a transition between private and working life. It does, however, lead to negative impacts at a personal and social-ecological level (health impacts, lack of time, climate emissions, etc.). This article is based on the transdisciplinary research project "CommuterLab" (PendelLabor), which investigates commuting practices in the German Rhine-Main region. Using a practice-theoretical approach, we conducted a qualitative empirical study to explore how commuters organise the transition between their personal life and job. Through our analysis, we were able to identify different meanings of commuting and its strong interconnection with other everyday practices. This allowed us to gain deep insight into the social (non-)sustainability of commuting. At the core of our results are four different types of commuting practice whose impact on social sustainability differs widely. Furthermore, since the interviews were conducted during the coronavirus pandemic, respondents had their first experience of strongly reduced commuting. This in turn allowed insights into the changing organisation of everyday life and the impact of reconfigured commuting practices on social sustainability. Based on these results, we drew conclusions about the dynamics of commuting in terms of social sustainability.

Keywords: commuting; practice theory; social sustainability; daily mobility; everyday life practices

1. Introduction

Commuting is a decidedly modern phenomenon originating in the separation from workplaces and homes through the development of urban railways in the mid-19th century. A possibility to escape polluted city centres, more recently with the mass dissemination of the private car, commuting also became a drudgery [1]. However, for many people, commuting is an integral activity of everyday life and a significant aspect of the personal relationship to mobility [2]. In fact, up until the coronavirus pandemic, the number of commuters (in Germany) had been steadily increasing [3]. How a "new normal" for commuting will look is the subject of ongoing debate.

The sheer number of commuters, especially in urban agglomerations, is a formative element of overall traffic, along with the underlying infrastructure geared to meet the demands of the morning and evening rush hour. Commuting does, however, have far-reaching consequences, not only for the shape of transport infrastructure but also for commuters themselves, the municipalities where they live and work, and the local and global environment. We take the problem of unsustainable commuting as a starting point to investigate how commuting can become more sustainable, based on the example of the Rhine-Main region in Germany.

1.1. Problem Understandings and Objectives of the Study

Commuting is more than just moving from A to B. It should be considered an interface between work and private life, especially in view of the major changes resulting from the coronavirus pandemic. We thus describe commuting as a spatial and/or temporal transition between the private sphere and the work sphere [4]. Our emphasis is on the context

and conditions of commuting (including the needs that commuting fulfils), settlement structures and the planning thereof, the development of technical and social infrastructures, arrangements within the private and professional spheres, individual orientations of action and also overarching societal and anthropogenic environmental changes. Commuting therefore is neither an exclusively individual decision nor a direct consequence of spatial or economic conditions. Rather, the above definition suggests that commuting is continuously (re)produced within a network of social and material arrangements and itself contributes to the maintenance of these arrangements. With our approach, we do not want to take commuting as a given where we focus only on alleviating the symptoms, for instance, by changing the mode of transport. Instead, we adopt a change of perspective, in which commuting becomes an activity that can be modified and influenced in many ways and itself contributes to changing the structuring circumstances. The understanding of commuting as a transition between private and professional spheres outlined here and the associated social and material arrangements thereby point to new ways of changing the *causes* of unsustainable commuting.

In this article, we apply a practice-theoretical perspective and investigate commuting as an everyday practice comprised of interconnected elements [5]:

A "practice" (Praktik) is a routinized type of behaviour which consists of several elements, interconnected to one other: forms of bodily activities, forms of mental activities, 'things' and their use, a background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge. A practice—a way of cooking, of consuming, of working, of investigating, of taking care of oneself or of others, etc.—forms so to speak a 'block' whose existence necessarily depends on the existence and specific interconnectedness of these elements, and which cannot be reduced to any one of these single elements" [5] (249f.).

Thus, practice theories conceptualise materiality as part of actions or activities [6,7]. This allows for an integrated consideration of the cultural symbolic dimensions (e.g., household constellations, corporate culture) and material dimensions (e.g., transport infrastructure, settlement structure) present in the phenomenon of commuting. Society, in consequence, is understood as a network of practices and materialities [5]. This structure derived from practices, however, cannot be understood as rigid but as a shared societal pattern that is reproduced by and reconfigured through numerous unique and individual activities. This emphasizes the relationships between different practices, as well as their embedding in and production through a web of practices and materialities [8]. In consequence, practices usually do not change abruptly, but the interconnection of the elements of practices needs to be reconfigured in order to produce more sustainable practices [9]. As indicated above, commuting refers to a wide variety of practices, which establish the transition between the private and professional spheres and are situated within a network of practices and materialities. Rather than consider commuting traffic in isolation, we presuppose a close interconnection between the expression of commuting and the organisation of everyday life and work.

In their current manifestation, commuting practices must be considered socially and ecologically unsustainable [10–13]. The inter- and transdisciplinary research project "CommuterLab" thus focuses on identifying ways to change unsustainable commuting practices. These are primarily those practices that are carried out in socially and/or ecologically incompatible ways due to their situatedness within the web of social and material arrangements. To achieve this goal, we follow a multi-step approach. Based on a thorough review of the literature on commuting, we conducted a qualitative socio-empirical investigation of commuting practices with the help of in-depth interviews. Furthermore, the project entails a regional quantitative survey amongst commuters and a real-world laboratory with commuters and municipal stakeholders in order to test measures for sustainable commuting. In this article, we present results of the explorative interviews that aimed to answer the following research questions:

1. What are the types and characterisation of (non-)sustainable commuting practices?

2. How can we understand the stability of practices, the factors of stabilisation and the organisation of commuting practices?
3. What opportunities for changing commuting practices exist?

The four types of commuting practices presented in the results section serve to better understand different commuting practices and enable specific statements to be made about their stability or potential for change, thus opening up new ways of shaping or influencing commuting in a sustainable way.

First, we present the relevant literature on how commuting affects social and ecological sustainability. Next, we give a brief insight into the methods. In Section 3, we present results of the in-depth interviews and the types of commuting practices developed. Following this, we discuss how the impact on social and ecological sustainability differs between the types of commuting practices and how the coronavirus pandemic has impacted them. We conclude the article by elaborating on the prospects of reconfiguring commuting practices in relation to social sustainability and sustainable mobility.

1.2. Effects of Commuting

The daily commute has enormous social impacts on commuters' lives and has major negative effects on the environment. This section highlights in three steps the social and ecological effects of commuting as discussed in the existing literature. Firstly, it describes the actual effects commuting can have on people's lives. Secondly, it considers three factors that determine the specific nature of these effects. Thirdly, the section shows the ecological and spatial consequences of commuting at the societal level and, additionally, how the dynamics of commuting have changed because of the coronavirus pandemic.

The most obvious effects of commuting are on health, available leisure time and the social environment. Commuting can trigger psychosomatic, psychological and physical complaints and thus worsen an individual's general health [14]. For example, commuting can increase the risk of stress, headaches, exhaustion, depression, back pain, sleep problems, poorer nutrition and lower immune competence [15–17]. Another important issue is the lack of time for leisure and recreation, which in turn can have negative impacts on a person's subjective well-being and quality of life [18,19]. Studies also found that a deterioration of private relationships and a person's diminishing sense of connection to the local community are among the negative effects commuting can have on an individual's social environment [20,21].

However, there are also positive effects to be had from commuting. Economically speaking, commuting allows improvements to people's quality of life, such as easier access to the workplace, a higher income and a more desirable residential location [22]. In addition, commuting per se can be perceived as an agreeable transition between private life and working life and a way of creating time for oneself, thus making it an enjoyable part of a person's everyday life [23,24]. In addition, a certain way of commuting may bring pleasure or be beneficial for health and subjective well-being. This is often contingent on the mode of travel, for example, when commuting by bicycle or walking [25,26].

Previous research shows that not all commuters experience the same social effects to the same extent. The characteristics—whether positive or negative—are significantly influenced by three factors: (1) the duration and distance of the commute and the means of transport used; (2) gender roles and household constellations; and (3) whether the commute is a matter of personal choice or necessity and how easily it can be integrated into a person's life. We discuss these three factors in the following section.

The duration of the commute (travel time per day) and the distance (more than 50 kilometres per trip) increase the negative effects on quality of life, well-being, health and social relationships [19,27]. Furthermore, the negative social effects occur primarily when commuting by car or public transport, as these modes are usually linked to longer journeys [28–30]. On the other hand, commuting by bicycle or on foot tends to have positive effects on quality of life, well-being and health [25,26,31].

The social effects of commuting differ significantly between genders and different household constellations [32–34]. The reason for this has to do with gender roles, which still vary greatly between men and women [35,36]. It was shown that women still bear significantly more responsibility for domestic chores and childcare, which is why they tend to have less time available for work and commuting [37,38]. Consequently, female commuters, especially mothers, tend to commute shorter distances than men but still suffer more from the negative effects on quality of life, well-being and health due to the juggling of family life, work and commuting [36,39,40]. Furthermore, long commutes can have a negative impact on partnerships and parent-child relationships and also influence a person's decision as to when to start a family [41,42].

In addition, the social effects of commuting depend on whether or not it is a matter of personal choice. If long commuting is a voluntary decision, for example, allowing a person to live in the neighbourhood of their choice or maintain their social environment, the negative social effects tend to be weaker. However, if the necessity to commute is due to external factors, e.g., a change in company location or overly expensive housing close to the workplace, the likelihood of negative effects on quality of life, well-being, health and social relationships increases [43]. The ability to organise the commute also plays a significant role. Negative social effects tend to be less distinct when the mode of transport and the way the time is used during the commute lie in the hands of the commuter themselves [15,17]. Conversely, if a person cannot choose their mode of transport or perceives commuting as not enjoyable, commuting becomes more likely to cause negative social effects [29].

So far, the focus has been on the social effects for the individual. However, commuting, especially by car, also has ecological and spatial consequences at the societal level. In addition, the coronavirus pandemic is having a broad impact on the dynamics of commuting, which must also be considered.

The social consequences of commuting stem mainly from the fact that most people commute by car. In Germany, this mode of transport—which causes climate emissions and thus contributes to global warming—is attributed to 64 % of all commutes [44]. Studies on the contribution of commuting to the total emissions caused by the traffic sector in Germany produce estimations of between 21 and 25 % [12,45]. Commuting by car also causes various local emissions such as air pollutants and traffic noise, resulting in damage to the environment and health [46,47]. Further consequences involve the space consumption of car infrastructure, which impacts on land usage and leads to urban sprawl, especially in metropolitan regions [48,49].

The coronavirus pandemic has significantly changed the dynamics of commuting. Federal guidelines encouraged working from home, which meant that in many cases the daily commute to work was no longer necessary and the overall number of commutes decreased [50]. Another impact of the pandemic may be that rural areas over time have become more attractive to people who can work from home. This is likely to increase distances to the workplace in cases where commuting nonetheless becomes necessary [51]. Due to the perceived risk of catching the coronavirus, public transport has been used less often, with a growing number of people choosing to use the car instead [52]. Finally, commuting as a widespread practice in society has played a significant role in the spread of coronavirus [53].

2. Materials and Methods

The qualitative social-empirical research consisted of two consecutive series of interviews: a main qualitative survey was conducted in the summer of 2021, with 45 problem-centred interviews supported by an interview guideline (see Supplementary S1). The interviewees were commuters who live and work in the Rhine-Main region. A qualitative in-depth survey was carried out with ten of the commuters already interviewed. This survey implemented card sorting and took place in the autumn of 2021. The aim of the social-empirical research was to understand the characteristics, complexity and stability of (non-sustainable) commuting practices.

Based on the findings of the literature review (see Section 1.2), a quota plan for the recruitment of interview partners was developed. The aim was to reach commuters particularly affected by commuting, whose commutes were socially and ecologically unsustainable.

We recruited according to sociodemographic characteristics (age, gender, household size, income, educational background), modes of transport used for the commute and residential location (spread across different spatial types) but were careful to recruit more people with children, as commuting can be a particular burden for young families and especially for women (see Section 1.2). This group was also of special interest because the need to accompany children often complicates commutes and this in turn favours the use of a car. In addition, a larger number of interviews are carried out with commuters who have to travel longer distances, as it is fair to assume that such journeys cause greater burdens and negative effects. Since commuting by car is considered the most widespread and most ecologically unsustainable form of commuting, the focus was placed on car use (see Section 2). The final interview sample corresponds to the pre-established quota plan (see Supplementary S2).

We defined the topics of the interview guideline according to the theoretical categories of practice theory. Operationalisation was based on the work of Heisserer and Rau [54], which draws on Schatzki's concept of practice [55]. A broad understanding of materiality in the sense of material arrangements was adopted, along with the practice network approach. In addition, the practice elements, according to Shove et al., "meaning", "competencies" and "materialities" were included [7]. Table 1 shows the empirical implementation:

Table 1. Empirical operationalisation of the practice-theoretical approach.

Practice-Theoretical Approach	Aim/Insight	Sample Questions
Meaning	Insights into different attitudes towards commuting and the respective advantages and disadvantages of the practice. Also includes more general mobility orientations	Do you like commuting or dislike it? How do you feel about the time you spend commuting?
Competencies [1]	Knowledge, skills and strategies that play a role in and are related to a commuting practice	What do you do on the commute? How do you react to traffic jams or delays?
Material arrangements	Investigation of the close interconnectedness and high relevance of material arrangements for commuting practices: traffic situation, infrastructure, other users, accessibility, parking availability	Are there difficult or annoying moments on your way to work? How do you perceive other people on the road
Practice networks	Examine other everyday practices such as workplace and household practices (e.g., childcare) that are interwoven with commuting practices and also activities before, during and after the commuting practice	What do you do before your commute? What do you do during the commute?
Dynamics of commuting practices	Examine changes in commuting practices in the wake of the coronavirus pandemic, commuting biographies, reasons for choice of residence and stability of commuting practices	How has your commute changed during the coronavirus pandemic? How long have you been commuting?

[1] The results on competencies are not presented in the following, as they are not relevant for the focus of this paper.

Prior to the study, an in-house ethics committee reviewed the survey concept. The interview partners were informed about the use and processing of their data before the start of the interview and signed a consent form. They received an incentive.

The interviews were analysed using a coding method based on practice theory in the MAXQDA computer-assisted analysing software for qualitative data, following Mayring's qualitative content analysis [56].

3. Results

In the following, we present the results according to three elements of the commuting practices: meanings, material arrangements and practice network. In the next step, we describe four distinct types of commuting practice. Last, we show the impact of the coronavirus pandemic on those types.

3.1. Meanings of Commuting

Contrary to the widespread assumption that commuting is purely a burden, we were able to identify a wide variety of meanings and evaluations of commuting: Although there are respondents in our sample who find it stressful, a majority see both advantages and disadvantages. Others have simply come to terms with their commuting situation, while some others are generally content with their commute and draw benefits for themselves from the time they spend during their commute.

Those respondents who consider commuting a burden give various reasons for this: they often experience stress due to rigid working hours, early appointments at work, high time pressure or inflexibility in their private lives—the latter especially affects parents who have to care for their children. Delays or traffic jams and the fact that they are likely to be late for work or arrive home late cause undue stress. In addition, delays on the commute also result in respondents having to make up for lost time in the evening or on another workday.

> *"Well, it really gets on my nerves. When you're stuck in a traffic jam at ten to seven in the morning and you know that you're going to be late for work through no fault of your own, and that's how you accumulate minus hours [. . .]." (36_m_32) (The interviews were conducted in German. Verbatim quotes in this paper were translated into English by the authors.)*

Moreover, delays rule out the possibility of arriving at work relaxed and starting the workday in a stress-free frame of mind. In this context, the commuter's lack of control over an unpredictable traffic situation plays a key role. A sense of powerlessness and being at the mercy of others sets in. For some respondents, the "commute stress" even leads to health effects and concentration problems.

In addition, many respondents perceive the time spent commuting as wasted time that could be used much better, for instance, on hobbies or family. This explains why some speak of commuting as sacrificing quality of life.

> *"So for me, actually, every minute [...] spent in the car is time wasted because there are just so many better things I could spend that time on." (45_m_38)*

However, many respondents also identify personal benefits of commuting. Some refer to the commute as valuable leisure time during which they can carry out different activities. Others point out that the commute is the only time of the day that they can use for themselves.

It is not only the activities during the commute that respondents value but also the temporal and spatial transition between work and private life: they use the commute to mentally prepare for the working day or family life or to switch off on their way home. Another advantage respondents mentioned is that of integrating errands or leisure activities into the commute.

Some of the respondents are neutral or resigned about commuting. Statements such as "there's nothing you can do about it" and "commuting is part of employment" are common among this group. They often compare their own commute with that of their colleagues and relativise it. In addition, the longer the respondents have been commuting, the more likely this attitude becomes.

3.2. Material Arrangements

By material arrangements in the context of commuting practices, we mean the entire traffic infrastructure and traffic situation, on the one hand, and, on the other hand, other

road users, the parking situation, the digital infrastructure, the necessary materiality for the provision of information and things that commuters carry with them on their commute.

Since the influence of the material arrangements differ in part strongly according to the mode of transport used, this section is structured accordingly.

People commuting by car often described the traffic infrastructure and traffic situation as being negatively affected by traffic jams, road works and accidents, especially on motorways. They perceived slow traffic as less unpleasant than traffic jams because progress is noticeable despite the congestion. Other road users play a decisive role in perception of the commute. All car commuters interviewed reported that other road users were in some way annoying. Many reported a high level of aggression on the roads, which is a causal factor for stress.

Access to parking at the workplace is also an important part of material arrangements for car commuters. According to respondents, the search for a public parking space causes substantial pressure and often consumes a notable amount of time, thus adding to the time spent commuting. Where employers provide parking spaces, respondents describe this as a "luxury". Respondents who drive to the train station by car and continue their commute by train describe the availability of park-and-ride spaces as very poor. In fact, it can cause them to undertake their entire commute by car. Other material arrangements are, for example, the transport of shopping bags given that many interviewees combine their commute with running errands. This favours the use of a car on the commute.

The frequency of public transport services, the connection between place of residence and workplace to public transport and the accessibility of stops all play an important role as material arrangements of public transport commuters. In addition, the quality of stops and stations and timely travel information are of high relevance. For this, the availability of digital infrastructures such as a mobile phone, internet signal and operating display is essential.

Commuting is significantly easier when there are several means of public transport or several public transport lines available at the same time, thus offering a certain flexibility. The frequency of suburban trains running only every 30 min or every hour in more rural areas is considered sufficient by some commuters and too inflexible by others. The majority of public transport commuters can reach the next stop or station on foot within 5 to 10 min, which leads to a high level of satisfaction.

All public transport commuters reported frequent delays and train cancellations, which was a high-stress factor for them. Overcrowding and packed platforms are another source of stress and are perceived by respondents to occur mainly on underground and suburban trains. For public transport commuters, quietness on the journey is an important factor for a relaxed commute. They therefore often find other transport users disruptive. Many mentioned loud phone calls or listening to loud music as disturbance factors, along with those fellow transport users who soil seats by putting their feet up on benches. However, many commuters find the atmosphere on buses and trains to be agreeable and relaxed.

Respondents who commute by bicycle assessed the (bicycle) infrastructure in various ways. This assessment mainly refers to the cycling infrastructure in Frankfurt. On the one hand, interviewees see commuting by bike as potentially dangerous and find that it requires concentrated riding and preparedness for potential hazards. On the other hand, they appreciate the recently built cycling infrastructure in Frankfurt and sometimes even accept detours in order to be able to use it. The possibility of taking bikes on suburban trains is another much-valued material arrangement. However, respondents also reported difficulties and disputes with other road users. In this context, they also mentioned the lack of elevators at some stations. As a result, bicycles have to be heaved up steps. Furthermore, respondents mentioned the insufficient availability of bike-sharing systems at Frankfurt Central Station at peak times.

In summary, material arrangements strongly influence the perception, evaluation and stress level of commuting. Material arrangements of car commuting practices and some of public transport practices can have a (strong) negative influence on the meanings of

commuting. The material arrangements of the bicycle commuting practice may have a positive influence.

3.3. Interconnection with the Practice Network

In looking more closely at commuting and its unsustainability, it is particularly important to examine the household and workplace practices in which commuting is embedded. This is important because daily commuting is not just an event detached from other practices but is also closely connected to them.

An important finding from our interviews is that commuting impacts those respondents who are particularly involved at home (for instance, in childcare or housework) quite differently than it affects people who are able to organise their everyday lives more independently. Although in some cases, partners share responsibilities for housework and childcare, the majority of this responsibility lies with women. The situation is similar with the transport of children. Although some respondents share responsibilities for bringing children to school or day care with their partners in the morning, in the afternoon, it is usually the mothers who do it. As with housework, this also relates to the fact that many of the mothers interviewed work part-time while only very few men and fathers do so. The consequence is that mothers are often inflexible in the afternoon and have to get home from work as soon as possible. Delays on the commute may mean stressful situations for them. The involvement in family life and the time constraints related to childcare and pick-up times at day care and schools turn commuting by car into a necessity for many.

Interviewees who have a flexitime arrangement with their employer (flexible working day with core working hours from, say, 9 a.m. to 4 p.m.) can start their commute outside the rush hour. This allows for a less stressful commute, but not everyone can take advantage of the option. As described above, some respondents are heavily involved in family obligations and have to plan their working hours around the start and end of childcare and school, which does not allow them to start their commute before or after rush hour. However, others deliberately start their commute during rush hour to avoid arriving home late so that they can get the most out of their leisure time. In other cases, respondents cannot use the flexitime option because of implicit rules at work.

In this context, it becomes evident that commuting is highly interwoven with leisure activities, household practices and underlying frameworks at work. People integrate private activities into their commute: they go shopping, do sports, visit friends or family and/or pick up their children from day care, school or their leisure activities. This integration of other activities is only possible with very flexible and time-efficient modes of transport such as the car.

3.4. Types of Commuting Practice

The analysis of the elements of commuting practices led us to identify four types of commuting practice. These differ based on the elements of commuting practices (Table 2). The elements of "meaning of commuting", "material arrangements" and "framing practices" served as type-forming characteristics. The elements of "competencies" and "activities during commuting" are descriptive characteristics.

Table 2. Types of commuting practices with the type-forming elements of practices. Grey highlighted elements show the most important elements of each type.

Type of Commuting Practice	Framing Practices	Meaning	Material Arrangements
Juggling Everyday Life	Strong: household practices, length of working hours. Defined by: childcare, household tasks, errands.	Time pressure and stress due to heavy time framing very much influence the meaning of commuting.	Negative impact: traffic jams, construction sites, other road users lead to delays and increased time pressure.
Being at the Limit	Partial: rigid working hours, family commitments; but these do not have a negative or limiting effect.	The traffic situation on the commute causes severe stress and is responsible for the negative impact of commuting.	Catastrophic impact (in terms of the state of the infrastructure, other road users, lack of alternatives for the mode of transport used).
Reaping the Benefits	Weak: household and work practices less of an issue due to reduced family embeddedness and good opportunities for flexitime.	Positive meaning of commuting through opportunities to make good use of commuting time and appreciation of separation between work and private life.	Positive impact: due to satisfactory infrastructure and/or regular commuting with others.
Accepting	Minor: practices in the household of negligible importance, as few households have children, and there is an equal division of household work.	Perception of commuting as an unavoidable part of employment, as unquestioned normality has no particularly negative or positive meaning.	Indifferent impact: functionalist attitude towards material arrangements has little consequence on other elements.

3.4.1. Juggling Everyday Life

The commuting practice "Juggling Everyday Life" is shaped by the framing practices in the household and is closely linked to chaperoning children, the routes associated with this and time restrictions. Practitioners are primarily child carers and are thus heavily involved in managing daily family life before and after the commute. Even if the employer offers flexitime, this flexibility cannot be used because there are fixed arrival times at home, e.g., to take care of the children or to pick them up from kindergarten. These commute trip chains encourage the use of the car on the commute.

The balance of work life and childcare leads to enormous time pressure and stress, as a strict schedule must be adhered to both in private life and at work. For this type, commuting means wasted time and diminished quality of life. They would rather spend the time with their families. At the same time, they are unable to spend the commuting time meaningfully because they have to concentrate on the road. They usually only listen to the radio while driving.

Material arrangements further increase the time pressure due to traffic jams that make the commute even longer. Practitioners often leave for work even earlier to avoid arriving late. It is not possible to leave for home earlier due to working hours.

> "The only annoying thing is when you're a part-time mum and you're always watching the clock." (19_w_46-55)

Other sources of stress described are aggressive behaviour on the roads and the lack of parking spaces at the workplace, leading to increased anxiety and delays. Overall, however, it is not the material arrangements that cause stress but the strong time framing of the household practices and the possible consequences of the traffic situation for the rest of the daily routine.

> "Then I have to call the day care and say, sorry, I'm running late. However [...] I have to pick up the child by 5 p.m. That means I'm under a bit of pressure. If I don't make it, then I have to organise for my husband to pick up the child." (17_w_46-55)

Almost everyone of this type is a woman. They either live in a relationship or are single parents with children under 14. Most work part-time and tend to have high educational qualifications. They mainly commute an average distance of up to 40 km and by car.

3.4.2. Being at the Limit

Material arrangements are the defining element in the case of the "Being at the Limit" type: these commuters perceive the traffic situation as particularly catastrophic. Daily traffic jams and aggressive, inconsiderate road users are what characterise the commute. This type perceives commuting as pure stress.

"And there are days, though, when you just can't do anything. You just want to yell out of the car and honk at everyone." (26_m_47)

Traffic jams mean that, despite leaving for work early, practitioners arrive (too) late and start the workday in a rush. Some even mention stress-related effects on their health or physical well-being.

The daily traffic updates are an essential part of this practice, sometimes already at the breakfast table. Here it becomes clear that the organisation of the commute plays a significant role before it even begins. Practitioners attempt to avoid congestion on the motorways, but this does not always equate to arriving at work any earlier. The mere fact that the car is rolling and drivers have a sense of control over their commute helps.

Traffic demands a great deal of concentration from drivers, and thus they are unable to engage in other activities such as talking on the phone or singing while driving. This leads to a perception of commuting as something both stressful and boring. It becomes clear that boredom is another negative factor of the commute.

With this type, household practices play less of a role. Besides occasional grocery shopping on the way home, the commute is less interwoven with other practices. For those with children, it is their partners who are usually responsible for their care.

This type consists mainly of men in full-time employment. Just over half have children, and the level of education is medium to low. They all travel at least a large part of the distance by car. Commuting distances are medium to high.

3.4.3. Reaping the Benefits

Commuting has a positive meaning in this type. The reason is that commuting time is enjoyed as time to oneself, e.g., to wind down, prepare for family life, take care of everyday organisation or simply enjoy "commuting leisure time" by reading, sleeping or making phone calls.

Framing practices in the household also play a key role in this type to an extent: due to obligations such as childcare, commuting time is perceived as a chance to switch off and relax or as a transition between work and (demanding) private life. Commuting time is also used to engage in activities for which there would otherwise be no time or for which leisure time would have to be "sacrificed," for instance, talking to friends on the phone, e-mailing or online shopping.

"Personally, I find the train ride itself quite good because it's a short moment for me. No one wants anything from me, I'm on my own, I can do a few things via smartphone, online banking or something. So I always make good use of the time. Sometimes, of course, I also read [...]. That is my time that I simply have to myself." (13_w_31-45)

However, commuting can also take on positive connotations in the absence of framing practices in the household, for instance, when there are no children to care for. Here, especially, the free time after returning home can be enjoyed without further obligations, which has a positive influence on the meaning of commuting. Commuting is also valued as a spatial and temporal transition between work and private life.

Material arrangements also have a positive or at least neutral influence in this type. Firstly, the fact that they have flexible working hours and/or fewer family commitments means that delays and traffic jams are often without consequences for the rest of their everyday life. Secondly, workplace accessibility and transport infrastructure are satisfactory. Another positive aspect is that, thanks to good public transport services, this type can choose alternative routes in the event of delays.

This type includes diverse household types, but there is a predominance of younger couples in full-time jobs, without children. Distances travelled and educational qualifications are average in relation to the sample. All modes of transport (car, public transport, bicycle and inter-modals) are represented, although car commuters are very much under-represented.

3.4.4. Accepting

In this type, commuting represents a necessary evil they must accept. The meaning is obviously not positive here, but neither is it especially negative in the sense of a burden. The subject of commuting engenders a certain sense of powerlessness due to its perceived lack of alternatives but also some degree of self-identification as a commuter:

"All you can really do is accept it or you can only hope that you get through it okay today." (14_m_31-45)

A long commuting biography can play a role in this meaning: for some who have been commuting for many years, commuting has become an integral and self-evident part of everyday life for which there is no alternative and which remains unquestioned but also represents a part of their own identity:

"Well, I come from a classic commuter family [...]." (27_m_35)

The commuting practice "Accepting" is often set in relation to the commuting practices of colleagues and friends: longer distances and more time-consuming commutes as experienced by others play an important role in reinforcing the normality of exhausting commutes and can lead to a relativisation of one's own situation. In addition, it is rare for activities to take place on the commute, but if they do (listening to music, reading the news, etc.), it is primarily to make commuting time less boring rather than use the time more efficiently. The material arrangements, i.e., the traffic situation or the infrastructure, are also taken as given and are considered neither satisfactory nor particularly negative.

The "Accepting" type can be divided into two subgroups: those who barely question commuting and whether or not it is problematic and those who attempt to make the unavoidable commute more bearable through various commuting strategies, for instance, by leaving earlier to avoid rush hour. Commuting then becomes more acceptable but not to the extent of being perceived positively.

Practitioners of this type tend to be average in terms of age and household status. They consist mostly of car commuters, but some also use public transport, and there are a few multimodal combiners (switching between car and public transport depending on the traffic situation).

3.5. Changes in Commuting Practices Due to the Coronavirus Pandemic

As elaborated above, we presupposed a close interconnection between commuting and the organisation of everyday life and work. Conducting interviews during the COVID-19 pandemic made it possible to gain insights into the changing organisation of everyday life due to measures to contain the pandemic. Since spring 2020, a number of measures have been implemented that influenced commuting. These include the recommendation (and later the obligation) to work from home wherever possible. Especially in the first half of 2020, many interviewees had to work entirely from home. Over the course of the pandemic, the majority of respondents were able to go back to the workplace and office one to three times a week, spending the remaining days working from home. This provided them with the chance to experience what it is like to commute less or not at all. Furthermore, commuting was altered by the recommendation to avoid public transport and carpooling. Despite similarities in all types of commuting practices, such as the positive assessment of commuting by car due to less crowded roads and therefore a shorter commute time, the interviews revealed how respondents of each type reacted differently to the changes in their everyday lives.

Practitioners of the "Juggling Everyday Life" type rated working from home at least for a few days a week very positively. It allowed them to save time and money, they were under

less time pressure, and it was easier to organise appointments. In some cases, changes in commuting times also resulted from changes to childcare schedules. The framing practices are highly relevant for practitioners in this type, and they found that working from home simplified organisation of their household and that they gained more family leisure time. However, there were also disadvantages: for many, social contacts with work colleagues were missing; for others, working from home was difficult because they had to take care of their children at the same time.

Practitioners of the "Being at the Limit" type mostly perceive working from home as relaxing, as more time is available to spend with their families, be outdoors, sleep longer, do sports or support their partners with household tasks. While working from home, however, some also felt lonely and missed social interactions at work.

For the "Reaping the Benefits" type, commuting is characterised by its positive meaning due to activities that respondents conduct on their commute. Nonetheless, respondents also rate working from home positively for the most part. The absence of commuting gave them "more time to live" and more productivity; it was no longer necessary to check the traffic situation; fuel costs could be saved; and leisure activities could be started right after work. Due to concerns about the risk of infection, respondents who had been using public transport commuted more by bike, e-scooter or on foot. However, none of them switched to the car. When it came to everyday life in their households, the changes caused by the pandemic had fewer positive effects than for the previous types. Respondents reported that errands previously carried out during stops on the commute necessitated additional journeys or special arrangements when it was not possible to work from home at the same time as their partner. They found that the organisation of everyday life, especially around children, became significantly more time-consuming. Working from home, some people missed the structure of everyday life and the social contacts of work but also private contacts organised around work. In addition, some respondents missed their "commuting partners", friends they met solely on the commute. Some interviewees also reported that working from home meant a significantly higher workload and at the same time required more self-motivation.

Practitioners of the "Accepting" type show a strong need for routines. Against the backdrop of the coronavirus pandemic, it becomes evident that respondents have experienced another consequence in addition to working from home: some have switched from public transport to commuting by car out of fear of an infection. In some cases, a new car was purchased for this purpose. The result of the mode shift was that they could no longer use the commute for activities such as writing e-mails or reading. However, they perceived their commute as more relaxing and flexible. In terms of organising everyday life at home, the perception of changes due to the pandemic was somewhat negative. Interviewees considered the period of home schooling as stressful for everyone involved, and they missed a clear separation between private life and working life.

In summary, it can be said that practitioners of the four types deal with the situation of working from home differently. Although for many, it is a relief as commuting trips are cut, there are also disadvantages in terms of having fewer social contacts or the fact that care work is more time-consuming. Especially for practitioners of the type "Juggling Everyday Life" and "Reaping the Benefits", more stress arose due to additional care work for their children.

4. Discussion

In this section, we discuss the characteristics of non-sustainable commuting, the stability of commuting practices and opportunities for change against the background of the social and ecological impact. We begin with the findings of our research questions and then look at the impacts and possible dynamics of commuting practices to lower or avoid unsustainability.

As illustrated by our description of the different commuting types, we were able to identify a number of commuting practices that vary according to different manifestations of the elements of commuting practices. Our results show not only how differently commuting practices can be performed but also how closely and how deeply the commuting practices

are connected to other everyday practices, how they influence each other and what impact this interconnectedness has on commuters' evaluation of commuting and their own well-being. Thus, in order to understand commuting or commuters, it is not enough to look solely at the trip from home to work and back. It is also important to examine the network of practices in which commuting is embedded, a decisive break with traditional views of transport and transport behaviour [54].

Looking at the non-sustainability of commuting practices, our results show that the types "Juggling Everyday Life" and "Being at the Limit" entail the greatest ecological impacts, as commuting by car—the least sustainable transport mode—is most common. At the same time, however, the greatest negative effects on social sustainability are also evident in these types: negative health impacts and stress levels associated with commuting are greatest here. The high health burden of car commuting has been highlighted in previous research [14]. It is evident in our study too: negative social effects also stem from a lack of time or inflexibility in private life. One consequence of commuting—especially in the "Juggling Everyday Life" type—is that people have less time for friends, leisure time or themselves. This aspect has a strong gender dimension: women with children are particularly affected. Our study showed, in line with other studies [18,19], that women still take on a larger share of household tasks and childcare. The "Being at the Limit" type includes men who have children but are not particularly involved in childcare. Here, the man's commute could have an impact on the woman's role and responsibility in the household [39].

The negative social consequences of commuting are thus expressed in terms of health burdens, lack of time sovereignty and gender inequality.

Deeper insights into the changes to commuting during the coronavirus pandemic—especially experiences with working from home and less commuting—also gave insights into the non-sustainability of commuting. In addition to the positive ecological effects of reduced commuting trips, positive social effects also became apparent. Some respondents only realised the burden of commuting during the lockdown together with how much time and mental investment (and money) they had to put into it on a daily basis. However, it became clear that the habit of transition between private and working life during the trip, considered so important, was no longer possible when working from home, creating its own problems. Furthermore, the important exchange and contacts with colleagues or friends that commuters met on their journeys were no longer possible. Here it becomes clear that reduced commuting mobility can lead to less social participation and, when considering social sustainability, working from home does not only have benefits.

It is particularly striking that for many commuters—irrespective of the mode of transport—rigid or non-existent flexitime conditions at work or fixed morning appointments mean they cannot commute flexibly and have to travel during the stressful rush hour. This emphasises the importance of framing conditions and related practices, often overlooked when researching possibilities to transform commuting. Furthermore, a tight daily schedule also makes commuting inflexible, for example, if commuters have to take their children to day care. This, on the one hand, favours commuting by car, as public transport is considered too inflexible for this purpose. On the other hand, it has become evident that the rigid operating hours of day care centres and schools are an obstacle for parents to more flexible commuting.

The reasons behind the stability of commuting by car as the least sustainable mode of commuting are manifold, but the one most commonly expressed has to do with errands run and purchases made on the way home from work. Most consider this only doable with a car, not with public transport. Another factor is picking up and dropping off children and other family members on the commute. Substantial time pressure is another aspect related to commuting by car. People from households with children, in particular, often experience constant time pressure during the commute, as they want to spend as much as possible of the remaining day with their children or use the time when the kids are in care as efficiently as possible.

Comfort is also among the reasons for the stability of car commuting. Interviewees find it safe, comfortable and relaxing, and they value aspects such as the ability to make phone calls. An added feeling of safety set in especially during the coronavirus pandemic.

In addition, material arrangements such as easily accessible and, in some cases, free parking spaces, business cars or high reimbursements from the commuter tax allowance (German: Pendlerpauschale) play an important role in the stability of car use.

Finally, some of the respondents' rigid private life routines and preferences (such as getting up and leaving the house at the same time every morning, even if it means commuting during rush hour) also contribute to the stability of car commuting.

The advantages and disadvantages of working from home show that it would be helpful and desirable, even after the pandemic, if the option of working from home or from co-working spaces situated in the places of residence were to be continued in order to strengthen the time sovereignty of commuters and reduce commuter-related stress. To mitigate the negative consequences of working from home, such as loneliness and lack of participation, a hybrid model (working at home two to three days a week and working in the office on the remaining days) would be useful, preferably spreading the attendance days over the week. This would mean fewer commuting trips and less travel time for the individual. Especially for parents, the hybrid model seems to be a suitable solution. While at first glance it may seem that working from home brings the greatest amount of relief for this group, our results indicate that working from home is challenging for parents in particular, as caring for children takes up additional time and makes it difficult to work at the same time. Across all types, another disadvantage of working from home is the lack of social contacts. Working at co-working spaces allows social contacts, clearer transition time and time flexibility and reduces, at the same time, trip length of the commute which triggers commuting by more sustainable means of transport. Overall, giving employees more freedom in choosing from where they work shows a potential for reducing the negative ecological and social effects of commuting and thereby is a good entry point for policy on the national and European level (e.g., right to work from home). Nevertheless, rebound effects, such as counter urban migration and potentially increasing commuting distances, need to be taken into account [57].

Another important way to increase time sovereignty is to make childcare and work schedules more flexible so that commuters do not necessarily have to commute at rush hour, thus alleviating time pressure. This would require financing models for childcare that, on the one hand, make it possible to expand childcare hours by increasing the number of staff. On the other hand, they would also make the profession of day care worker more attractive by creating higher earning opportunities. In Sweden, where a much higher proportion of GDP is spent on childcare than in Germany, there is a legal entitlement to all-day care for children between the ages of one and twelve, if the parents are employed or studying. For example, day care centers are open for $11\frac{1}{2}$ hours. Although the cost to parents varies from municipality to municipality, it is capped nationwide [58]. Enabling safe routes for children to make their own way to day care and school would be another possibility.

Rethinking the widespread 40 h work week scheme is also worth mentioning. Especially for office workers, concepts such as monthly or annual working time schemes, in which people are free to decide when and how much they work, would be an approach forward to more time sovereignty.

As for the meanings of commuting, it is clear that the positive evaluation of commuting is primarily associated with the possibility of organising time in a meaningful or effective way. This is especially the case for public transport commuters. Emphasising the use of time on public transport can be a starting point for encouraging uptake of this option as an attractive alternative to commuting by car.

One development that could also relieve commuters in the future would be commuting with an autonomous vehicle. This could make commuting less stressful, as commuters would not have to concentrate on traffic, would not have to look for a parking space and could make better use of their commute time [59]. That commuting with an autonomous

driving vehicle will be possible in the future was described as a hope by some of our respondents. From an ecological point of view, however, the development should be viewed critically in that commuting by motorized individual transport and further suburbanization and urban sprawl could increase [8,60,61]. Although we found in our survey that the respondents are less likely to move to another place due to close social ties at their place of living, *future* developments in the labour market and mobility could lead to employees moving further away from their place of work. For example, working from home and developments in autonomous driving may lead to proximity to the place of work no longer being important. A survey of 1500 employees in Germany came to the conclusion that 21% of respondents would move if they could work mainly from home in the future. One very important motive for moving is to be able to live in the countryside [62]. This could lead to people increasingly moving to more rural regions in the future, a development that might actually lead to increasing overall commute distances but also a revitalization of rural regions if it is connected to co-working, for example [57,63].

These first pathways show the need for experimental co-production for new solutions to explore not only how the material arrangement can be improved but also how the meaning of commuting can be shifted and the framing practises newly arranged. Thus, through our expanded understanding of commuting as transition between work life and private life, it became clear that commuting is not just a trip purpose but a complex and interconnected practice of everyday life which requires innovative approaches in order to be reconfigured.

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