



# Living Lab #2

## Work near, Travel Smarter

Effects of COVID-19 pandemic on work & travel life

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Report for Mistra SAMS Sustainable Accessibility and Mobility Services research

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### About the project

Using the living lab method developed by researchers in the Mistra SAMS research program, this report aims to understand how a professional work environment closer to home, combined with new mobility services, can operate in practice. The programme is hosted and managed by KTH Royal Institute of Technology in close cooperation with VTI Swedish National Road and Transport Research Institute. Together with its partners, Mistra SAMS conducts innovative research on the transformation of mobility, primarily in an urban environment.

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### Report for

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## **List of Abbreviations**

<i>Designerly Living Labs</i>	DLLs
<i>Employer's Office</i>	EO
<i>Home Office</i>	HO
<i>Information and Communication Technology</i>	ICT
<i>Mobility as a service</i>	MaaS
<i>Neighbourhood Telecommuting centers</i>	NTCs
<i>Non Motorised Transport</i>	NMT

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## **Introduction**

### ***Background***

As cities continue to expand, urban challenges related to housing shortages, increasing living costs, and longer distances to work are making commuting a burden. Not only is commuting inconvenient for the individual it also has an adverse effect on the environment. Hence, there is a need for sustainable travel practices and solutions. With the development of ICT as well as digital technological advancements, virtual accessibility to different locations and activities is now a reality (Maeng & Nedovic-Budic, 2010). With the help of these technological advancements, new mobility services such as MaaS (Mobility as a Service) are able to bring together various transport providers that can offer public transport, public transport on demand, and rental bicycles, through a common digital platform (Jittrapirom et al., 2017; Pangbourne et al., 2018).

Studies have started to suggest that services Neighbourhood Telecommuting Centres (NTC) that can replace or shorten travel could be included in such platforms (Jittrapirom et al., 2018; Kramers et al., 2015; Maeng & Nedovic-Budic, 2010; P. L. Mokhtarian, 1998; Sjöman et al., 2020). NTCs can be described as office spaces shared by employees of two or more employers to enable remote working. A combination of NTCs and sustainable modes of transport could yield positive impacts, essentially reducing long-distance commuting as well as help in avoiding the disadvantages of working from their HO, such as lacking ergonomics and social isolation (Buffer, 2021; P. Mokhtarian, 1991; Vaddadi et al., 2020).

However, empirical studies regarding remote working state that although it may reduce commuter travel, it may also lead to additional trips and urban sprawl (Moeckel, 2017). Gaining an understanding of the possible potentials and impacts of new services is not straightforward, as it is difficult to predict how it would be used and accepted before it is fully launched and operational (Henderson & Kyng, 1991). An NTC's direct effects on commuting and uptake may be offset by unexpected changes to other travel practices, or unrelated factors and the true extent of these effects can only be understood after a long process of adaptation. Hence, as Spaargaren, (2011) concludes, products, technologies, or infrastructures for sustainability purposes must be designed with knowledge of user practices. Real-life experimentation methods such as Living Labs make it possible to explore the potentials of innovations.

### ***Approach***

The living labs within the Mistra SAMS research program were developed with a design-driven approach called Designerly Living Labs or DLLs (Sjöman & Hesselgren, 2020). DLLs act as "learning devices" and take an explorative approach, where the users are exposed to future scenarios, staged in the context of their everyday lives in the form of "design interventions". Through various data collection methods and observation and tracking, it is possible to understand how these interventions are perceived by the users, and how their everyday lives may be affected. Testing a combination of services via a digital platform in urban contexts allowed us to gain insights into how different user groups respond to these services which in turn helped us generate knowledge on the possible design of new service concepts for achieving a resource efficient travel pattern. Using this design driven methodology, the aim for Mistra SAMS Living Lab #2 was to offer an NTC living lab in a

suburb close to people's homes together with mobility services combined in the same digital platform.

### ***The NTC and its users***

The Mistra SAMS Living Lab #2 "Work Closer, Travel Smarter" NTC<sup>1</sup> was set up on January 2019 in the municipality of Botkyrka, 20 kilometres south of Stockholm. The aim with the NTC was to investigate the effects of a professional workplace environment in close proximity to the users' homes on their travel and work behaviour. Through this NTC living lab, researchers at Mistra SAMS investigated whether combining accessibility and mobility services could provide a combined work and travel arrangement tailor-made to cater to an individual's specific travel needs while promoting better quality of life.

The NTC was set up in a neighbourhood centre, in close proximity to the local library, supermarkets, and a commuter train station. This neighbourhood was chosen as it significantly had more housing than workplaces, and limited accessibility to the workplaces of most residents. The NTC offered a fully- equipped activity-based office space with 14 bookable desks through an app, 3 telephone booths, 1 conference room, 1 kitchen, 1 lounge area, 2 electric bicycles and 1 electric cargo bicycle were also provided.

As the NTC was intended to function as an accessibility service to support shorter commutes, recruitment of users focused on commuters who lived in close vicinity to the NTC. Users were recruited in two rounds. Group 1 (32 people) was recruited via local Facebook groups and Facebook ads targeting commuters in the neighbourhood, as well as by word of mouth within partner organisations of the research programme. Group 2 (35 people) was recruited through a large partner organisation associated with the research programme. This round of recruitment happened later, as participation in the DLL had to be cleared at several levels of the organisation. In total, 67 people registered as users in this DLL of which 52 ended up actively using the NTC. A survey was administered to gather information about demographics, travel habits, and various characteristics of these users' current working life. During the one year operation of the DLL, users took part in several research activities such as in-person interviews, phone call interviews, and three-week time-use diaries<sup>2</sup>.

### ***Objective***

Before the COVID-19 pandemic, the NTC offered a professional work environment closer to the users' homes. This saved them almost 2 hours a day in commute. Due to the workplace norms and regulations at the time, these users were not allowed to work more than 1- 3 days a month from their HO. Due to this, they exchanged their HO days for NTC days. For a small number of users who lived in close proximity to the NTC and whose working conditions allowed using it often, the NTC triggered more significant lifestyle changes.

After the DLL had been in place for about a year, conditions for office work changed drastically due to the onset of the COVID-19 pandemic. In line with the regulations set up by the Swedish Public Health Department, as of March 2020, recommendations were issued for people to work from home as much as possible to prevent the spread of COVID-19 (Public

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<sup>1</sup> Mistra SAMS Living Lab 2. <https://www.itrl.kth.se/research/completed-projects/mistra-sams-living-lab-2-1.917927>

<sup>2</sup> A scientific journal paper discussing these data collections and results is currently under review at Travel Behaviour and Society.

Health Department of Sweden, 2020- 03-16<sup>3</sup>). Due to these recommendations, all the users of the DLL started working from their HO.

During this period, the capacity of workspaces was reduced to 8 desks at the DLL in order to maintain safe distance between the users and limit the number users using the DLL at one time. While this initially led to lower use of the NTC, it also changed the conditions for remote working overall. The users observed changes in attitudes towards remote work and expressed the need for NTCs during this period, believing that they would use one more often post-pandemic to remedy some of the negative aspects of working from their HO. This could potentially enable a larger reduction in commuting especially in areas where more people commute by car, sustainability effects would likely be greater. However, it was unclear how many people would need or choose an NTC as an alternative to working from their HO or at the EO post the pandemic.

With the help of in-person interviews, this report explores users' attitudes towards the NTC, observes the changes in the users' work and daily life before, during, after and post <sup>4</sup> the COVID-19 pandemic and highlights the possible implications for NTC use in the future.

### Data collection

As of October 2021, we invited the users of the living lab to resume working at the NTC (In accordance to the Swedish Public Health Agency regulations). Our users stated that, since the rules regarding remote work have been revised at their companies, they felt working from their HO is a convenient alternative (quitters). However, there were about 10 users who have been regularly working at the hub since early October 2021 (regulars). We sent out a short survey regarding the changes in the users' everyday work and travel aspects during the COVID-19 Pandemic to all the 52 active users, of which we received 29 responses. The demographic profiles of the 29 users are detailed in Table 1. Along with the survey, we conducted short 20- 30 minute interviews with 9 users of which 5 were regulars and 4 quit the NTC as of October 2021 in which we dove deeper into the changes in their daily work and travel patterns, workplace rules and regulations, their new working set up and reasons for staying on at or quitting the NTC.

Table 1 Users' demographic profiles

Gender (n=29)		Users' age groups (n=29)						No. of people in the household (based on age; n=29)								
Male	Female	35-40	40-45	45-50	50-55	55-60	60-65	Below 18 years			below 65 years			Above 65 years		
								None	1-3	> 3	None	1-3	>3	None	1-3	>3
15	14	3	6	4	6	7	3	18	11	0	0	28	1	29	0	0

<sup>3</sup> The Public Health Agency of Sweden. (2020). The Public Health Agency of Sweden's regulations and general guidelines relating to everyone's responsibility to prevent COVID-19 infections. <https://www.folkhalsomyndigheten.se/the-public-health-agency-of-sweden/communicable-disease-control/covid-19/>

<sup>4</sup> **Time periods:** *Before* refers to the time the DLL was operational before the onset of COVID 19 pandemic (January 2019-January 2020). *During* refers to the period when the Swedish Public Health Department issued regulations to reduce the spread of the COVID-19 Pandemic were active. (Januray 2020- September 2021). *After* refers to the time when the regulations set by Swedish Public Health Department had been relaxed allowing people to return to work (October 2021 onwards). *Post* refers to the time when COVID 19 pandemic would completely subside (a future timeline).

## Limitations

The results in this report are based on the extensive notes and cross checking conducted by the researchers during the short interview sessions instead of transcription. The interviews recorded for this segment of data collection were not transcribed in detail. The survey and the interviews could not cover all of our 52 participants. However, the results represented the large majority of the participants who used the NTC and quit the NTC during this period. This was crosschecked with the booking platform data as well as emails we received from the users who wished to quit.

## Results

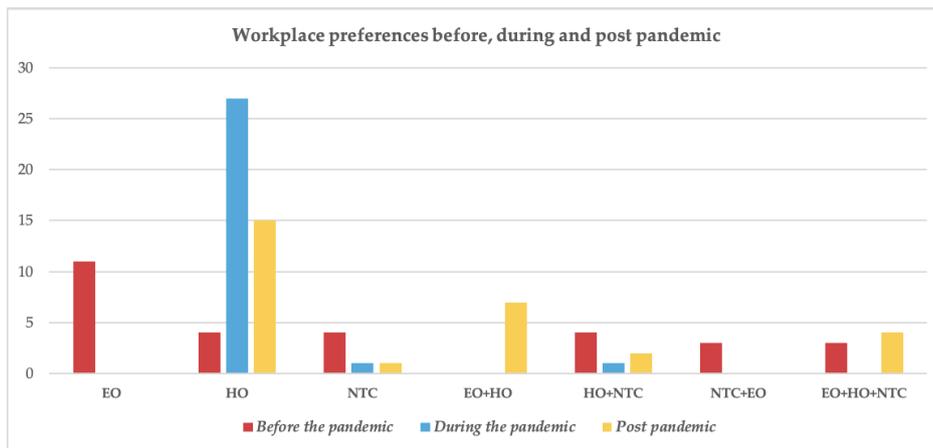


Figure 1 Workplace preferences of the users before, during and post pandemic

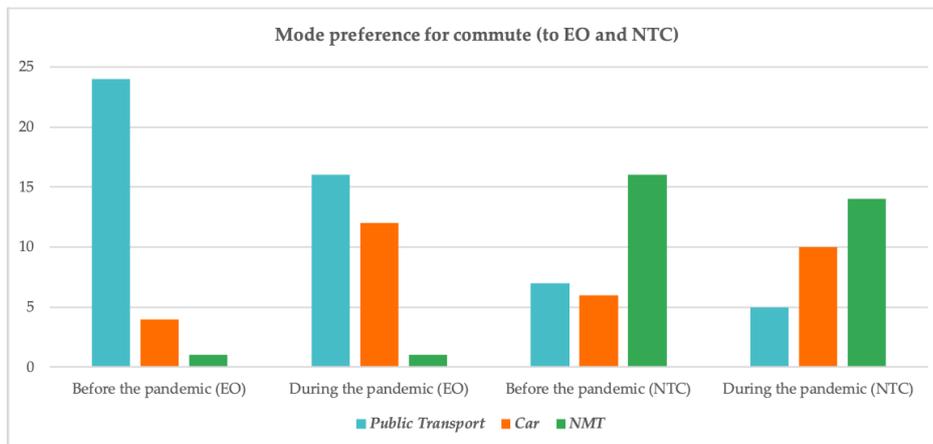


Figure 2 Mode preferences of the users for commute to EO and the NTC before and during the pandemic

From the survey, it was noted that:

- 1) The NTC and the EO were visited less than once a week as most participants were asked to work from home during the pandemic
- 2) Activities such as grocery shopping and physical activity were performed more frequently (more than once a week)
- 3) Entertainment/leisure activities such as eating out, non-grocery shopping etc. were performed rarely or less than once a month as these activities were not essential

- 4) The most preferred workplace before the pandemic was the EO, during the pandemic it was the HO and when asked regarding post pandemic workplace preferences, users stated they would like to continue working from their HO or divide their work days between EO and HO (Figure 1).
- 5) The most preferred mode of travel for commute to EO before the pandemic was the public transport and during the pandemic public transport was preferred. However, the dependency on personal cars increased as users wished to avoid the risk of being in crowded public transport (Figure 2).
- 6) The dependency on car to commute to the NTC increased during the pandemic. However, NMT was the most preferred mode to commute to the NTC before and during the pandemic (Figure 2).
- 7) For all other activities such as grocery shopping, entertainment/leisure activities, Car was the most preferred mode of travel both before and during the pandemic.

We used qualitative content analysis method to analyse the interviews, as described by Schreier (2014). We identified 5 main conditions under which the users used or did not use the NTC during and after the pandemic: *Working without distractions, Technological requirements, Co-worker collaboration & workplace norms, Changed conditions under the COVID-19 pandemic, Separating time for personal activities* (Figure 3).

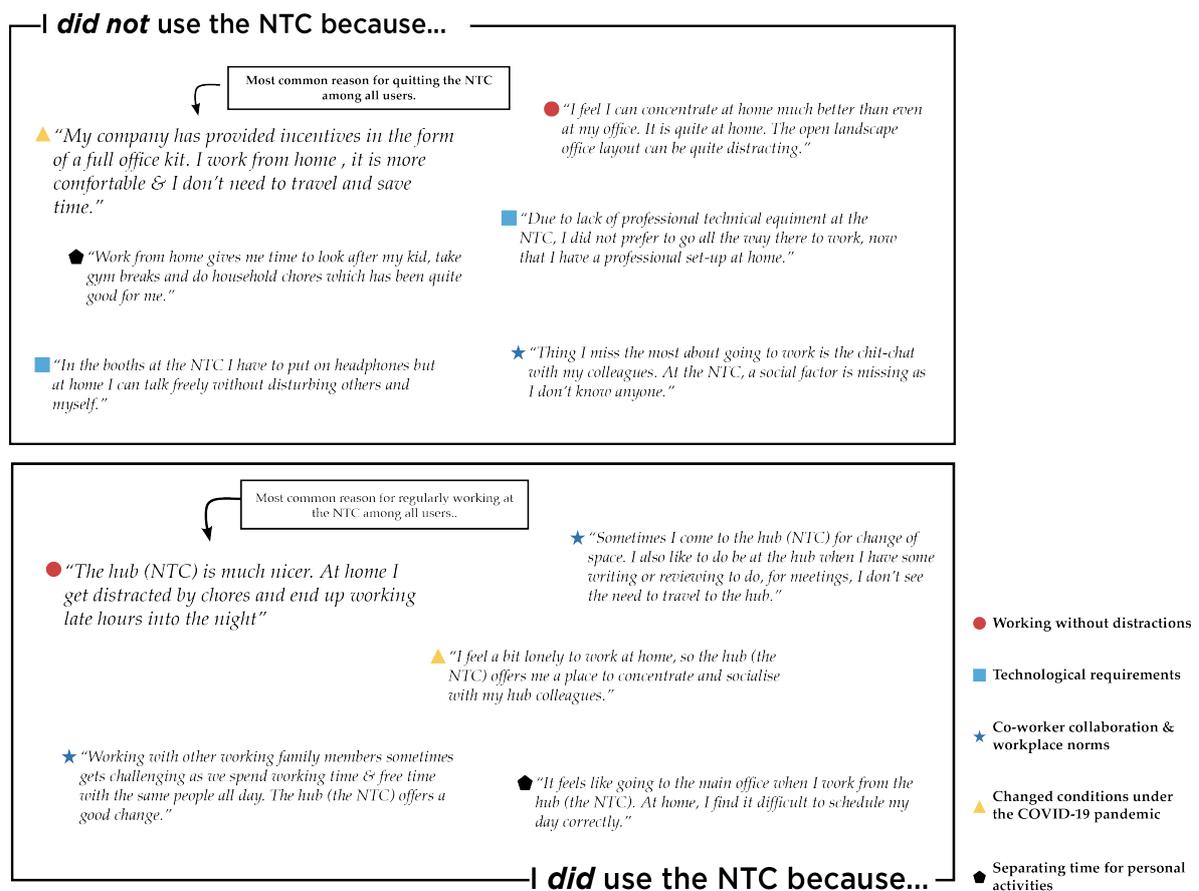


Figure 3 Statements by the users who quit the NTC (above) and who regularly worked at the NTC (below)

Due to the COVID-19 rules and regulations set up by the Swedish Health Agency, our users informed us that during 2020 and early 2021 their companies had a strict work from home policy. While some users eventually fell into the routine of working from their HO, some required a change of space to be more productive. Compared to the previous company norms stating that employees could work from home 1-3 days a month, it was understood from these new interviews that largely, the previous NTC users and their employers have realised that efficient work from the HO can be achieved.

Users informed us that, to ensure efficient and comfortable work environment at home, their companies provided them adequate professional workplace kit including a table, chair, screens and other technical equipments. This was one of the main reasons why users quit working at the NTC (Figure 3). Those who quit stated that while it was a difficult to work at home to begin with, their HO set-up provided by their company offered them an ideal work environment to be as productive as possible. Some users who quit the NTC also told us that even before COVID, the NTC did not provide them enough opportunity to socialize with other users. The online platform of working from their HO provided them to set up quick meetings, phone calls and after-works with their colleagues.

Those regular users who lived in close proximity to the NTC walked, biked or took their car to the NTC and on the contrary to those users who quit, some of the regular users stated that the hub offered a place to concentrate on work as working from their HO offered many distractions such as household chores (Figure 3). Due to this, the distinction between work and free time was difficult to make. The NTC offered them a space to work without distractions for 7-8 hours.

### **Concluding Discussion**

Before the COVID-19 pandemic, the NTC offered a professional work environment closer to the users' homes. This saved them almost 2 hours a day in commute. However, due to workplace norms and regulations, these users could not be away from the office more than 1-3 days a month. Hence, they merely exchanged working from their HO for working from the NTC. For a small number of users who lived in close proximity to the NTC and whose working conditions allowed using it often, the NTC triggered more significant lifestyle changes.

During the COVID-19 pandemic, due to the rules and regulations set up by the Swedish Health Agency, the users of the NTC observed changes in attitudes towards remote work as they were asked to work from home full-time. During the early months of the pandemic in 2020, we spoke to the NTC users over the phone regarding this sudden change in their working patterns. Many users expressed the need for NTCs during this period, believing that they would use it more often after the pandemic to remedy some of the negative aspects of working from their HO.

However, in October 2021 when the country wide COVID restrictions were relaxed, we opened up the NTC to full capacity. We found that many of our users opted out of the NTC stating the reason that they were now fully accustomed to working from their HO and do not see the NTC as a viable option. They also stated that working from their HO saved them time

as they completely avoided commute. In the last set of interviews with our users, we asked them how was the experience of working from their HO. Many told us that before the pandemic they used have long virtual meetings with their colleagues across the world. This mix of online and offline meetings often led to unclear outcomes. However, after a year in the pandemic, the users told us they now feel all their colleagues felt equal in their online meetings.

We also asked our users, how to they see their work and travel life after the all the pandemic restrictions have been removed. Most of the users told us that they are considering working half the time from their HO and the other half from their EO. Some even mentioned they do not see the point of commuting all the way to their EO, especially on the days they only have meetings. To adapt to these workplace changes, we learnt that the users' employers have decided to set up a new office plan with flexible desks and booking systems so the office doesn't reach full capacity. Reflecting on this new office set-up most of our users said: "If I can be physically around my colleagues and/ book my desks according to them, especially on meeting days, I could consider working from the office 50% of the time otherwise, I will work from home 90% of the time."

The question we now ponder upon is, what really is the future of NTCs after the pandemic subsides completely? Employers are also working towards reducing their overall capacity of their office space hence saving space and reducing rental prices and ultimately reducing the need for users to commute to their main workplace. We believe that in these new conditions, NTCs could continue to offer professional work spaces without distractions and help users save commute time. Additionally, we asked the users how much would they be willing to pay for the NTC per month if given an option and who should be responsible for paying for the NTC.

Most of our users agreed that the payment or subscription of the NTC should be the employer's responsibility and built into their contracts. Payment for NTC like services could be complicated and could involve aspects such as insurance and protection of company data. Currently, researcher at Mistra SAMS are conducting research on this particular aspect of NTCs. We believe post COVID-19, with changes in attitudes towards remote working and new office layouts, NTCs could play a role in, potentially supporting more local and sustainable lifestyles, and reducing the need for travel.

## References

- Buffer. (2021). *The 2021 State of Remote Work: Top insights and data from one of the largest remote work reports*. <https://buffer.com/2021-state-of-remote-work>
- Henderson, A., & Kyng, M. (1991). There is no place like home - continuing design in use. In J. Greenbaum, & M. Kyng (Eds.), *Design at Work: Cooperative Design of Computer Systems* (pp. 219–240). Lawrence Erlbaum Associates.
- Jittrapirom, P., Caiati, V., Feneri, A., Ebrahimigharehbaghi, S., Alonso-González, M. J., & Narayan, J. (2017). Mobility as a Service A Critical Review of Definitions , Assessments of Schemes , and Key Challenges. *Urban Planning*, 2(2), 13–25. <https://doi.org/10.17645/up.v2i2.931>
- Jittrapirom, P., Marchau, V., & Meurs, H. (2018). *Dynamic Adaptive Policymaking for Implementing Mobility As a Service ( MaaS )* (Issue August).

- <https://doi.org/10.13140/RG.2.2.11906.99524>
- Kramers, A., Hojer, M., Nyberg, M., & Soderholm, M. (2015). Work hubs - location considerations and opportunities for reduced travel. In *Proceedings of EnviroInfo and ICT for Sustainability 2015, EnviroInfo*, 126–135. <https://doi.org/10.2991/ict4s-env-15.2015.15>
- Maeng, D. M., & Nedovic-Budic, Z. (2010). Relationship between ICT and urban form in knowledge-based development: Empirical analysis of Washington, DC metro region. *International Journal of Knowledge-Based Development*, 1(1–2), 97–117. <https://doi.org/10.1504/IJKBD.2010.032588>
- Moeckel, R. (2017). Working from their HO: Modeling the Impact of Telework on Transportation and Land Use. *Transportation Research Procedia*, 26(2016), 207–214. <https://doi.org/10.1016/j.trpro.2017.07.021>
- Mokhtarian, P. (1991). Defining Telecommuting. In *escholarship.org*. <https://escholarship.org/uc/item/35c4q71r>
- Mokhtarian, P. L. (1998). *A Synthetic Approach to Estimating the Impacts of Telecommuting on Travel*. 35(2), 215–241.
- Pangbourne, K., Stead, D., Mladenovic, M., & Milakis, D. (2018). The Case of Mobility as a Service : A Critical Reflection on Challenges for Urban Transport and Mobility Governance. In *Governance of the Smart Mobility Transition*. (pp. 33–48). Emerald Publishing Limited. <https://doi.org/10.1108/978-1-78754-317-120181003>
- Schreier, M. (2014). Qualitative content analysis. In *The SAGE Handbook of Qualitative Data Analysis* (pp. 170–183). SAGE Publications Ltd. <https://doi.org/10.4135/9781446282243>
- Sjöman, M., & Hesselgren, M. (2020). Designerly Living Labs: Early-stage exploration of future sustainable concepts. *DRS2020: Synergy*, 2(September). <https://doi.org/10.21606/drs.2020.307>
- Sjöman, M., Ringenson, T., & Kramers, A. (2020). Exploring everyday mobility in a living lab based on economic interventions. *European Transport Research Review*, 12(1). <https://doi.org/10.1186/s12544-019-0392-2>
- Spaargaren, G. (2011). Theories of practices: Agency, technology, and culture. Exploring the relevance of practice theories for the governance of sustainable consumption practices in the new world-order. *Global Environmental Change*, 21(3), 813–822. <https://doi.org/10.1016/j.gloenvcha.2011.03.010>
- Vaddadi, B., Bieser, J., Pohl, J., & Kramers, A. (2020). Towards a conceptual framework of direct and indirect environmental effects of co-working. *ICT4S 2020*, 27–35. <https://doi.org/10.1145/3401335.3401619>

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