

Will short-term behavior changes during the COVID-19 crisis evolve into low-carbon practices?

During the Covid-19 pandemic, many people have changed established routines in everyday life, often involuntarily. Some of these changes implied a lowering of carbon emissions. Will this behavior change lead to sustainable habits that extend beyond the pandemic? Recapitulating conditions of behavior change, we suggest policy measures that could support a lasting adoption of low-carbon habits.

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GAIA 31/3 (2022): 158–166

Abstract

In the course of the COVID-19 crisis, there were a number of behavioral adaptations to the extraordinary conditions that temporarily reduced individual carbon footprints. The question is whether these short-term changes will evolve into sustainable behavioral habits and how to support these changes through policy measures. During the three waves of the pandemic, there has been an increase in surveys as well as in social science studies and research in Germany and other countries on the topic of behavioral changes due to the pandemic. The paper recapitulates what is known about behavior change from psychology and sociology, and synoptically summarizes the preliminary findings from the empirical studies conducted so far. The emphasis will be on the behavioral changes, with a focus on mobility and work routines, as witnessed in Germany. However, the insights from Germany may also shed a light on similar processes in other countries.

Keywords

behavior change, climate protection, Covid-19 pandemic, interactivity in decision-making, mobility behavior, policy measures, sustainable practices

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<https://doi.org/10.14512/gaia.31.3.6>

Received July 6, 2021; revised version accepted August 2, 2022 (double-blind peer review).

Due to the Covid-19 pandemic and the recent experience of heat waves and flood events, awareness of societal vulnerability has risen in Germany. Yet the percentage of people who want to change personal behavior because of the climate crisis has neither increased nor decreased during the pandemic. While some polls suggest that the urgency of climate protection as a political task is seen more strongly than before the crisis (e.g., Greenpeace 2020), others have not confirmed this connection (e.g., the Mannheimer Corona-Studie 2020,¹ Blom et al. 2021). There are even indications that climate protection is to take second place when it comes to reviving economic activity.

That being said, a number of behavioral adaptations to the extraordinary conditions of the COVID-19 pandemic have temporarily reduced individual carbon footprints. We ask whether these short-term changes will evolve into sustainable behavioral routines and social practices and how these changes can be supported by policy measures. Given that the pandemic is still affecting Germany and most other countries, there are three potential scenarios of how the situation will evolve over the next months: 1. the pandemic will slowly fade away and the situation will be similar to the time before the crisis (return to normal); 2. other and new variants of COVID will emerge over time and the pandemic will continue to harm people, albeit at a less pervasive rate so that most individuals will get more and more accustomed to the risk of infections, and life would more or less return to pre-COVID-19 conditions (recalibration of normality); or 3. the situation will get worse or will not improve so that restrictions and regulations will continue to shape social life for an indefinite future (new normal).

The present analysis assumes that scenarios 1 and 2 are most likely to occur. This implies that behavioral changes that were (involuntarily) accepted during the crisis are up for review and people may choose to return to their old behavioral routines or alternatively rather stick with them. We will first recapitulate what is known about the conditions of behavior change and behavior maintenance from psychology and sociology, and then synoptically interpret findings from the survey studies conducted so far, with a focus on mobility and work routines (working

¹ www.uni-mannheim.de/gip/corona-studie

remotely) in Germany. In the discussion the emphasis will be on how the available data may be interpretatively related to our conceptual approaches. We will conclude with some policy implications for the question of how conditions can be improved so that the temporary adoption of low-carbon habits gains momentum.²

Theoretical expectations about behavior change after crisis situations

In this section we will summarize the theoretical expectations of change that can be derived from psychological and sociological approaches. Although there are incompatibilities, we see the complementary use of both disciplines as fruitful for deducing possible conditions for long-term behavior changes.

(Social) psychological approaches

Individual behavioral routines possess astonishing persistence (Bargh 1996). Many of these emerge during early socialization (predominantly through observation and imitation of others) and later during episodes of social learning (trial and error, functional adaptation, role acquisition) as a form of coping with everyday problems and tasks and adjusting to social norms. Behavioral patterns practiced and often repeated in childhood and adolescence become entrenched over time and evolve into nonreflective, automated routines in a stable everyday context. Changing these routines requires either a strong volitional decision or a disruptive change in external conditions.

In the case of a *volitional decision*, behavior change is based on a new insight that so strongly influences the individual's motivation that they freely replace previous routines with new behavioral patterns. Social psychological research has shown that new insights or attitude changes are usually not sufficient to make behavioral changes permanent (Mack et al. 2019, Nachreiner et al. 2015). The perception of normative pressure and perceived behavioral control facilitates the translation of attitude change into corresponding behavior (Ajzen 1991, Bamberg 2013, Nolan et al. 2008). A recent survey study shows, for instance, that social norms of significant others are significantly correlated with the adoption of protective behaviors in the Covid-19 crisis such as wearing masks and keeping physical distance (Mack et al. 2021).

In the second case, behavior change is generated by *disruptive change in the natural or social environment*. The pandemic is a good example of disruptive context change. Context changes destabilize and interrupt automated routines, allowing alternative behaviors to emerge or past routines to reemerge if they seem to fit the new context (Harms 2003, Betsch et al. 2015).

While behavior change occurs in response to a change in the hitherto "normal" context, old routines may be reactivated once the normal context returns (Michie and Johnston 2012). For example, during the BSE crisis about 40% of the population indicated that they would avoid beef in the future, but this resolution

was followed up by less than 5% after the crisis ended (Meyer-Hullmann 1998).

During the COVID-19 pandemic, certain behavioral routines developed (e.g., video conferences) that are not only protective with respect to the virus but also ecologically more sustainable than pre-pandemic routines (e.g., business travel). Will these new routines endure?

From a psychological point of view, the end of the pandemic will constitute an important instance of contextual change, with the consequence that the routines developed during the pandemic will break up. This allows pandemic and pre-pandemic behavioral routines as well as novel behaviors to gain access to conscious reflection and decision-making processes. According to social psychological action models (Bargh 1996, Bamberg 2013, Goldstein and Cialdini 2007, Klöckner 2013), whether the ecologically sustainable new behavior or the unsustainable old behavior is preferred depends on the following factors, among others:

- **attitudes:** How are, under post-pandemic contextual conditions, consequences of pandemic routines evaluated in comparison with the consequences of pre-pandemic routines? Judgment criteria include the functionality of the behavior with respect to a desired goal (e.g., work outcomes, quality of collaboration) and, depending on the behavior, other factors (e.g., quality of network maintenance, comfort and effort, financial and nonfinancial behavioral costs).
- **personal norms:** How strongly pronounced is the personal norm of ecologically sustainable behavior?
- **perceived behavioral control:** Under post-pandemic contextual conditions, are the internal and external resources judged to be sufficient to support carrying out the behavior?
- **social norms:** To what extent are the pre-pandemic and pandemic behavioral routines supported by the norms of both the immediate and the wider social environment (e.g., colleagues and company guidelines)? Here, it is important to distinguish between *descriptive norms* – how others are perceived to behave – and *injunctive norms* – the behavioral expectations others are perceived to hold.
- **degree of habitualization:** Often-practiced behavior becomes routinized and automated and requires fewer cognitive resources than new behavior. How strongly did the new routines stabilize during the pandemic?

Sociological perspectives

Current sociological theorizing shifts the focus away from the individual as a decision-maker or routine-carrier to (infra-)structural preconditions of lasting behavior change (Henkel et al. 2021) and to complex practices as units of analysis (Pohlmann 2018):

² This article is based on a previous publication of the *Science Platform for Climate Protection (WPKS)* (Renn and Engels 2020). WPKS is an advisory forum for the German Federal Government, represented by the Federal Ministry of Education and Research (BMBF) and the Federal Ministry of Economic Affairs and Climate Action (BMWK).

The importance of (infra-)structures: Systems of production and provision not only figure as context variables to determine individual behavior, they also are decisive structural preconditions with inbuilt power asymmetries as well as preconditions for who the individuals are as actors (Newell et al. 2021). *Systems of provision drastically limit the choices that people can make, but they also create the grounds on which routinized action becomes possible in the first place* (Bayliss and Fine 2020). If, on the one hand, a person is bound to work night shifts, has to commute a long distance between home and work, and has no established public transport, this person's mobility behavior is very much determined by these conditions. On the other hand, if a person has a high-end job with a good salary and very flexible working hours as well as high technological competencies and physical abilities, there is often ample choice available between different modal options of how to get to and from work, if physical presence is required at all. Under such circumstances, there is much more space for a change of routines and a switch to more sustainable habits. Theories about socioeconomic structure and action emphasize that ecological behavior can also be understood as a form of ecological distinction (Neckel 2018); theories about subjectivation show how subject positions evolve and form around sustainability practices (Pritz 2018).

Approaches that highlight these systemic and structural conditions would therefore lead one to expect that behavior change resulting from a temporary (forced) disruption of routines is unlikely to be lasting unless systems of production and provision undergo change and provide different infrastructures, or the sociostructural setup of a given society is changing towards new forms of subjectivity and opportunities of social distinction.

Behavior as performances of practices: An entire strand of research within the social sciences is concerned with describing individual behavior as performances of complex practices (Kurz et al. 2015, Spurling et al. 2013). This approach reveals that behavior can be explained primarily in terms of the interplay of material and initial social conditions with cognitive, affective, and intentional dimensions of judgment formation. The research also shows that more of our behavior is due to routines than to conscious decision-making (Shove 2010, Shove and Walker 2014). *Practice theories* shift the attention away from individuals as decision-makers and bearers of routine behavior. They look at complex practices as the most important unit of analysis. Their focus lies on ways of doing things, for example, how an office job is done practically, and how complex bundles of practices reinforce each other. These theories show how meaning, (cognitive) competencies and material elements need to come together for a practice to be stabilized over time (D'Adderio 2008). Disruptions can break up the whole complex, or they can only touch selected elements. Depending on the depth of the disruption and how comprehensively a practice had to be changed to respond to the crisis, there might be a long-term change of practices, but not if only certain elements of a complex practice are affected (Matzat 2020).

If we want to understand mobility behavior in terms of practice theory, we must, for example, consider not just the individual decision to choose between the bike or the car to buy food, but on the interlocking complex practice bundles of eating, cooking, shopping and storing supplies at home. Competencies to prepare meals and bodily abilities to ride a heavily loaded bike go hand in hand with the material components of cooling and cooking as well as meanings of meals for guests, for family or for oneself. Likewise, work practice appears as complex bundles in which the material requirements of the tasks go hand in hand with the specialized competences of the workforce, the importance of teamwork and the meanings of independent and unsupervised work versus direct hierarchical control. Policy interventions aiming at practice changes would then aim at recrafting practices, for example, to lower their resource intensity, or at substituting complex practices instead of appeals to individuals to change their behavior, or at changing the ways how different practices interlock (Spurling et al. 2013). However, a change in one practice can have unintended consequences as it might change other interlocking practices, which can be observed as rebound effects (Sahakian and Wilhite 2014).

Theoretical expectations from (social) psychology and sociology

From a psychological perspective, behaviors that arose during the pandemic because of their protective function may be maintained after the pandemic if their consequences are also evaluated positively with respect to other areas (e. g., in relation to functionality, comfort, effort), if they are supported by social norms (descriptive or injunctive norms), and if they are easy to implement. It is also helpful if these routines were frequently performed during the pandemic and thus stabilized. This may be true both for low-carbon behaviors like videoconferencing instead of business trips, and high-carbon behaviors like using private cars instead of public transport.

From a sociological perspective, behaviors that were structurally impeded during the pandemic (e. g., traveling, commuting) might durably stay in their new mode post-pandemic only if infrastructural settings are changed. The availability of affordable long-distance train connections obviously predetermines the extent to which short-distance flights will reach their pre-pandemic levels; the availability of a comfortable workspace at home, employers' work time arrangements and state regulations will likewise predetermine the future share of home office among the workforce. Seen through the lens of practice theory, one would have to ask how complex bundles of practices have been transformed during the pandemic. The complex practice of "paid work" can be decomposed into several practices such as performing a certain job task and coordinating several job tasks with colleagues. In addition, these practices interlock with other complex practices either belonging to the sphere of work, such as recruiting a workforce, managing companies, teambuilding, or to the domestic sphere, such as household and caretaking duties, leisure activities, and private travel. The persistence of vid-

eoconferencing in a post-pandemic world would therefore also depend on changes in the recruitment practices of employers (e.g., whether they expect new employees to move near the workplace) and in new forms of caretaking at home (e.g., as a consequence of experiences with schooling at home and with senior care facilities during the pandemic).

Behavioral changes: available evidence

During the COVID-19 pandemic, a number of social science studies and research has been initiated where the results are not yet available or are preliminary at the moment. Therefore it is difficult to derive robust trends for behavior changes based on preliminary survey results and data from initial research findings. We will present illustrative empirical studies.

General trends

Nearly all survey results on behavior change agree that most people have developed a greater awareness of the vulnerabilities of modern life (overview in Politico 2020, Zwanka and Buff 2020). A large majority of those surveyed expressed a desire to focus more on what really matters in life. The extent to which this insight has a direct influence on people's behavior cannot be clearly deduced from the surveys. However, it is striking that the values of social solidarity and empathy are frequently mentioned when people are asked about perceived changes in their social environment. This was especially prevalent during the first lockdown phase; in the second and particularly the third wave, experiencing aggressiveness and rude behavior were increasingly mentioned (Gesellschaft für Politikforschung und Politikberatung 2021). In addition to these personal experiences, many people also experienced the crisis as a sign of social polarization. In an international comparison, this variable was relatively strong in Germany, although not as strong as in the United States and the United Kingdom (Politico 2020). It can be assumed that the already existing degree of polarization in Germany between protest voters disappointed by modernization, digitalization and an open society and the vast majority of citizens largely satisfied with the system also shaped the assessment of the pandemic and the measures taken to counter it (Radwan 2020). Media coverage plays an important role here as well, often reinforcing polarized positions (Kenneth-Nagel 2021, pp. 52 ff.).

Concerning behavior change in general, the obvious restrictions imposed by the measures of spatial distancing and hygiene are predominant. As surveys show individuals who live alone and young people generally perceive distancing as particularly burdensome and restrictive. However, more than two-thirds of the people surveyed say that they have generally managed despite the restrictions (Brand et al. 2021). Beyond the obvious shifts in work life (working from home), travel, and social encounters, no other drastic changes in behavioral routines have been reported. For example, there is little evidence of an overall greater shift toward more ecologically oriented lifestyles. However, in the

United States, organic food from the local area was four times more in demand than before the pandemic and the leisure activity "walking and hiking" had also doubled in the time budget of Americans (Zwanka and Buff 2020). The preference for walking and hiking can also be observed in Germany: 79% of respondents in a representative sample reported scheduling more frequent walks or going on hikes in time period where the pandemic was less threatening (Husmann 2021).

Mobility

A relatively large number of statistics, surveys and initial social science studies are available on the subject of mobility behavior change brought about by the pandemic. Although the results are scattered, there are some central findings worth mentioning.

Air travel, the most environmentally harmful transport choice, has been largely curtailed during the crisis. The drastic reductions in air travel demand can be seen in figure 1 (p. 162). During the first, strict lockdown in April 2020, the number of passengers at German airports was reduced by 99% compared to April 2019. Although people started to travel by air again during the summer months of 2020, overall demand for air travel was down by 75% in 2020 compared to the previous year (ADV 2020). In the second pandemic year, 2021, the collective measures and travel restrictions were less strict, and a majority of the population had been vaccinated by summer of 2021. Still, the annual demand in 2021 (January to November) for air travel was down by 70% compared to the pre-pandemic year of 2019. However, a "recovery" trend in air travel demand can be observed during the second half of the year 2021, indicating that a substantial share of passengers returned to pre-pandemic travel behaviors while others still choose not to travel or to avoid air travel. Part of this reduction is due to virtual business meetings replacing physical encounters. Many decision-makers now believe that a lot of business trips can be replaced by virtual meetings (Hofmann et al. 2020). Here, survey participants showed a predominantly positive view of the new virtual opportunities and are convinced that they will play a stronger role in professional life in the future (Gatterer et al. 2020, Grömling 2020, Politico 2020).

After air travel, using a private car is the second-most environmentally harmful mobility behavior. The pandemic has led to an increased subjective attractiveness of private car use and ownership: a private space with no infection risks, no obligation to wear a mask, and no need to fulfill the 3G-rule under which users of public transport services in Germany had to be vaccinated, tested, or recovered. A representative survey in May/June 2021 shows that 20% of respondents use the car more often than they did before the pandemic (BMDV 2021, p. 23). Due to the increased perceived benefits of private car use, the pandemic might lead to a reinforcement of existing trends that are opposed to a sustainable development of the transportation sector. The decision to purchase a car is the most relevant behavior choice in this regard because it brings about long-term changes in mobility behavior. Once a household buys a car, the personal mode-share of car use increases enormously (Van Acker and Witlox 2010).



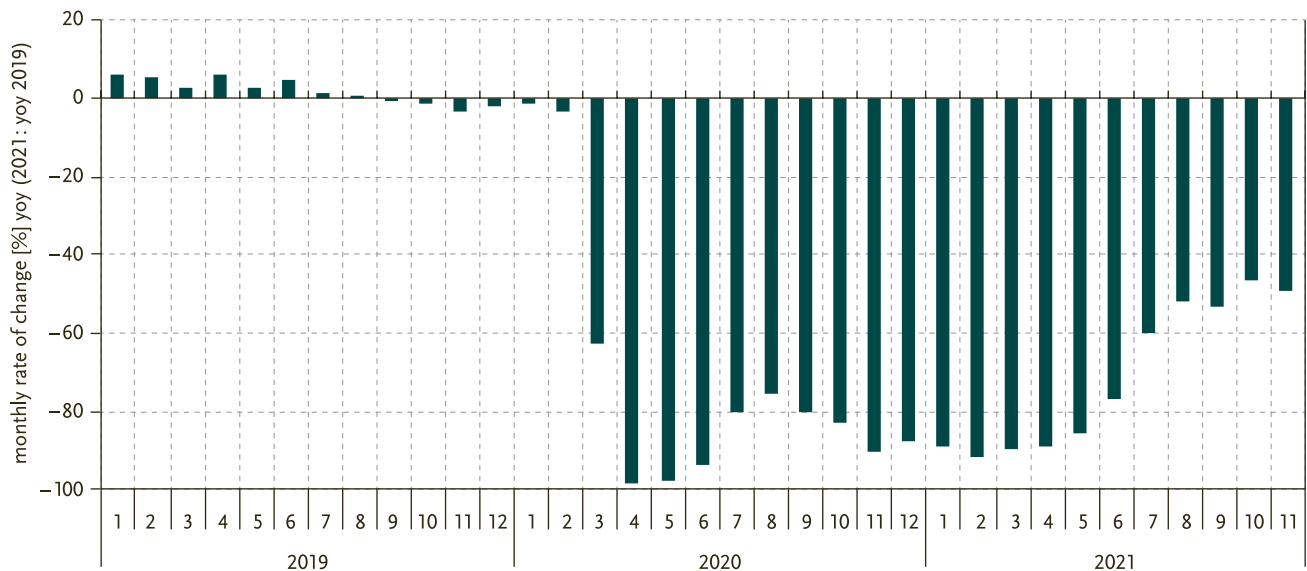


FIGURE 1: Monthly relative changes in passenger numbers at German airports (outgoing and incoming passengers), compared to the respective month in pre-pandemic times (2019). yoy: year-over-year. Data source: ADV (2021).

Looking at changes in car ownership rates in Germany in recent years (table 1), no disruptive changes in the car ownership rate per 1,000 inhabitants can be observed so far. The rate is still increasing year by year, but a minimal slow-down can be observed in 2021. The concern that the pandemic might lead to an enormous renaissance of private car use has thus not been confirmed yet. One reason might be the high saturation rate of the German car market: 77.4% of all households own at least one car.³ Another reason could be the economic downsides of the pandemic, which has caused many consumers to postpone big investments. Accordingly, the number of newly registered passenger cars in Germany declined by 19% in 2020 compared to 2019, and further by 10% in 2021 compared to 2020 (KBA 2021) (table 1). This means that companies and consumers have not made long-term choices towards a general shift to personal motorized travel.

Using public transport is among the pro-environmental mobility behaviors, but it has been reduced during the pandemic. There have been dramatic declines in public transportation use, for example, with demand in March 2021 only about 45% of comparable pre-pandemic levels in Berlin (depending on the area).⁴ Although there was also a recovery effect in 2021, it was much less pronounced than in private car use (DLR Verkehr 2020). Moreover, there was a partial shift from transit to car use: in autumn 2020, 41% of previous transit users shifted to driving, while 19% shifted to cycling (Zehl and Weber 2020, p. 21). Understanding how people can be motivated to use public transit again as a daily means of transport will be a challenge for providers, politicians and applied mobility researchers. Individual risk

perception will be a crucial factor in this regard (Barbieri et al. 2021).

Cycling and walking are sustainable and healthy and have both increased during the pandemic. In Berlin, a 20 to 23% increase in bicycle use was measured in 2020 through official bike counts (Senatsverwaltung für Umwelt, Verkehr und Klimaschutz Berlin 2021). There has been an increase in the sale of bicycles, both conventional and e-bikes. The German bicycle industry increased turnover by 61% in 2020 compared to the previous year.⁵ Transport policy has played an important role in this development: in European cities where additional bicycle paths have been created, or so-called pop-up bike lanes have been set up, cycling has increased by 42% on average compared to places where these measures did not exist (Kraus and Koch 2021). In Berlin, a 73% increase in cycling usage was measured after a pop-up bikelane had been installed on the respective street (Becker et al. 2022). Acceptance levels of the new temporary bike lanes are high among users of public transit and those who walk and cycle in Berlin (Götting and Becker 2020) and among the general public in Germany (70% positive attitude according to the representative survey by BMDV 2020, p. 48).

The changing world of work and labor

The situation in the occupational sector is primarily characterized by two new developments: the shift to working remotely and the replacement of business trips by digital meetings (see above). Additional side effects of the pandemic include short-time work, the loss of earnings, threats to economic livelihood, security and the risk of unemployment. However, these are fun-

3 See www.umweltbundesamt.de/daten/private-haushalte-konsum/mobilitaet-privater-haushalte#-hoher-motorisierungsgrad.

4 See <https://idw-online.de/de/news765742>.

5 See www.ziv-zweirad.de/marktdaten/detail/article/marktdaten-2020.

TABLE 1: Development of car ownership and purchase behavior in Germany from 2015 to 2021. Source: KBA (2021).

	PASSENGER CAR FLEET	CAR OWNERSHIP RATE			NEW REGISTRATIONS OF PASSENGER CARS	
	passenger cars	population	passenger cars/1000 inhabitants	development car ownership rate compared to previous year [%]	new registrations	development new registrations compared to previous year [%]
2015	45,071,209	82,175,684	548		3,206,042	
2016	45,803,560	82,521,653	555	+1.2	3,351,607	+4.5
2017	46,474,594	82,792,351	561	+1.13	3,441,262	+2.7
2018	47,095,784	83,019,213	567	+1.06	3,435,778	-0.2
2019	47,715,977	83,166,711	574	+1.14	3,607,258	+5.0
2020	48,248,584	83,155,031	580	+1.13	2,917,678	-19.1
2021	48,540,878	83,237,124	583	+0.52	2,622,132	-10.1

damentally associated with economic crises and not specific to the COVID-19 crisis.

The transition to working from home took place on a large scale in Germany in the first lockdown (figure 2). A survey by Fraunhofer Institute for Industrial Engineering IAO (Hofmann et al. 2020) conducted in May 2020 indicates that the share of employees working from home has increased by almost 40%. A large number of both employers and employees rate the shift as positive or largely positive. In the second wave, the share of employees working from home decreased, and the evaluations of the employees concerned were increasingly characterized by ambivalence: they predominantly appreciate the possibility and flexibility of working from home, but do not want to give up their fixed workplace at their organization. However, working remotely has become a real and also positively evaluated option alongside (and not instead of) the permanent workplace (HBS 2020). In the abovementioned survey by Hofmann et al. (2020), a total of 23 % of the respondents would like to work from home more often in the future. This is one of the important prerequisites for the perpetuation of this shift post-pandemic.

However, the *Mannheimer Corona-Studie* (Blom et al. 2021) and data from the *MOBICOR* study (Follmer and Schelewsky 2020) show a strong social differentiation in who works from home. In particular, people with a medium to high level of income and education are increasingly using this option. At the same time, people who have to look after their children during their workday (due to daycare and school closures) and were forced to work from home experienced lockdowns as extremely stressful. For them, and many others, working from home eliminates the separation between work life and private life. Some people are concerned that in the future, employers will make it compulsory for them to work from home in order to save money on expensive office rents. Between March and July 2020, the share of the population in favor of a right to work from home fell from 82 to 73 % (Blom et al. 2021). As a result, trade unions, among others, are not only in favor of the right to work remotely, but also of the right to an office workplace.

Discussion

Limitations of the methodical approach

Behavior change, whether in respect to individual behavior or to social practices, can conclusively be shown on the basis of longitudinal study designs only, not on the basis of cross-sectional or repeated cross-sectional designs. Valid results may only be obtained if proper controls are instituted, which are often lacking in the reported studies. For these two reasons, currently available empirical evidence is preliminary and suggestive at best. Nevertheless we can interpret the anecdotic evidence in relation to our conceptual framing.

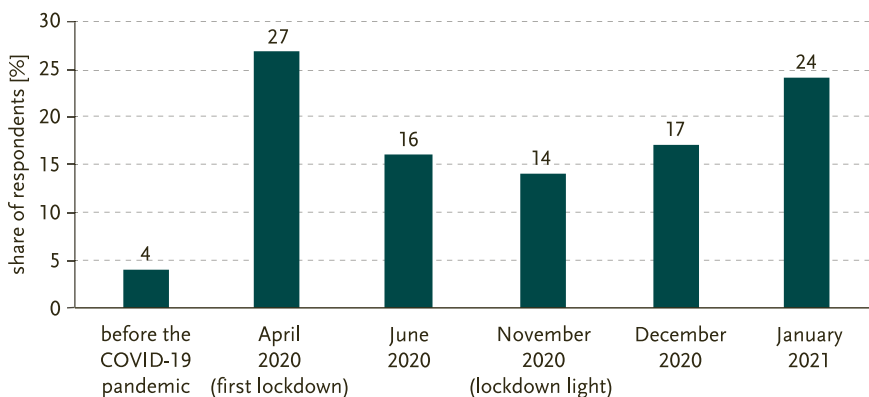
What is temporary, what will remain in place?

Under which conditions could short-term changes be expected to develop momentum and help routines to become established permanently? It has been shown in the past that after experiencing existential crises (such as natural disasters), consumer behavior has changed in favor of a more sustainable consumption pattern. However, this assumes that people felt directly affected by these crises (Etzioni 2011). In this respect, it cannot be ruled out that the experience of crises could permanently lead to a more responsible behavior.

In the studies we present, it is not clear if the observed changes were motivated by environmental awareness or sensitivity or the need for more protection against becoming infected. However, changes in behavior may be rationalized ex post as serving environmental goals in addition to protection, and this could be an incentive to continue with the new routines. This can be interpreted in a way that a behavior or routine change caused by disruptive change can be stabilized by the perception of a (climate) crisis and also by corresponding changed social norms.

Generally speaking, the more the new routines are seen as equivalent to or even better than their predecessors, the more likely it is that they will persist after the crisis. Whether routines are evaluated positively also depends on how they fit into existing institutions, large-scale infrastructures and complex bundles

FIGURE 2: Transition to working from home in Germany: share of employees working from home in Germany before and during the COVID-19 pandemic in 2020 and 2021. Data source: HBS (2020).



of practices. This is especially true of the expansion of remote working, the replacement of physical meetings with virtual equivalents, and the attractiveness of bicycling and walking, particularly in urban areas (Hofmann et al. 2020). In the case of bicycling and walking, we have seen that at least in some cities the new routines were accompanied by massive changes in the supportive infrastructure, rendering lasting change more likely.

However, we have also seen that changes such as the possibility of working remotely are strongly influenced by households' socioeconomic positions: highly qualified jobs offer more opportunities, and low-wage jobs often come along with small living spaces that are more densely occupied, which makes working from home more stressful. Any lasting changes in the way that work is organized will therefore be accompanied by social differentiation and might even lead to stronger polarization.

In addition, unsustainable routines such as private car ownership and usage have been strengthened by the COVID-19 crisis because spatial separation from the physical environment proved to be a particular asset for health protection. In this case, the unsustainable behavior is perceived to have a higher utility function.

Conclusions and policy implications

The COVID-19 crisis has created uncertainty among many people and doubts about some of the behavioral routines they practice, and structural conditions have at least temporarily prevented or impeded some types of behavior. Lockdowns and other containment measures have caused some familiar behavioral patterns to be replaced by new ones. This could be effective as a window of opportunity, especially if accompanying measures succeed in structurally safeguarding routines that are desirable in terms of sustainability. The extent to which these will form new habits and routines because of the prolonged crisis cannot be foreseen at present, in particular since the invasion of the Ukraine is overshadowing the behavioral changes induced by the COVID-19 crisis.

In terms of policy lessons, in particular for policies to induce behavioral changes for climate protection or sustainable lifestyles, policy-makers need to acknowledge that 1. most individuals will not engage in more sustainable behavioral patterns un-

less these are perceived as sensible, proportionate and effective; 2. the burdens associated with the measures should be fairly distributed; 3. the political authorities prescribing these measures need to be trustworthy and committed to the common good, and 4. changes in infrastructural settings addressing complex practices (e.g., paid work) are needed. These four conditions would help to achieve a high level of acceptance and approval. For example, the relief provided by the possibility of working from home (more comfort, more flexibility) and reduced business travel (less cost, time efficiency) could be used as an opportunity to create incentives for employers to permanently change the culture of attendance and business travel. Likewise, a more structured approach to supporting sustainable mobility is needed to secure lasting gains. Even though the years 2020 and 2021 have seen impressive drops in air travel, we have not seen a massive investment in the build-up of alternative infrastructures such as night-train connections and affordable sleeper trains. Only in this combination, or with substantial price increases for plane tickets, can we expect that the share of air travel will remain at the low levels of the pandemic year 2020.

Beyond structural incentives and compensatory measures, policies could also be put in place to encourage active ownership of change among the population, for example, through increased promotion of neighborhood concepts, supporting climate-friendly business models when they are relaunched, or even in starting new ventures in the food, hospitality, mobility, and tourism sectors. In addition, care must be taken to ensure that climate protection is not perceived as a further economic burden, but rather as an incentive for companies to revamp their practices in the direction of a sustainable, resilient economy.

Acknowledgement: We would like to thank three anonymous reviewers for their helpful comments as well as *Damian Harrison*.

Funding: This article is based on work within the framework of the *Science Platform for Climate Protection (Wissenschaftsplattform Klimaschutz, WPKS)*, which has been published as a report of the *WPKS Steering Committee*⁶.

Competing interests: The authors declare no competing interests.

Author contribution: initial research design, data collection and analysis, manuscript drafting, writing the final manuscript: O.R., A.E., B.M., S.B.; manuscript drafting, writing the final manuscript: C.C.

⁶ www.wissenschaftsplattform-klimaschutz.de/de/Verhaltensanderungen-waehrend-der-Coronakrise-1742.html

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