MASTER THESIS

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A Global Pandemic & Travel Behaviour

The Effects of the COVID-19 Pandemic on the Travel Behaviour in The Netherlands

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"Tell me and I forget, teach me and I may remember, involve me and I learn."

Benjamin Franklin

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Abstract

The COVID-19 pandemic has irreparably changed the way we live our lives. For the past two years, the "new normal" has been about social distancing, wearing masks, and limiting our movement. This study focuses on investigating the effects of the COVID-19 pandemic on travel behaviour in the Netherlands.

The overall research aim is to identify the changes in travel behaviour due to the COVID-19 pandemic through the timeline of the Covid-related public transport policies introduced in the Netherlands. The specific research objectives and related research questions are:
1. Identify changes in the use of public transport in the Netherlands in the different phases of the pandemic.
2. Determine the changes in travel behaviour before, during and after the pandemic.
3. Provide policy recommendations.

Multiple methods have been used to conduct this research. A systematic literature review was done on travel behaviour, travel behaviour and its relation to past pandemics/epidemics, effects of COVID-19 on travel behaviour in the Netherlands, and a review of various grey literature. Furthermore, an analysis was carried out for the ODiN 2019 (Onderweg in Nederland, CBS) to identify the trip purposes, trip frequencies and mode choices. In order to collect data, interviews with public transport operators (n=4), a focus group discussion (n=9), and a digital survey (n=170) with residents of the Netherlands were undertaken. Additionally, data acquired of the total number of check-ins on public transport between 2019 - 2021 from the company Translink was also analysed.

It was discovered that that the number of check-ins reduced significantly between January 2019 and April 2021, which also was a result of passengers having an apprehension towards travelling in public transport. The public transport providers faced a number of challenges while managing bus and train services. The frequency of services provided was reduced, which led to huge financial losses. Due to the social distancing and work from home norms, trip frequencies for all trip purposes were significantly reduced. Furthermore, it was observed that with the decrease in preference for public transport, bike usage and walking significantly increased as people wanted to maintain a healthy and active lifestyle. In some cases, even car use increased.

It can be concluded from this study that the COVID-19 pandemic has brought along many changes in every individual's life. The changes in travel behaviour that have been identified from this research provide an insight into what structural changes will be observed in future travel behaviour. As the entire situation of the pandemic is extremely dynamic, it widens the scope for future research and gives other researchers an opportunity to study this phenomenon further.

CHAPTER

Introduction

COVID-19 has irreparably made the 'normal' life come to a halt. The 'new normal' in Dutch society is maintaining a distance of 1.5 metres, working from home, avoiding using public transport, needing to wear masks for protection, and proper sanitisation. All of this has inevitably led to a difference in the way people have always been living their lives. The present study will focus on investigating changes in travel behaviour due to the COVID-19 pandemic in the Netherlands/

1.1 Societal Relevance

The first cases of COVID-19 were reported at the end of 2019 in Wuhan, China. It did not take long for the virus to start spreading to the rest of the world, and two months later, all countries were seeing some form of a lockdown or controlled movement. Unlike other pandemics, the spread of the novel coronavirus has not been easy to deal with. Because it has symptoms similar to the common flu, it is easily contagious. Like any other disease, it puts people with already compromised health in much more danger than the average person. Thus, during the last year, ensuring social distancing was of utmost priority.

Although multiple vaccines have been developed and the process of widespread vaccination has begun in the Netherlands, the number of infections is still not low enough.

The pandemic has forced people to stay in their homes with limited contact with the outside world. Research has shown that both staying at home and social distancing has caused many changes in travel patterns (van der Drift, 2021; de Haas 2020). Hence, it is affirmative that the spread of COVID-19 has affected how individuals live their lives, the way they travel, their choices for trips, and their overall travel behaviour, which this study aims to gain a deeper insight into. Due to the observed changes in people's travel behaviour, it is also understood that that has affected the use of public transport as well, which has led to this sector facing massive financial loss after having to reduce frequency of service and operate at a limited capacity ('Public transport companies reduce services as commuters stay home', 2020). Furthermore, since the start of the pandemic, the Dutch government introduced many measures in order to combat the pandemic which also influenced travel behaviour in the country (which is further discussed in the following sections). Thus, in this study, these two elements, namely – the change in travel behaviour from a people-centric view, and the change in the use of public transport from a transport-provider view, based on the policy introduction timeline are the three focal points.

1.2 Scientific Relevance

As the focus of this study is on changes in travel behaviour and public transport use, it is of paramount importance to discuss the various elements that comprise these concepts. Before elaborating on these changes in behaviour related to travel, however, it is first essential to discern the concept of travel behaviour. According to van Acker, van Wee, and Witlox (2010), in order to participate in different activities, people must travel, and the way they choose to make these trips is essentially what travel behaviour is. Additionally, Van Wee (2002) remarks that travel can be regarded as the result of spatial and infrastructure patterns. To better understand the concept of travel behaviour, the work of Ajzen (1991) titled "The Theory of Planned Behaviour" has also been discussed, which states that "cognitive self-regulation" has a vital role when it comes to human behaviour. This, in simple terms, means that an individual's behaviour is based on their thought process and how they perceive certain situations around themselves. Although Ajzen (1991) does not speak about travel behaviour specifically, the theory is still relevant in terms of travel behaviour. Cognitive self-regulation means fulfilling the desire to participate in spatially distributed activities, i.e., what behaviour is entailed to achieve participation in these activities. Meaning that, in the context of this study, this "cognitive self-regulation" refers to the change in people's behaviour after the onset of the COVID-19 pandemic.

Additionally, as Crane (1996) theorised, based on the utility maximisation principle of microeconomics, travel choices are based on the individual trips and travel modes and the relative costs of making those trips or choosing those travel modes. In this study, although the costs of making trips are not studied, the decisions behind choosing specific modes of transport, either in isolation or in preference over other modes, is researched. Lastly, as Scheiner (2018, p.43) remarks in his work, "the evolution of individual travel behaviour over time can be seen as an interplay between stability and change". It is something that is unique to every place and culture, and because of the extraordinary circumstances of the COVID-19 pandemic, it is hypothesised, based on this work, that the pandemic has caused instability in people's lives thus creating changes in their behaviour.

1.3 State of the Art

Talking specifically about the pandemic situation, it is also important to note that travel movements lead to the spread of diseases. According to Apolloni, Poletto, Ramasco, Jensen, & Colizza (2014), the spatial transmission of diseases depends on how the infected individuals interact with other people in their surroundings, and the spread of the disease happens based on their movement. As spatial transmission is an integral aspect of the COVID-19 disease, it will be interesting to see what behavioural changes have arisen, like if people are opting to ride

their bikes (or walk) for daily errands rather than using cars or public transport, trying to find alternate routes that are less congested, avoiding trips that are not essential, etc. Some of these changes would be transitory, while others may be permanent.

In order to identify the changes and what policymakers can do to incorporate these in future policies, this study will examine the effects of COVID-19 on travel behaviour and the changes that have occurred because of it, changes in the operation of public transport and passenger flow, etc. with the basis being the timeline of the development of the pandemic in the Netherlands and focus on the measures introduced at each stage.

This study is focused on the Netherlands, and thus it is vital to acknowledge which elements make up the concept of 'travel' here. In their research, Schwanen, Dieleman, and Dijst (2001, p. 185) note that in the Netherlands, "the number of trips and the distance travelled for leisure (social calls, culture, recreation, sports, walking and driving around) comprise most of the travel among adults". Additionally, according to the National Mobility Report (Kennisinstituut voor Mobiliteitsbeleid (KiM), p. 3, 2019), travel by car increased between 2010-2017 for commuting to work and leisure trips. Similarly, bike trips were mainly for commute and leisure, whereas most walking trips were for leisure. However, due to the pandemic, the possibility arises that the trips, as mentioned earlier, are no longer considered essential and the preferences for mode of transport have changed. According to an online article by Fietsersbond (2020) "In grote steden in de hele wereld blijkt de fiets nu een goed en veilig alternatief voor het OV waar besmettingsgevaar dreigt." [In large cities all over the world, bicycles are now proving to be a good and safe alternative to public transport where there is a risk of contamination]. Another source remarks that "57% of the people who were frequently travelling by public transport were considering using their bicycle instead" (Schaik, 2020). The sales of e-bikes have also grown significantly in the Netherlands (Schaik, 2020; 'On Your Bike: Why Consumers Are Increasingly Choosing E-Bikes', 2021; Toll, 2021). When it comes to public transport in the Netherlands, according to a study conducted by Nederlandse Spoorwegen (NS) and Technische Universiteit Delft (which will be further discussed in the next section), the use of trains has seen a sharp fall since the start of the COVID-19 pandemic (Nederlandse Spoorwegen [NS] & Technische Universiteit [TU] Delft, 2020). Supporting that claim, in a report from CROW which measured customer satisfaction with the public transport during 2020, they remark that "wat in een normale situatie als rustig wordt beschouwd voelt tijdens de pandemie als druk." [what is considered to be calm in a normal situation feels like pressure during the pandemic] (CROW, p.5, 2021) with regards to the low scores of customer satisfaction with public transport.

1.4 Research Problem

The research problem of this study lies in the simple question – what the consequences of the COVID-19 pandemic on the travel behaviour and public transport usage in the Netherlands are. With the entire situation of a pandemic being a shock event all over the world, its ripple effects are challenges that everyone has had to face. As the focus of this study is on changes in travel behaviour and public transport usage, studying these phenomena is important to understand how and in what way these changes have occurred and explore which of these behaviours are likely to stay in the future. Because of the dynamic nature of the pandemic, without research on elements as such, it is difficult to predict its lasting effects. Hence, the research problem of this study not only aims to understand the changes during the pandemic but also find out what behaviours are likely to stay even afterwards.

1.5 Research Objectives

The overall research objective is to

identify the changes in travel behaviour due to the COVID-19 pandemic through the timeline of the Covid-related public transport policies introduced in the Netherlands.

The main research sub-objectives are outlined as follows:

1. Identify changes in the use of public transport in the Netherlands in the different phases of the pandemic.
2. Determine the changes in travel behaviour before, during, and after the pandemic.
3. Provide policy recommendations.

On the next page, the sub-objectives per research objective have been defined.

identify the changes in travel behaviour due to the COVID-19 pandemic through the timeline of the Covid-related public transport policies introduced in the Netherlands.

1. Identify changes in the use of public transport in the Netherlands in the different phases of the pandemic.

1.1 Which public transport measures were introduced in different phases of the pandemic?
1.2 How have the different phases of the COVID-19 pandemic affected the operation of public transportation in the Netherlands?

2. Determine the changes in travel behaviour before, during and after the pandemic.

2.1. Understand people's perspective on the pandemic and its effect on their lives.
2.2 Compare the different changes in people's choice of mode before, during and after the pandemic.
2.3 Compare the differences in trip purposes and their frequencies before, during and after the pandemic.
2.4 Explore which of the new travel behaviour are likely continue even after the pandemic.

3. Provide policy recommendations on the following:

3.1 Regulating public transport in a way that sustains the service providers even if passenger numbers remain lower than they were pre-COVID,
3.2 Encouraging more use of alternative modes transport like bikes, walking, etc.

1.6 Organisation of the Thesis

The subsequent chapters have been organised in the following order. Chapter two addresses the background of travel behaviour and its related concepts. Additionally, it also discusses travel behaviour with regards to past epidemics and pandemics, different studies related to the effects of COVID-19 on travel behaviour and a review of various grey literature. Following that, the third chapter elaborates on the various research methodologies used in this study. This section elaborates on the different methods and data that have been used to answer each research question. In the fourth chapter, the results for each method have been presented. Following that, the fifth chapter discusses the results with regard to each research question. In addition, the ethical considerations and the limitations of this research have been discussed. In the sixth and final chapter, the final conclusions and further research recommendations have been presented.


CHAPTER
2

Literature Review

The basis of this literature review is formed by research on travel behaviour, the effects of other pandemics and epidemics, their transmission, and a general overview of the spatial transmission of diseases.

2.1 Travel Behaviour

Before understanding how the spread of diseases affects travel behaviour, it is essential to understand the concept of travel behaviour itself. According to Van Wee et al. (2013), travel behaviour depends on the individuals who are undertaking the act of travelling in order to participate in activities and the different options they have to fulfil these needs. The influence on behaviour is a result of needs (N), opportunities (O) and abilities (A). This concept can be better explained by the NOA model (Viek et al., 1997), which distinguishes these factors which influence travel behaviour.

As it can be observed in Figure 1, the needs, opportunities, and abilities are all governed by implicit and explicit forces (for example, in the context of this study, the needs and opportunities can be shopping for essential items during low rush hours, and the abilities being their capacities of using certain modes of transport). Motivation can simply be explained as the attractiveness of the travel behaviour, which is also related to the feasibility of performing certain actions. All of these factors lead to certain behavioural choices.

In terms of travel behaviour, this model explains that the motivation for needs (N) and the use of different travel methods to fulfil these needs are the opportunities (O), and the individual's abilities (A) are time, money, capacity, etc. (van Wee et al., 2013, p. 25). In another work by Van Acker, Van Wee, and Witlox (2010, p. 221), the concept of travel behaviour is

Figure 1: Factors Influencing Travel Behaviour: NOA Model (van Wee et al. 2013, p. 24)

described as a "hierarchal decision structure" which can be both short term and long term. Figure 2 shows this hierarchical structure. This structure defines the influences over three planes – individual, social environment, and spatial environment. What this means is that there are opportunities in constraints in all of these planes in terms of performing in a behaviour. Furthermore, these influences can be both reasonable and unreasonable. In the context of this study, the simplest example could be that for a travel behaviour like undertaking sports activities during the pandemic, it is influenced by the individual's desire to perform that activity, the government measures which restrict movement and enforce closure of sport centres (social environment), and the proximity to the sport centre (spatial environment). Due to prolonged periods of inactivity during the pandemic, an individual might feel restless and take up another activity which ensures a healthy lifestyle but in turn changes their current behaviour from the pre-pandemic behaviour.

In the context of this study, it is imperative to understand what influences the decision-making when it comes to choosing which trips are essential and how they are made. Thus, a hierarchal structure helps determine how the pandemic's events influence the needs, opportunities, and constraints of individuals.

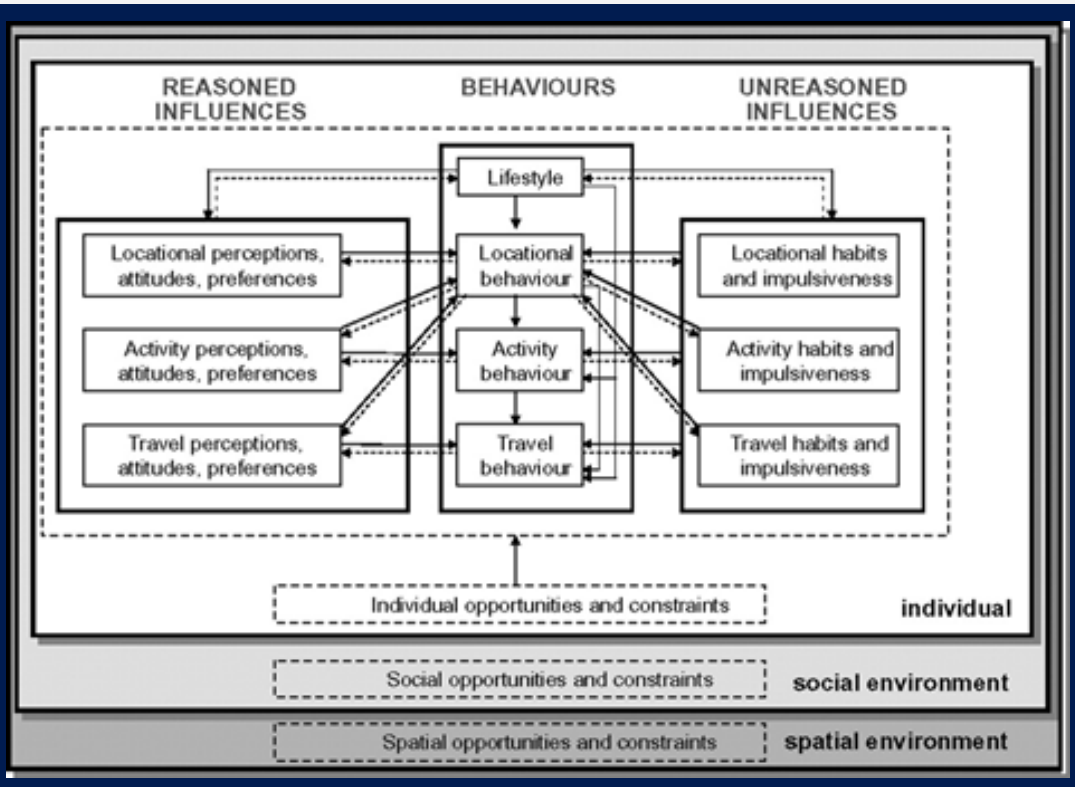

Figure 2: Hierarchical Decision Structure of Travel Behaviour (Van Acker, Van Wee, & Witlox, 2010, p. 221)

To further understand travel behaviour, Ajzen (1991) developed the Theory of Planned Behaviour, which is designed to predict and explain human behaviour under specific scenarios. According to the author, "intentions are assumed to capture the motivational factors that influence a behaviour; they are indications of how har1d people are willing to try, of how much of an effort they are planning to exert, in order to perform the behaviour" (Ajzen, 1991, p. 181), meaning that the stronger the intentions, the higher the plausibility of the occurrence of the said behaviour. In the context of this study, this remark by the author is related to the frequency of trips – i.e., "how much of an effort they are planning to exert" is translated to the question of would people still go out despite the risk of contracting the coronavirus.

Additionally, it also brings up the question of whether there would be a change in the frequencies of trips. As it can be seen in figure 3, the theory of planned behaviour has been explained in the context of this study. A digital survey is one of the main methodologies of this study among others (which will be further discussed in Chapter 3), and the thought process as portrayed in the figure forms a basis of developing this survey. The different aspects of the belief system and its effect on planned behaviour is of high importance in this research as the extraordinary circumstances surrounding the pandemic compromises the health and safety of people. The beliefs outlined in the figure 3 although at this stage are hypothetical but have been developed through observation of the current scenarios and people's opinions. These hypothetical views were further confirmed through the methods of focus group discussion and survey. In the case of this study, it is important to note that the detailed elements of this theory (like attitude and intentions) only have an implicit role in the development of the survey and focus group discussion and their indirect implications are measured through questions like "How do you feel about the pandemic and its effect on your daily life?" (FGD). Thus, the Theory of Planned Behaviour provided a perspective on how the different aspects of planned behaviour change when there are situational changes around an individual.

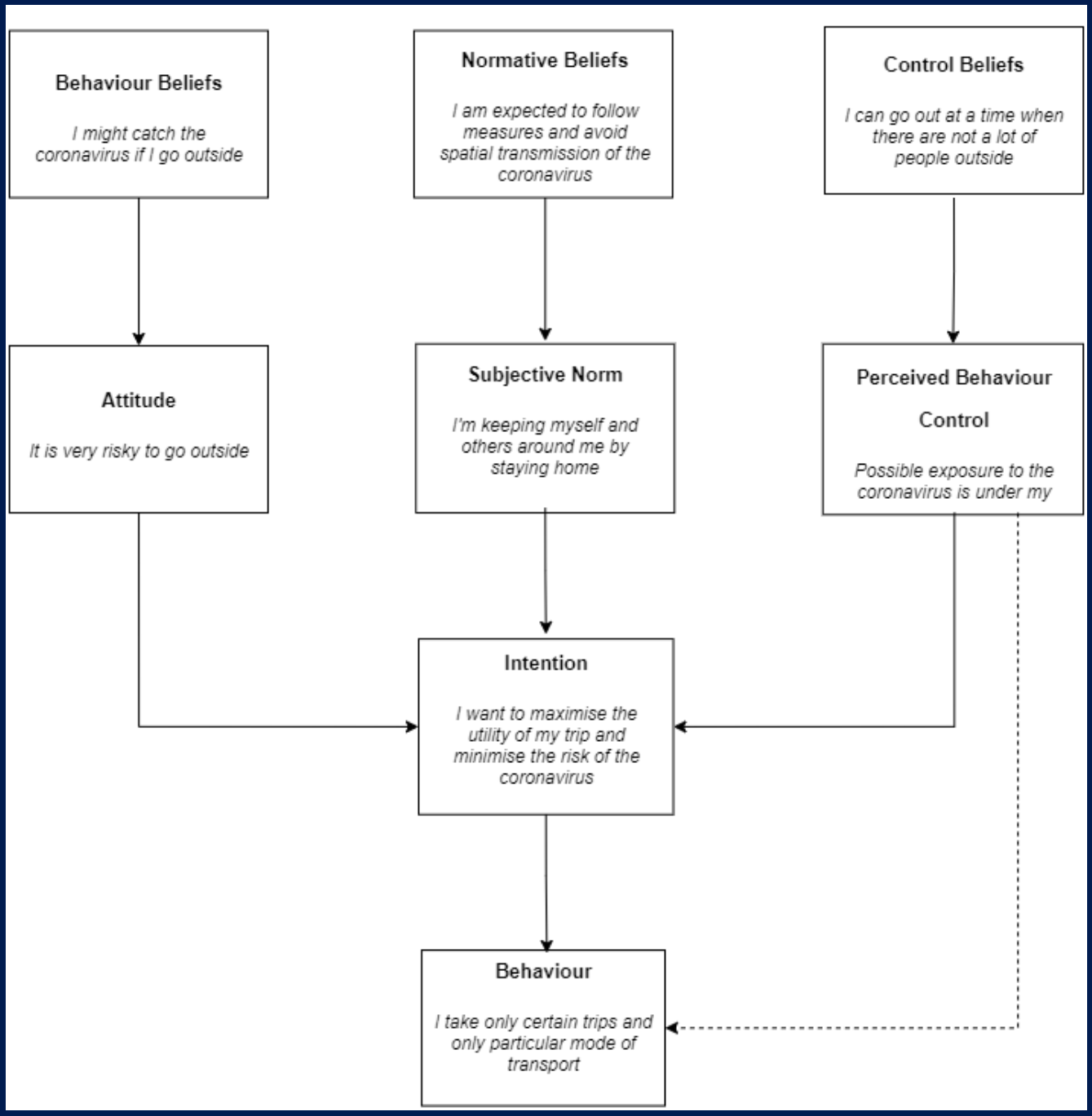

Figure 3: Theory of Planned Behaviour (Ajzen, 1991) in the content of this study (example)

2.2 Travel Behaviour and its Relation to Past Pandemics/Epidemics

This section will review previous literature related to pandemics and epidemics that have occurred in the past, with the purpose of uncovering other relevant aspects to be considered in this research.
Peak et al. (2018), in their study about the effects of a travel ban in Sierra Leone due to the spread of Ebola, deals with the travel restrictions and the use of big data to study changes in mobility helps in gaining a perspective on how mobility data can be used to track population movement and to develop travel restrictions further. Although the lockdown in Sierra Leone was only for three days, and the results show that travel went back to normal after the restrictions were lifted, this study is still relevant as mobile phone data play a significant role in tracking movement through space and can be used to explore how it changes over time. Although mobile phone data will not be used directly in this study, other sources (like Google and Apple) are using them, and that data will be a part of the secondary data collection.
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2.3 Effects of COVID-19 on Travel Behaviour in the Netherlands

A study conducted by NS and TU Delft (2020) explored the changes in travel behaviour in the Netherlands during the pandemic, including asking questions regarding working from home, willingness to travel via public transport, and adjustment to the 1.5 metre distancing rule (OVPro, 2020). The results show that most respondents choose private cars (74%) as an alternative mode of transportation for public transport (figure 4). This result is similar to that of Li, Nguyen, & Coca-Stefaniak (2020), for the context of Wuhan, China, which shows

most travellers have shifted from public transport to private cars. In their work, de Haas, Faber and Hamersma (2020) discuss that about 80% of people reduced their outdoor activities (like going to work, shopping, etc.), alongside which, the share of workers that worked from home during this period increased from 6% to 39%. Additionally, in the same study, it was also discovered that 20% of people are expected to continue using bikes and walking more in the future after the pandemic. Similarly, in van der Drift, Wismans and Kalter (2021) the average number of trips for the modes of car, bicycle, walking, and public transport decreased overall, while during the course of the pandemic, the bicycle and walking trips increased as can be seen in Figure 5.

In addition to that, it can also be observed that the use of cars has increased during the pandemic while the use of trains has decreased (figure 6). In the context of this study, all these works are highly essential as it helps developing an approach for this. As it will be further discussed in the following chapters, these studies helped in developing hypotheses and questions that are aimed to answer with this study and provide a direction on what kind of results can be expected.

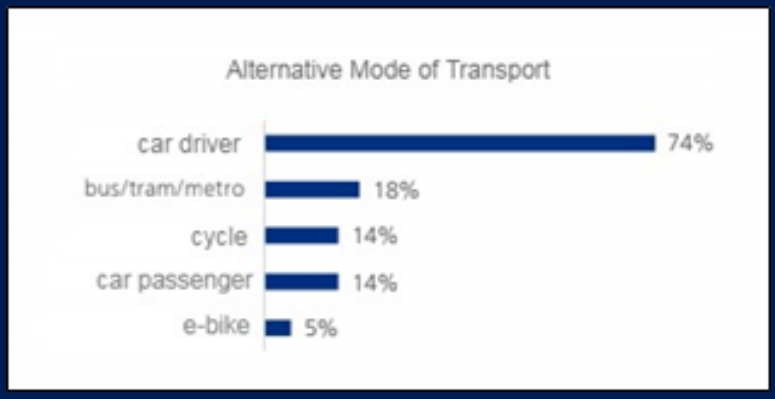


Figure 4: Alternative Mode of Travel (NS & TU Delft, 2020)

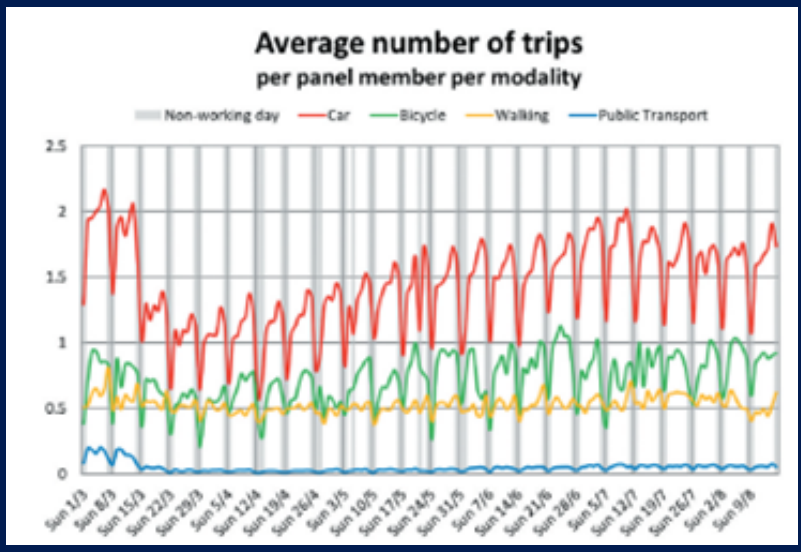


Figure 5: Average Number of Trips (van der Drift, Wismans and Kalter (2021)

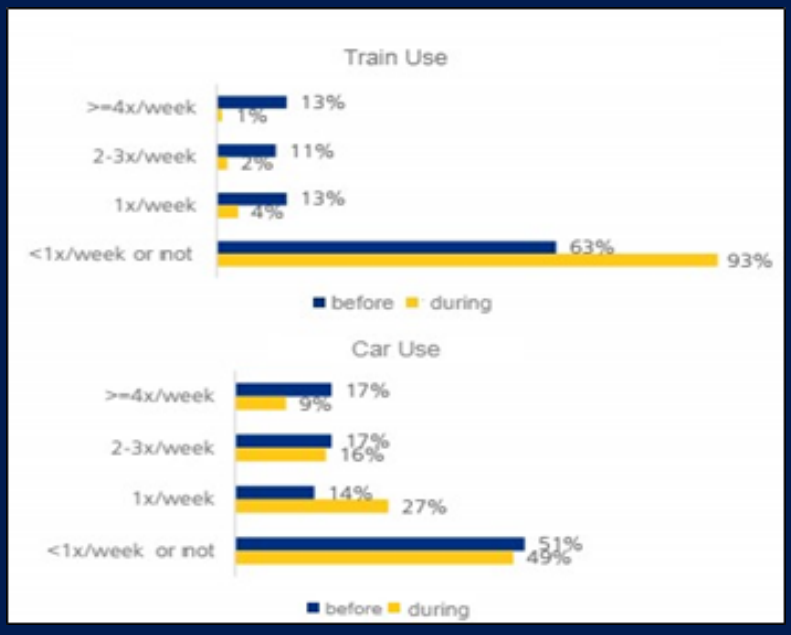


Figure 6: Changes in the Usage of Trains and Cars (Before & During Pandemic) (NS & TU Delft, 2020)

2.4 Review of News Articles

The literature review for this study has not been limited to just academic works; relevant newspaper reports about passenger movement, mobility, and policy recommendations have also been researched. From a transport user's point of view, in a statement by OVPro, it was observed that passenger numbers in public transport have significantly reduced since the last year. According to the online article, "Translink, the company behind the OV chip card, has registered nearly 400 million fewer check-ins compared to last year" (OVPro, 2020b). Although just the simple checking in does not constitute one journey as a passenger can check-in multiple times, it still provides a first look at how the public transport system has recovered since the pandemic started (OVPro, 2020b). This information aids in gauging how passengers are beginning to get back to normal as time progresses. In addition to that, as the recommendation of policies in one of the aims of this study, this article aids in providing a perspective on how the public transport system is coping with the current measures.

Regarding mobility, it was reported by Moster (2020) that Google and Apple are using data from their map service apps to map the travel patterns of its users. These reports show how these users travel by walking, cars, or public transport (Mostert, 2020). Google (2020) reported that in the Netherlands, overall, there was a slight increase in congestion in supermarkets and pharmacies, and congestion in parks saw an extremely high increase of 123%. It was also noted that there was a 21% decline in the mobility in transit stations for buses and trains. According to another news source, Stadszaken.nl, it was pointed out that there was no significant change in the number of cyclists, but there was an increase in the number of people who are walking in April than it was in March (Team Stadszaken.nl & Snaije, 2020). This does not come as a surprise as bicycling is common in the Netherlands, but the onset of the pandemic has brought a change in the preference for modes of travel.

Lastly, writers at Verkeersnet.nl report the need to bring policy changes faster. For example, the Flanders region saw a 2/3 decrease in public transport usage within the first few days of the lockdown, and the development of appropriate mobility policies is too slow (Rottier, 2020). Due to the expectation of the transport providers that the pandemic will only last a few weeks (further discussed in chapter 5), initially government intervention did not raise a cause of concern. Unlike the Flanders region, the Dutch government developed transport related policies in a short duration of time. However, due to the longevity of the pandemic, these measures led to a variety of issues and concerns among the providers and decrease in public transport usage resulted in more governmental measures. Reiterating that one of the aims of this thesis is to provide policy recommendations, articles like these helps develop a perspective from a passenger-centric perspective and aid in developing the said policy recommendations.

Chapter Summary

This literature review helps in identifying the crucial aspects of this study, which include, but are not limited to, understanding the key concepts of travel behaviour, how the psychology behind performing behaviours work, how stimuli of stress lead to a change in behaviour, the use of technology to combat and monitor these changes and the significance of having policies that help in reducing the spread of the virus, while trying to minimise losses.

To conclude, based on the literature review, it can be ascertained that the different aspects that need to be studied in the course of this thesis are a contextual understanding of travel behaviour for this study, change in the preference of a mode of transport, change in passenger movements, public transport operation during the crisis including the level of service, frequency and losses incurred, and policy amendments, all through keeping a focus on the timeline of the development of the COVID-19 pandemic and the subsequent measures introduced in the Netherlands which will be further discussed in chapter 4. This is summed up in figure 7.

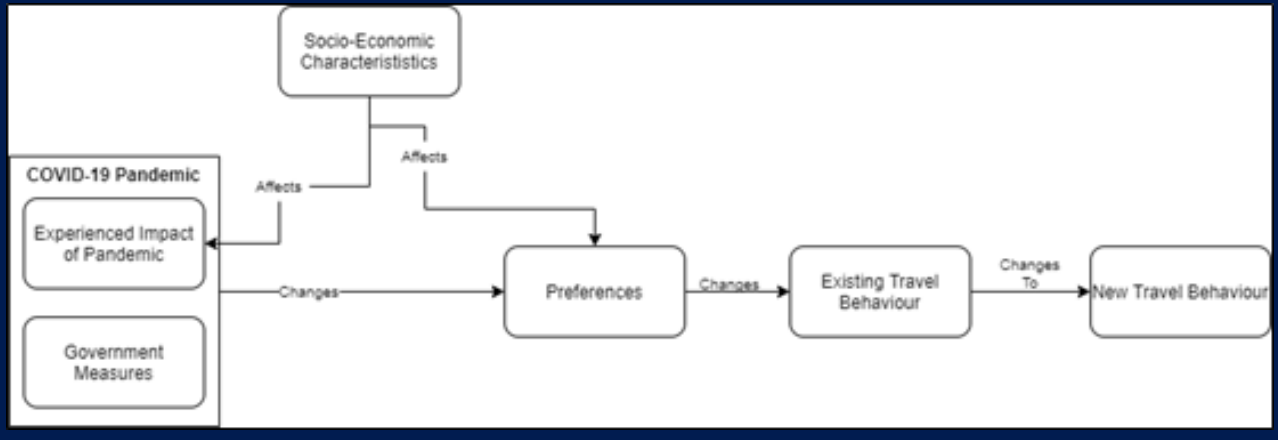


Figure 7: Conceptual Framework (Adapted from de Haas, Faber and Hamersma (2020))


CHAPTER
3

Methodology

This study was conducted in the Netherlands. Five different methodologies were used in this research, namely, literature and policy analysis, statistical data analysis of public transport check-in data, focus group discussion, survey, and a series of in-depth interviews with public transport providers in the study area. This chapter focuses on a brief discussion of these methodologies.

3.1 Research Approach

This research follows two approaches – a people-centric approach and a transport centric approach, meaning that in addition to understanding the effects of the pandemic on people, the effects of the pandemic on public transport have also been explored.

To elaborate further, effects like reduced service, loss in revenues, and reduced service capacity have also been investigated. With a comparison between pre-COVID and during-COVID scenarios, a closer look has been taken at what behaviour is the part of the transition phase (during the pandemic) and which aspects behaviour is likely to remain after the pandemic. These phases are discussed in detail in Chapter 4. Hence, scientifically, studying those mentioned above will pave the way for more research. This thesis aims to contribute to the literature on the effects of COVID-19 on travel behaviour, which in turn provides insights for policymaking and public transport operations. Figure 8 outlines the different methodologies used for each research question.

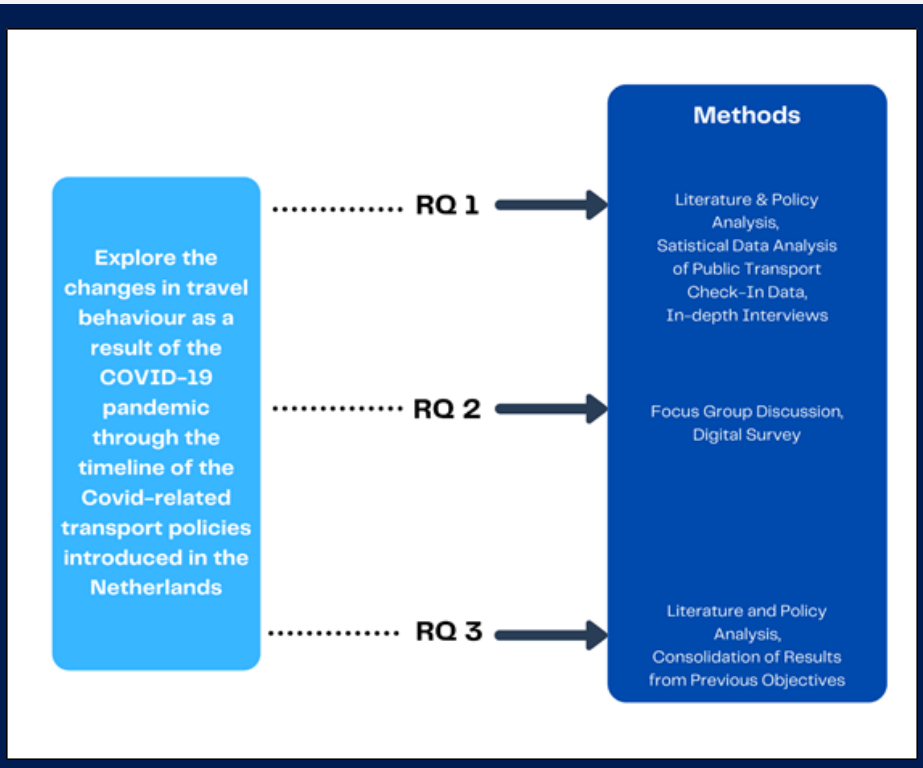


Figure 8: Methods With Respect to Research Objectives

In addition to the scientific peer-reviewed papers and books (specifically on the topics of travel behaviour, travel behaviour and its relation to past epidemics/pandemics, and studies related to COVID-19 and its effects on travel behaviour), the following table (Table 1) shows which primary and secondary data are required to conduct this research successfully.

3.2 Literature and Policy Analysis

For the literature review, research done for peer-reviewed journal paper, books, and grey literature such as newspaper reports and magazine articles have been used. Policies with regards to transport planning in the Netherlands during the COVID-19 pandemic have also been utilised. Additionally, the measures taken to control the pandemic have also been used heavily. For this research endeavour, it was essential to identify a timeline of the pandemic in the Netherlands as the introduction of rules at the different points in time directly relate to how bad or good the situation was and thus, in identifying these points in time, phases of the pandemic were determined. These phases then helped in analysing how travel behaviour changed over time.

3.3 Statistical Analysis of Public Transport Check-In Data

Following the literature and policy analysis, the effect on public transport has also been analysed. For this thesis, the public transport taken into consideration is all transport modes that uses the OV-Chipkaart, i.e., trains, metro, trams, and buses. To understand the changes in the use of the public transport system, the data used is from Translink, the company behind OV-Chipkaart. This data consists of the number of check-ins each day from January 2019 to April 2021. As this dataset also includes the number of check-ins from the same day in 2019, so a comparison between the two years was made as well.

Table 1: Data Sources and Types

Data	Type	Source	Usage
Dutch Measures for COVID-19	Secondary, Qualitative	Rijksinstituut voor Volksgezondheid en Milieu (RIVM)	To understand the development of policies to combat COVID-19
OV-Chipkaart Data	Secondary, Quantitative	Translink	To obtain the number of check-ins on public transport from the period of January 2019 – April 2021
ODiN Survey 2019	Secondary, Qualitative	Centraal Bureau voor de Statistiek (CBS)	To obtain the the characteristics of travellers (age, sex, trip frequency, trip purpose, mode choice)
Interview Data	Primary, Qualitative	Transport Providers	To understand how public transport operation was affected
Focus Group Discussion Data	Primary, Qualitative	Sample	To obtain a a qualitative perspective of change in travel behaviour
Survey Data	Primary, Quantitative+Qualitative	Sample	To analyse the change in travel behaviour of the sample

3.4 In-Depth Interviews with Public Transport Operators

To understand how the operation of public transport has changed in the Netherlands due to the pandemic, a set of four interviews have been conducted with public transport operators in different parts of the country. Before conducting the interviews, some literature was consulted in order to make the process as successful as possible. Overall, the guidelines and suggestions by Thomas & Thomas (1999) set the tone for the process. The guidelines are as follows:

1.“Make sure the research question is clear.
2.Develop a check list of the questions to be asked during the interview.
3.Express clearly the purpose of the interview.
4.Start with a neutral question to facilitate free flow of information.
5.Use open-ended questions so that the respondent can choose his answer.
6.Limit the content of each question with a single idea to avoid confusion.
7.Reduce questions that give responses of `yes' or `no’ because they give limited information.
8.Do not influence the respondent by asking leading questions.
9.If you have not understood the response, ask the respondent to repeat and clarify.
10.Do not assume answers.
11.Do not pass judgements.
12.Avoid irrelevant discussions.
13.When you change the tack, inform the respondent that you are doing so.
14.Keep the interview short.
15.At the end of the interview summarise the points reported and ask the respondent if the summary is correct.”

In research by McGrath, Palmgren, & Liljedahl (2018), the authors suggest a set of twelve tips in order to conduct a fruitful interview. Understanding all of the tips was of utmost importance, especially the one about preparing myself as an interviewer (by researching about the companies and the interviewees) and constructing a set of questions that will provide the most answers was looked into more carefully. Before the day(s) on which the interviews were scheduled, the participants were asked to complete a consent form and were provided with some background information about the study, which was later elaborated on during the interview itself. The whole process followed a structured pattern and more tips like asking questions about the present first and then the past and future, providing a transition between major topics, and maintaining a conversational interview (‘General Guidelines for Conducting Research Interviews’, n.d.) were focused on.

Table 2 gives some background information about the interviewees.

Table 2: Details of Interviewees

Company Name	Position of Interviewee	Area of Operation of Interviewee
MuConsult	Consultant	Noord Holland, Overjissel, Brabant
MuConsult	Founder	Noord Holland
OV Bureau Groningen Drenthe	Planner and Transport Developer	Groningen & Drenthe
Arriva	Development Manager	Achterhoek

The questions followed different themes, starting with discussing the background of the company and getting more information about the capacity at which the company (as well as the interviewee) were involved in public transport operation. Following that, the main section of the interview was undertaken, and the questions of which dealt with the company's actions during the COVID-19 pandemic. These questions ranged from the expected and unexpected changes to public transport, change in frequency and ridership, users' changes in opinions towards travelling via public transport, etc. In various cases, not all questions had to be asked because the interviewee provided answers to multiple questions at once in different instances. Once this discussion was concluded, the respondents were asked about the financial issues concerning the pandemic, particularly what kind of losses were incurred and what plans they had in order to make up those losses. Finally, the interviewees were asked about the future plans of the company and whether there were any promotional campaigns to promote public transport were in the pipeline. The detailed questions of the interview can be found in the appendix.

3.5 Focus Group Discussion

The primary aim of conducting a focus group discussion was to get qualitative inputs to understand the different travel behaviours and how the advent of COVID-19 has resulted in changed travel behaviours. One of the other reasons for undertaking a focus group discussion was to gauge the kind of questions that can possibly be asked in the digital survey that followed this step. In a study like this, where both qualitative and quantitative data are of paramount importance, a focus group discussion also had the purpose of understanding people's views and opinions on how travel preferences have changed due to the pandemic.

As the researcher was inexperienced with focus group discussions and the inability to conduct meetings in person, various literature on the same issue has been reviewed. These academic works helped in conducting the focus group discussion successfully. The first step was to understand what a focus group is. In their work, Powell and Single (1996, p. 499) state that a "focus group is a group of individuals selected and assembled by researchers to discuss and comment on, from personal experience, the topic that is the subject of the research".

They also remark that focus groups "can be used to identify potential areas of inquiry or to clarify subject matter" (Powell & Single, 1996, p. 500), which is also a reason to conduct a focus group in this research. According to Sharken Simon (1999), a focus group discussion needs to be undertaken with the following nine steps –

·Defining the purpose
·Establishing a Timeline
·Identifying and Inviting Participants
·Generating the Questions
·Generating a Script
·Selecting a Facilitator
·Choosing a Location
·Conducting the Focus Group
·Interpreting and Reporting the Results

These steps were followed during the process of conducting the focus group discussion.

The sampling strategy for this method was a snowball strategy, meaning that the researchers personal contacts, and their further contacts were approached for the study. The type of sample required was a mix of students and working professionals in order to match the required sample of the digital survey.

The following open-ended questions were asked in the focus group discussion:

Q1: How do you feel about the pandemic and its effect on your daily lives?
Q2: How has the frequency of using different modes of transport changed during the pandemic from before?
Q3: Follow up question – did the mandate of PT running at a lesser capacity (40%) personally affected you?
Q4: How have your trip purposes changed during the pandemic?
Q5: To what extent do you think the curfew will affect your travel behaviour?

3.6 Online Travel Behaviour Survey

An online travel behaviour survey was developed with the purpose of understanding their normal travel behaviours, the change of behaviour of the sample population due to the pandemic, how has the pandemic affected their daily lives, and what they believe will continue in their behaviour even after the pandemic is over.

As this method aims to provide quantitative answers to the research questions, it was of paramount importance that the survey was conducted as thoroughly as possible. Thus, to achieve that, a few academic works were reviewed in order to make the conceptual aspect of a survey clear.

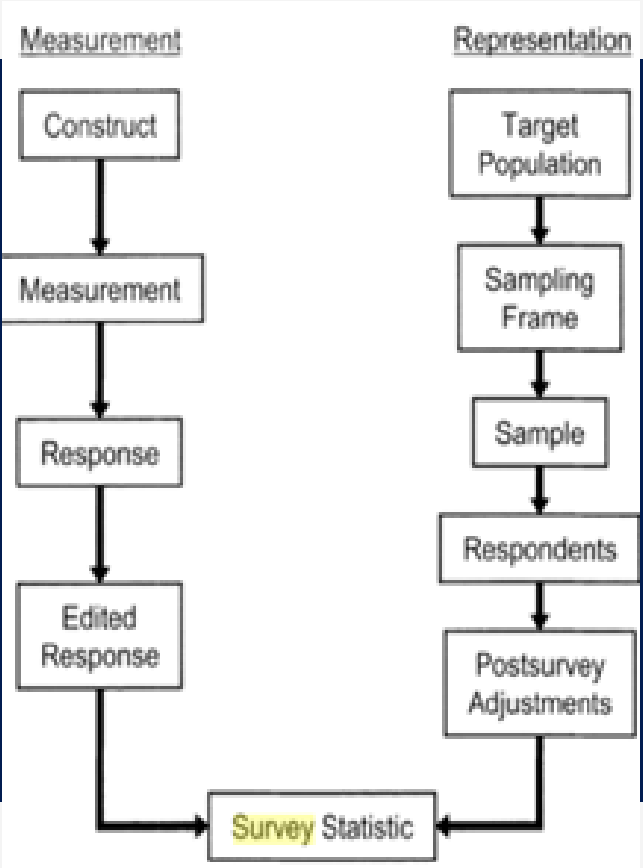


Figure 9: Lifecycle of a Survey (Groves et al., 2009, p 42)

From figure 9, each of these steps, in the context of this study have been further discussed as follows:

- **Construct**: The survey was developed after gauging the important aspects of travel behaviour from the analysis of the focus group discussion as well as using particular keywords for trip purposes, trip frequencies and mode choice were influenced by the ODiN Survey (2019)
- **Measurement and Response**: The survey was written in both English and Dutch in order to increase accessibility. Before sharing it with the sample, it was first sent to peers who gave constructive feedback on the questionnaire which were then taken into account before finalisation.
- **Sample and Response**: The sample aimed for this research was people in the age group of 18-70, of any gender and occupation. Additionally, the only other criteria that was specified was that of the respondent having to have lived in the Netherlands for more than two years.
- **Edited response and adjustments**: After the completion of the survey, the data was cleaned. Elaborating more on that, the collected data was then checked for missing or incomplete responses, which were then deleted.

Additionally, literature on conducting e-surveys (Reynolds, Woods, & Baker, 2006) has also been researched, which aids in understanding the pros and cons of a digital survey over a pen and paper survey.

For the kind of survey undertaken for this research, the Dutch national mobility survey – "Onderweg in Nederland" or ODiN (2019) served as one of the prime references as these mobility surveys represent the Dutch population very well and show the mobility levels in all of the Netherlands. Furthermore, important characteristics and keywords that were used in the survey (like trip purpose, mode choice and trip frequencies) were derived from the ODiN survey. Additionally, as mentioned in chapter 2, the development of the open-ended questions in the survey used elements of Ajzen's Theory of Planned Behaviour (Ajzen, 1991) in order to understand how the sample's preferences changed over time and categorize the results on the basis of different themes.

The trip purposes that were identified were as follows:
· **To/From Work**: Trips taken to and from workplaces.
· **For Work/Business**: Trips taken for work-related reasons (for example site visits, picking up business shipments, etc.)
· **Grocery Shopping**: Trips to the supermarket
· **Other Shopping**: Trips taken for shopping other than groceries
· **To/From School/University**: Trips taken to and from schools and university
· **Sports**: Trips taken to undertake sporting activities
· **Hobbies**: Trips taken to undertake hobbies
· **Visit Friends & Family**: Trips taken to visit friends and family
· **Leisure Activities**: Trips taken for recreational and leisure purposes

The trip frequencies were determined by the following:
· 1-2 times per week
· 3-4 times per week
· 5 or more times per week

The modes of transport which were identified are as follows:
· Walking
· Bike
· Electric Bike
· Scooter
· Car
· Bus
· Tram/Metro
· Train

The interface of the survey was divided in six sections which are briefly described as follows:

- Part One: Personal Details

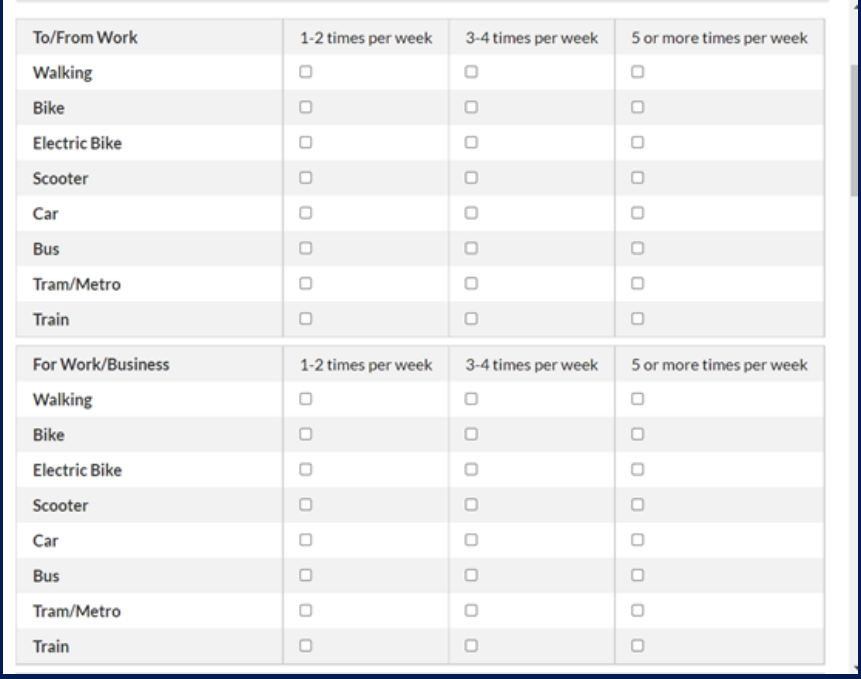
In this section, the details collected were email address (only for those interested in participating in the gift voucher lottery after the completion of the survey), date of birth, gender, occupation, country of origin, postcode (PC4), and years living in the Netherlands. After completion of the survey, all the information (except for – date of birth, gender, PC4, and years living in the Netherlands) were deleted.

- Part Two: Travel Time for each Trip Purpose

This information was included in order to determine whether travel times of different trip purposes had any effects due to the pandemic. The categories varied as such:
·Up to 30 minutes,
·30 minutes – 1 hour
·1 hour – 2 hours
·More than 2 hours
·Not applicable

- Part Three: Before COVID-19

In this section, the respondents were asked to choose from a cross-tabulation grid their most used mode and trip frequency for each trip purpose before the COVID-19 pandemic. If they didn't engage in a particular trip, they were asked to skip it. In Figure 10, a part of the cross-tabulated grid is shown. This format was followed for parts 3-5 of the survey.



To/From Work	1-2 times per week	3-4 times per week	5 or more times per week
Walking	☐	☐	☐
Bike	☐	☐	☐
Electric Bike	☐	☐	☐
Scooter	☐	☐	☐
Car	☐	☐	☐
Bus	☐	☐	☐
Tram/Metro	☐	☐	☐
Train	☐	☐	☐

For Work/Business	1-2 times per week	3-4 times per week	5 or more times per week
Walking	☐	☐	☐
Bike	☐	☐	☐
Electric Bike	☐	☐	☐
Scooter	☐	☐	☐
Car	☐	☐	☐
Bus	☐	☐	☐
Tram/Metro	☐	☐	☐
Train	☐	☐	☐

Figure 10: Cross-Tabulated Grid from Digital Survey

- Part Four: During COVID-19

Like part three, in this section also the respondents were asked to choose from a cross-tabulation grid their most used mode and trip frequency for each trip purpose during the COVID-19 pandemic. If they didn't engage in a particular trip, they were asked to skip it.

- Part Five: After COVID-19

In this section, the respondents were asked to predict their travel behaviour for each trip purpose with regards to mode choice and trip frequency after the COVID-19 pandemic. The same cross-tabulated grid structure was also followed in this section and the respondents were asked to skip the trip purposes they believed they still would not engage in after the pandemic.

- Part Six: Concluding Remarks

This section focused on asking the respondents a few open-ended questions. This was done in order to specifically talk about their opinions on public transport and include their inputs in the policy recommendation objective of this research. Additionally, the respondents' expectations of their travel behaviour after the pandemic as well as their opinions about the measures were also asked. The following three questions were asked –

·Have your opinions regarding the use of Public Transport changed because of COVID-19? If yes, please indicate why.

·Which changes in your travel behaviour do you expect will remain after the COVID-19 pandemic?

·What do you think could've been done differently by the government during the pandemic?

A detailed copy of the digital survey can be found in the appendix.

The digital survey was sent out through different social media platforms (Facebook, LinkedIn, Twitter, etc.). Respondents between the ages of 18-65 were the aimed age group for the sample. The age group was set as such because the labour force consists of people between this age and are the ones who travel the most. It is hypothesised that the pandemic has affected this group's travel behaviour the most. The survey was inclusive of all these aspects and was made available in both English and Dutch so that both native and English-speaking residents can access the survey.

Chapter Summary

This study was conducted in the Netherlands and no particular area was focused on, in order to achieve heterogeneity in the sample and gain multiple insights on the situation. There are five main methodologies used: literature and policy analysis, statistical analysis of both primary and secondary data collected (on public transport check-in data and data collected from the survey), in-depth interviews conducted with different transport providers, focus group discussion, and an online survey to determine travel behaviour before, during and after the pandemic. The following figure (Figure 11) gives an overview of the methodological phases:

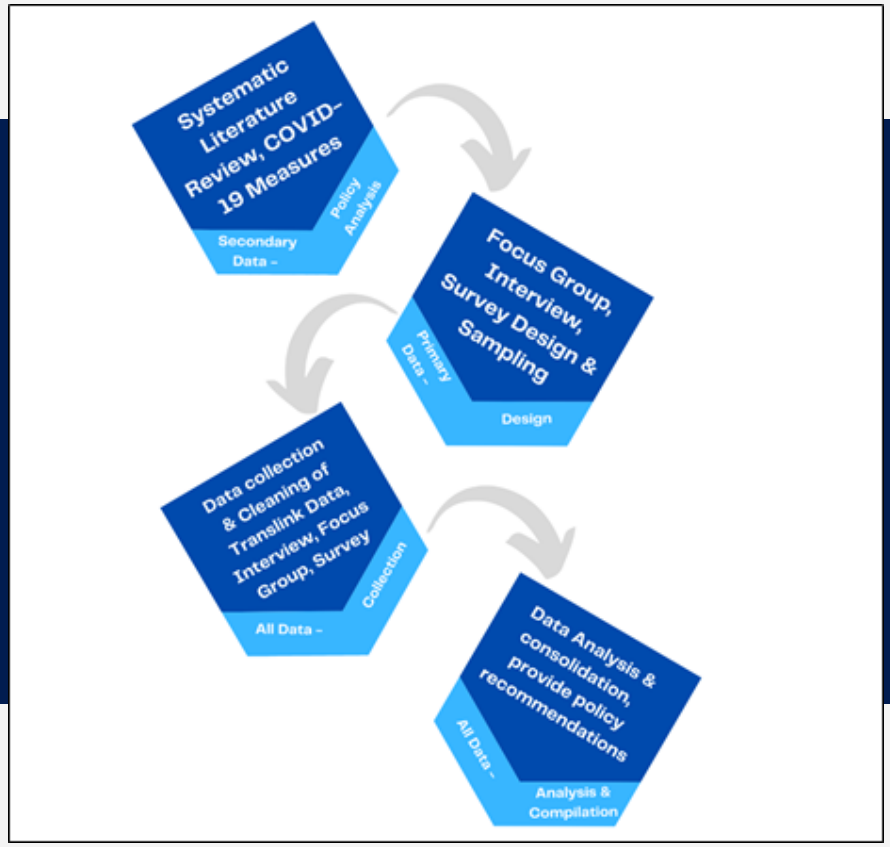
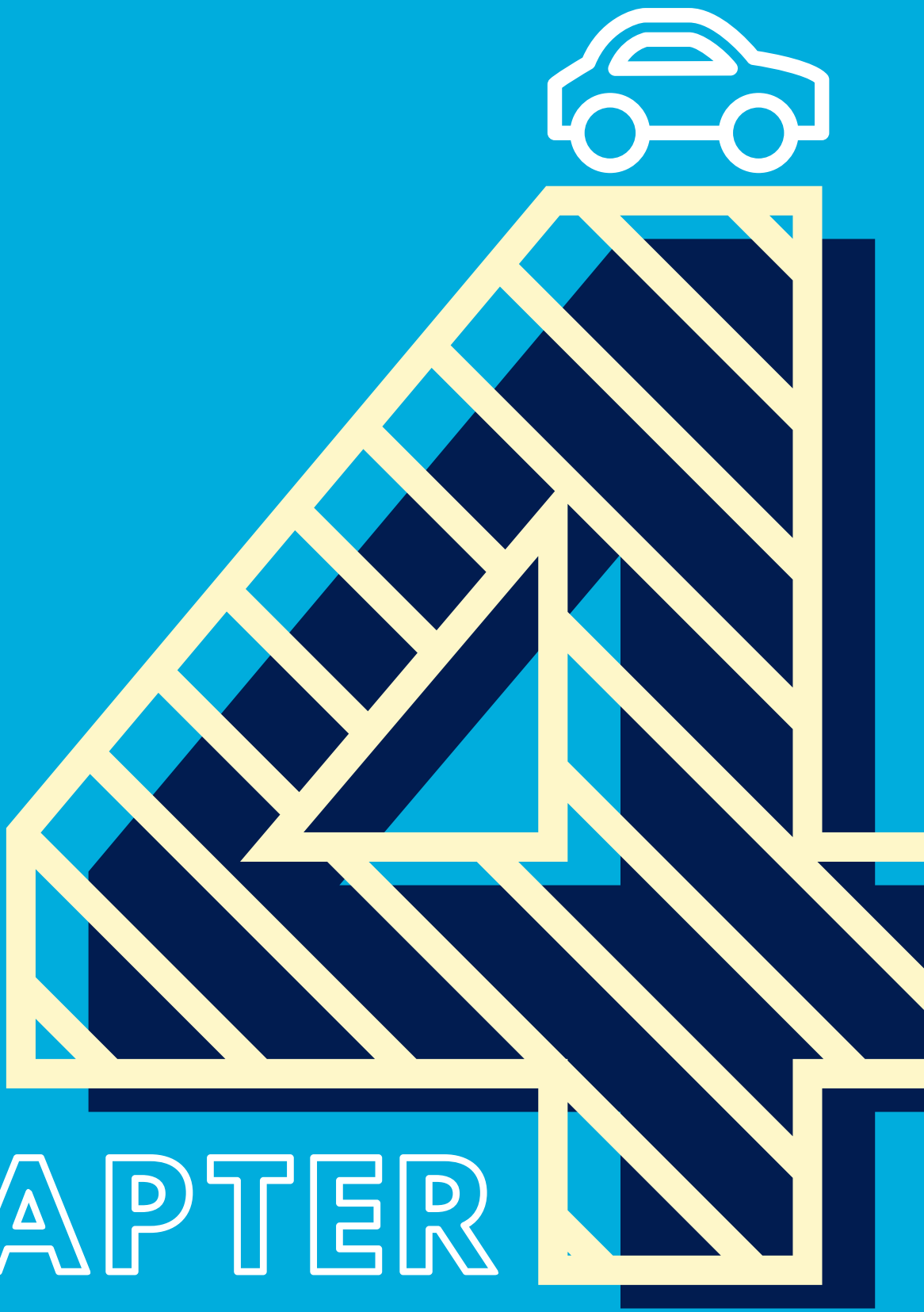


Figure 11: Methodological Research Phases



CHAPTER

Results

In this chapter, the results of the different research phases are reported. Firstly, the different phases that have been identified as the different points of comparison of all the data have been presented. Following that, the changes in the use of public transport will be analyzed on the basis of the data collected from Translink, interviews conducted with transport service providers, and responses specifically about public transport from the focus group discussion and survey. Next, the changes in travel behaviour will be reported. These results come from testimonials received from the public transport survey providers, the responses from the focus group discussions, and data collected from the survey. This section will be further divided into the categories of trip purposes, trip frequencies, and modes preferred.

4.1 Identification of Phases

The first step was to define the timeline of the development of the pandemic in the Netherlands, that will be the basis of this research. In order to do so, the different periods in which the government introduced COVID-19 rules were studied. However, due to the nature of the data collection methods, the phases are not uniform for each research objective. Elaborating more on that with the examples, the data collected from Translink, i.e., the number of check-ins in public transport follows a clear timeline (Table 3), whereas the data collected from the focus group discussion, interviews, and survey follow a more general timeline (Table 4). This was done keeping in mind that the respondents for the latter methods, because it uses a retrospective survey, would probably not have had a clear memory of their travel behaviour linked to a specific date.

Table 3: Timeline for Translink Data

Method - Translink Data	
Points of Comparison	**Date**
Phase 1 - Onset of the Pandemic (Introduction of the 'Intelligent Lockdown')	13th March 2020 - 30th June 2020
Phase 2 - Summer (First Relaxation of Measures)	1st July 2020 - 31st August 2020
Phase 3 - Autumn (Onset of Second Wave of the Pandemic)	1st September 2020 - 13th December 2020
Phase 4 - Winter & Spring (Onset of the Third Wave of the Pandemic, Increase in Vaccinations)	14th December 2020 - 4th April 2021
Weekdays	Weekdays of Each Phase
Weekends	Weekends of Each Phase

Table 4: Timeline for Interviews, FGD, Survey

Method - Interviews, Focus Group, Survey	
Phases	**Timeline**
Before	Before 13th March 2020
During	From 13th March - 4th April
After	Expected Changes (After Normalcy Returns)

As it can be seen from table 3, for the Translink data, the course of the pandemic has been divided into four major phases, namely, the onset of the pandemic, the second phase of summer, the third phase of the autumn months, and the fourth phase of the winter and spring months. Additionally, separating the weekdays and weekends of each phase was done in order to bring clarity to the comparisons of the different phases as it was observed in the Translink data that the difference between the number of check-ins for weekdays and weekends was significantly different.

For the other data collection methods, as observed in table 4, in order to simplify the process and not rely completely on the memory of the respondents, the timeline was divided into before, during and, after (which is expected changes as per the respondents). Both timelines overlap with each other and aid in giving a foundation to the rest of the data collected and analyzed.
The following figures 12 - 15 give an overview of the different rules that the government introduced in the different phases of the pandemic. These rules are further classified into various sub-sections namely, basic rules; rules for groups; rules for hotels, restaurants, and cafes; rules for education; rules for culture and sports; and rules for public transport.

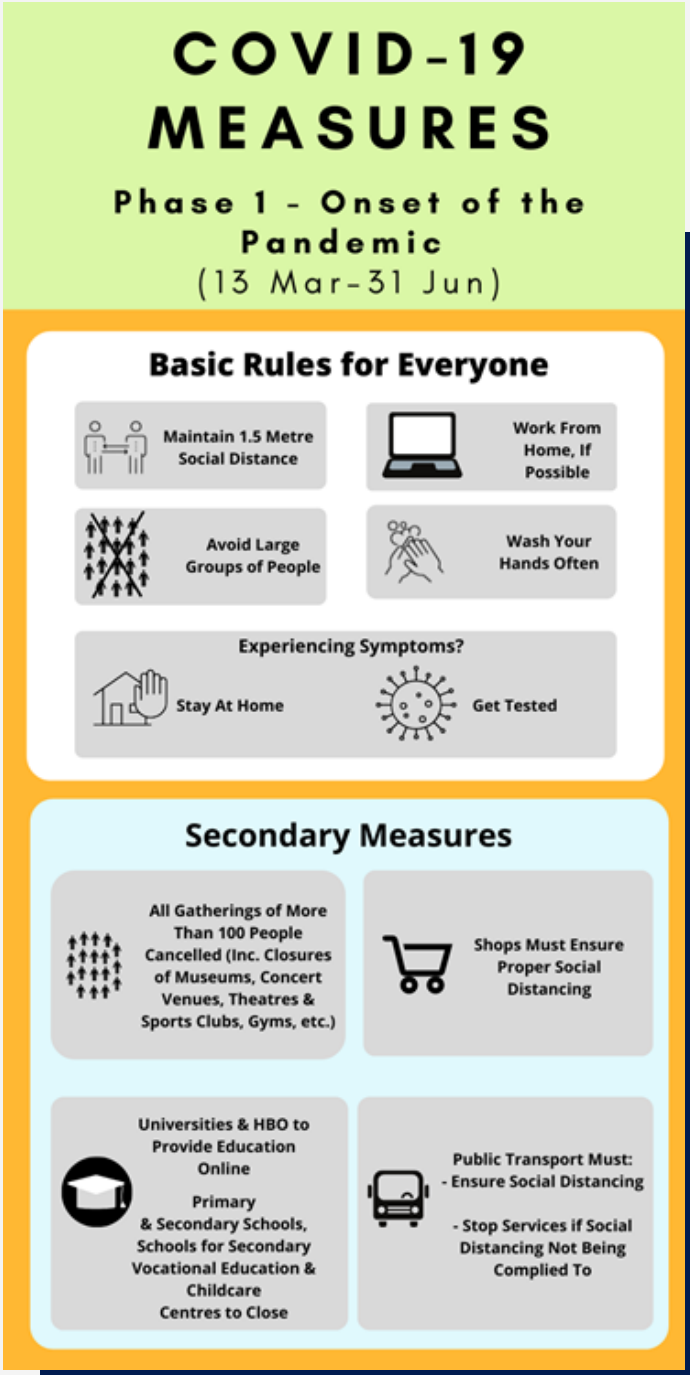


Figure 12: Phase 1 Measures (Adapted from (Rijksoverheid, 2020))

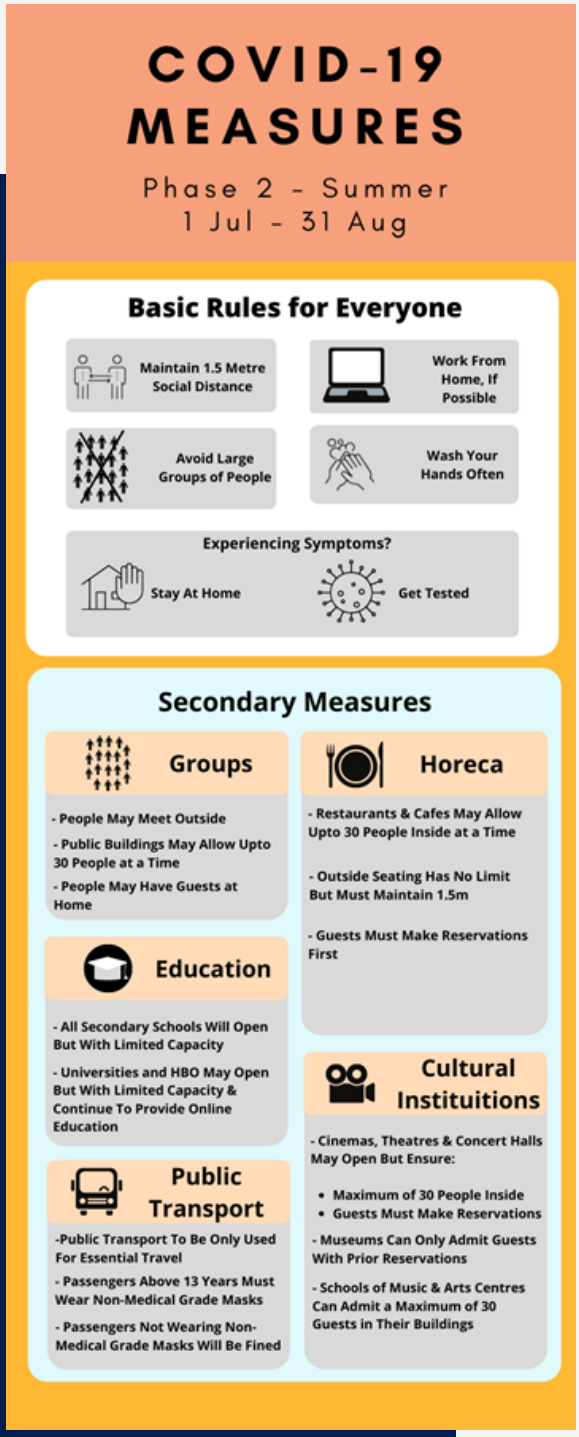


Figure 13: Phase 2 Measures (Adapted from (Rijksoverheid, 2020))

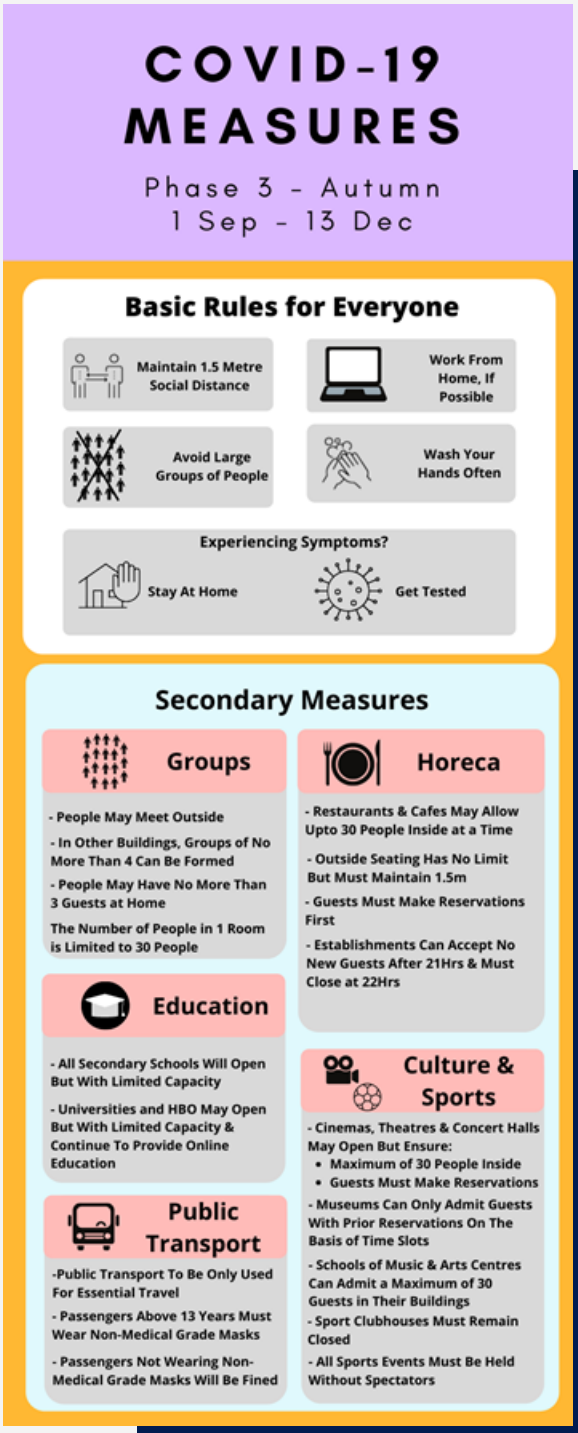


Figure 14: Phase 3 Measures (Adapted from (Rijksoverheid, 2020))

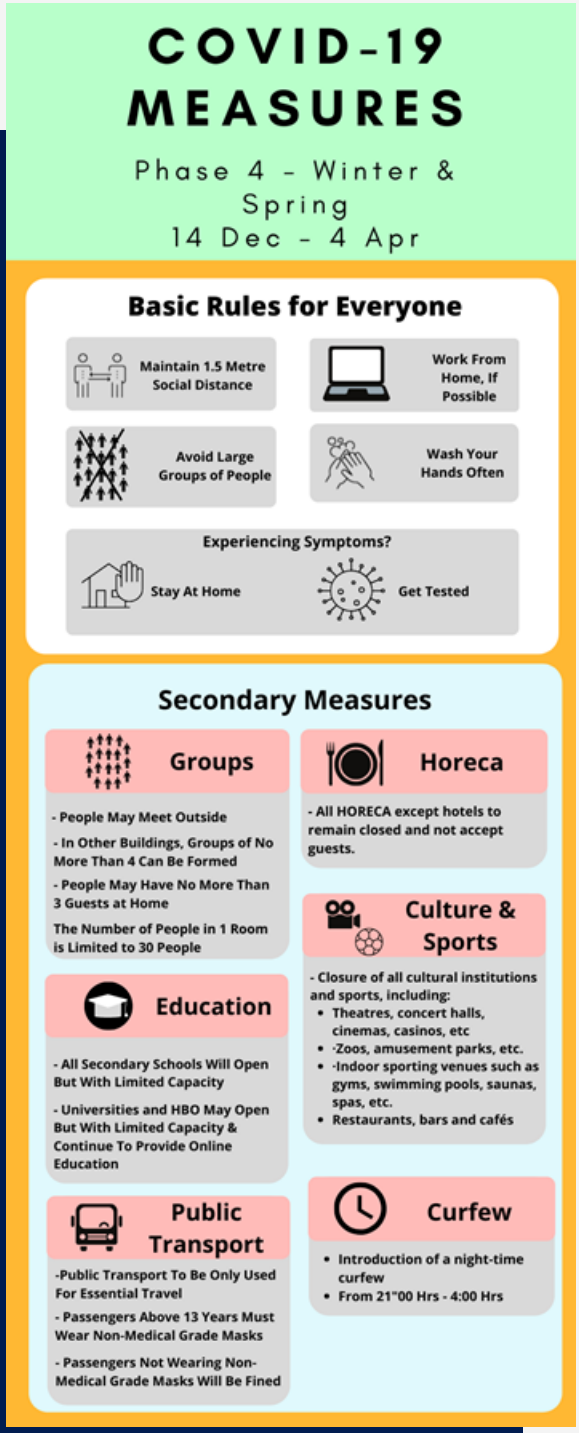


Figure 15: Phase 4 Measures (Adapted from (Rijksoverheid, 2020))

4.2 Changes in the use of Public Transport

The use of public transport was significantly affected by the onset of the pandemic as the Dutch government made work from home (from here now referred to as 'WFH') and limit the use of public transport. All the café's, restaurants, and bars were also directed to close, so leisure trips also reduced significantly. Now, the question arises of how the public transport system was directly affected by it.

4.2.1 Public Transport Check-In Comparison 2019-2020

Before reporting on how the use of public transport changed from the onset of the pandemic to the spring of 2021, it is first imperative to understand how public transport was being used before the pandemic. In figure 16, it can be seen that in 2019 and early 2020, the number of check-ins on public transport is high, with the highest check-ins on a given day being 5.34 million in February of 2019. Following that, with the onset of the pandemic, the number of check-ins sharply falls and stays significantly low throughout the year. The highest difference of change at any given point of time between the two years is in the month of April with the rate of difference being 90%. These observations also coincide with the highest number of deaths reported In April 2020 (Figure 17) and the rise in infections in December 2020, which will be further discussed later in this section.

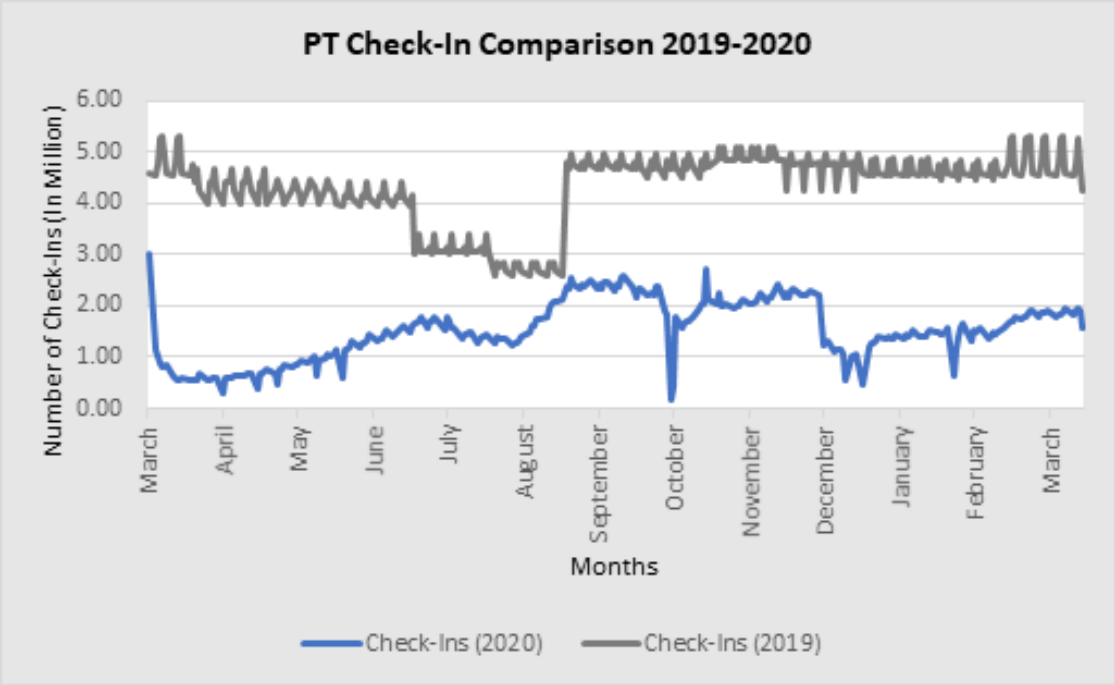


Figure 16: PT Check-In Comparison 2019 – 2020

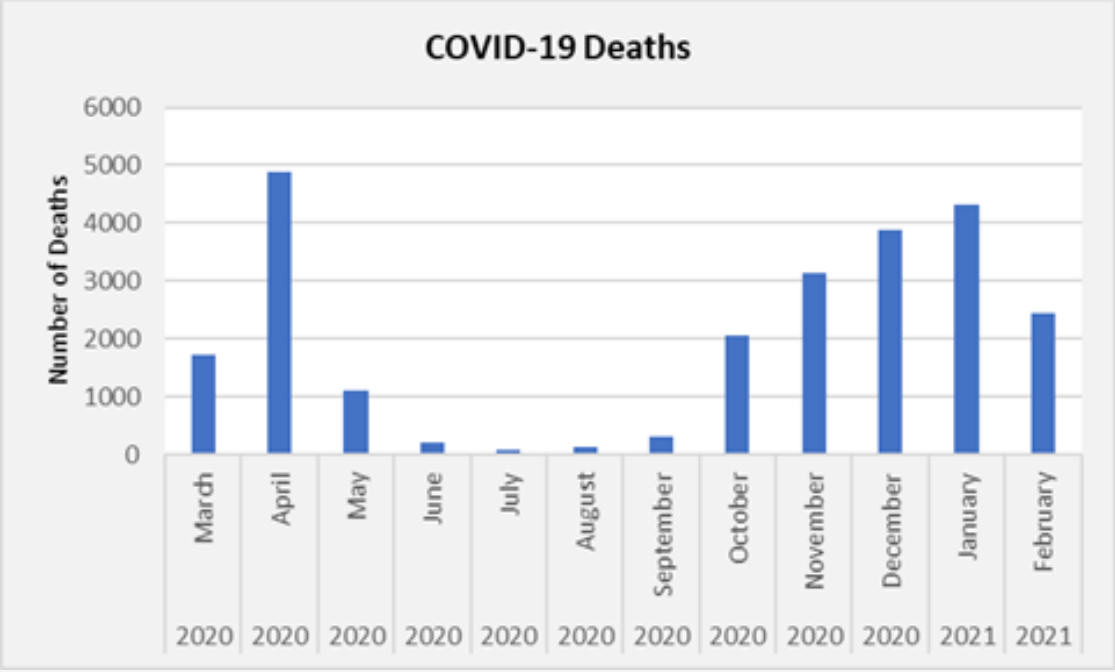


Figure 17: COVID-19 Deaths (Centraal Bureau voor de Statistiek, 2021)

As the government has strongly been advising to only use public transport only for essential travel, the numbers clearly reflect the reluctance of people in travelling via public transport as it makes chances of exposure to the virus higher. In addition to that, as it can be seen from figure 18, the rate of change in the number of check-ins tells the same story – there is a steep change between the number of check-ins between 2019 and 2020. In other words, as the number of check-ins goes lower, the rate of change goes higher. The highest rate of change is in the month of April, when the difference from 2019 is almost 90%, meaning that the number of check-ins in April 2020 was 90% lesser than it was in 2019. Hence, to conclude, it is understood that the number of check-ins drastically reduced in 2020, as compared to 2019, as a direct result of the pandemic. In addition to that, the change was also influenced by the reduced capacity of public transport which will be further discussed in section 4.2.3.

4.2.2 Change in the Use of Public Transport in Each Phase

Now that the intensity of the changes has been discussed, the changes as per the aforementioned phases can be discussed. The following sub-sections lay out in detail all the observations made for each phase in chronological order.

4.2.2a Phase 1 – Onset of the Pandemic

As it can be seen in figure 19, in the phase 1, with the increasing number of COVID-19 cases, the use of public transport decreased. On Friday, 13th March 2020 when the first set of COVID-19 rules were put in place, the number of public transport users suddenly drops to almost 500,000. Meanwhile, over the course of the next months, with the surge in the number of infections, the use of public transport decreased further, the lowest being 240,000 on March 24th, 2020. Additionally, it can also be noted that while the number of

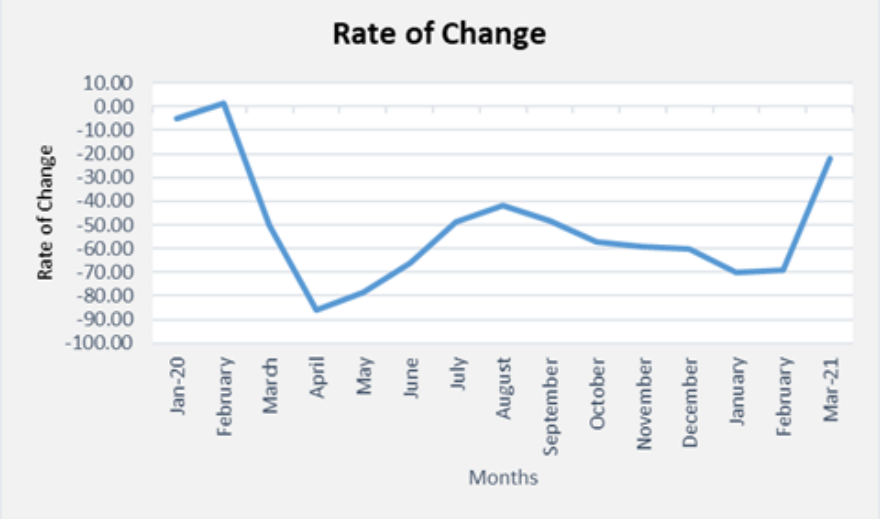


Figure 18: Rate of Change in Number of Check-ins (2019-2021)

infections keep rising in the months of March and April, the use of public transport remains significantly low and as the infections start lowering, the number of check-ins start rising again. It is also important to note that during the end of this phase, the Dutch government made it mandatory for all public transport to be operated at a limited (40%) capacity, which also influenced the subsequent number of check-ins. Additionally, the extreme downtrends in all the phases are the numbers of the check-ins recorded on the weekends; this is the case for each phase.

4.2.2b Phase 2 – Summer

During the summer months of July and August, the number of check-ins remain somewhat constant, fluctuating between 1.8 million to 2.5 million a day, similar to the initial phase. However, towards the end of August, with the increasing number of infections, although the check-ins stay constant, the number of check-ins start decreasing again in September. It is important to note that the summer months, in general, are expected to have less public transport use due to vacations and people using their personal modes of transport to travel. The same observation can be seen in figure 19.

4.2.2c Phase 3 – Autumn

Following the summer, during the months of September to December, the number of COVID-19 cases fluctuate significantly. With the highest cases recorded on a given day were 11,118 in October (Rijksoverheid, 2020–2021), the use of public transport also decreases, with the lowest number of check-ins recorded at 180,000 in the same month. However, as November approached, the number of infections started declining and with that, the number of check-ins saw a sharp rise (from 1.8 million to 2.7 million) from the end of October to the beginning of November. This can be observed in figure 18. Still, until the next month, the number of check-ins stays somewhat constant (the highest numbers recorded ranging between 2.42 million to 2.26 million a day). The change in this number can be only seen in the next phase which will be reported next.

4.2.2d Phase 4 – Winter & Spring

During the winter and spring months, there is a sharp rise in the number of cases (from 2.26 million to 460,000 in December 2020, and then a decrease to 180,000 in February 2021) due to the significant rise in the number of infections. It was during this period when the second wave of the virus had started, and the number of reported infections was at an all-time high. The highest number on a given day was recorded at 12,373 cases on 19th December 2020, wherein on the same day, the number of check-ins was also considerably low, at 540,000 check-ins in total. This can be observed in figure 19.

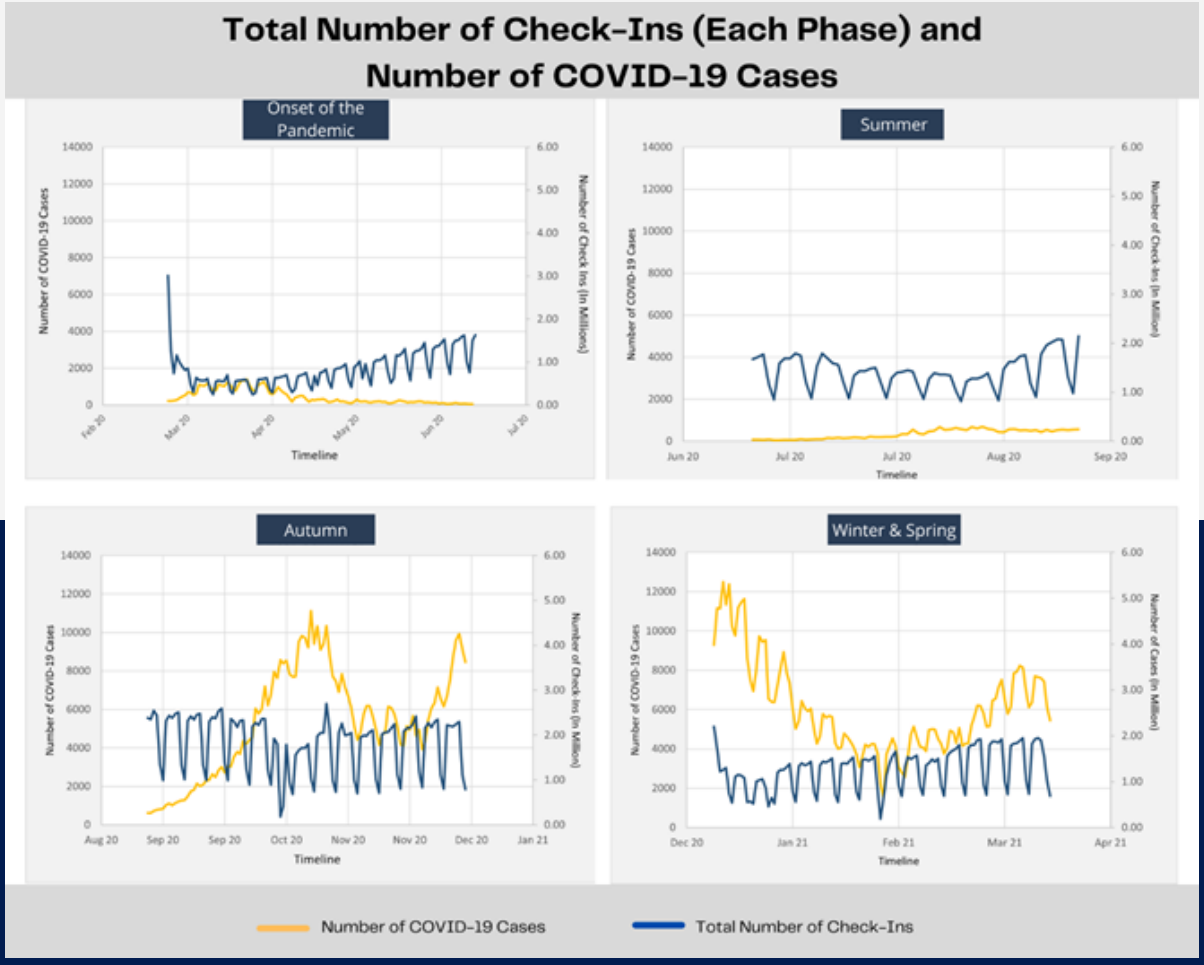


Figure 19: Total Number of Check-Ins (Each Phase) and Number of COVID-19 Cases

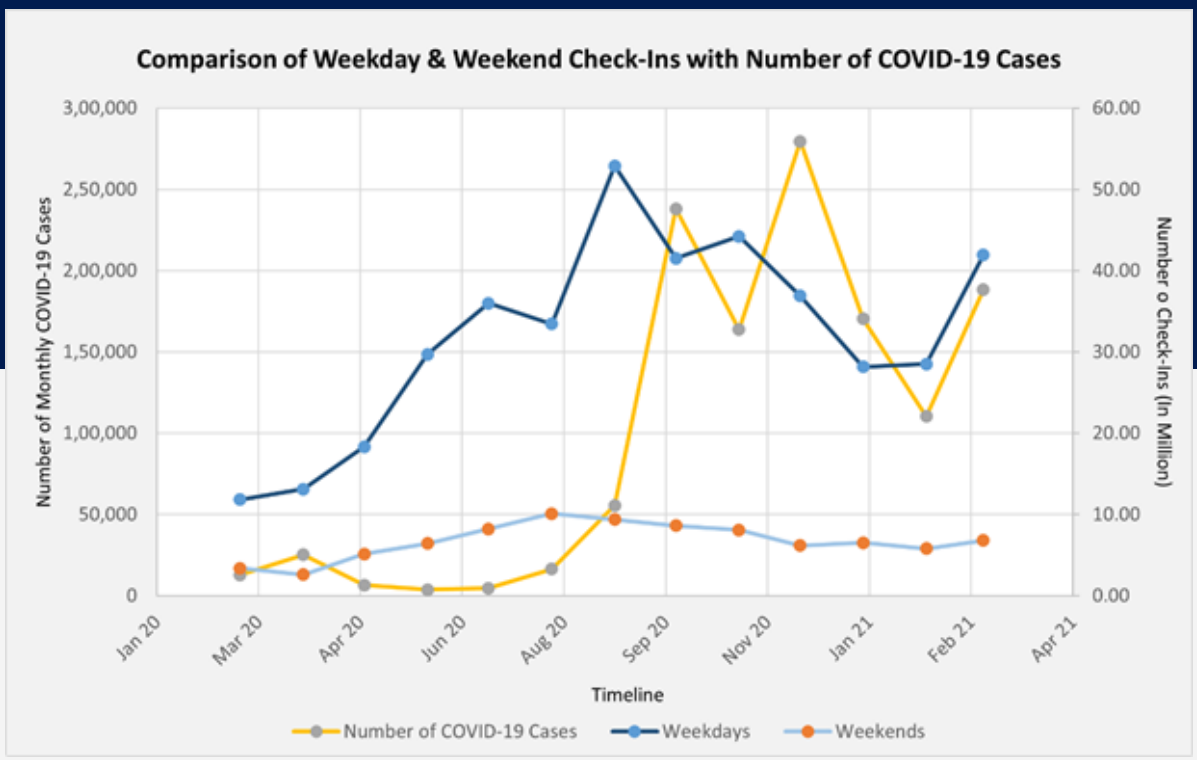


Figure 20: Comparison of Weekday & Weekend Check-Ins with Number of COVID-19 Cases

As it can be seen in figures 19 and 20, the difference between the check-ins of weekdays and weekends is significant. Thus, in figure 19, a comparison between the average check-ins for weekdays and weekends along with the average of the number of covid-19 cases each month have been made. As it can be seen in figure 20, similar to the observations made from the previous visualizations, both the weekends and weekdays indicate that with increasing number of cases, the check-ins decrease. However, it must also be noted that even though number of cases substantially increase after August 2020, so do the number of check-ins. They are of course considerably lower than what the numbers were in 2019, but in the context of the pandemic, it is relatively high; this increase in number of check-ins is also observed in research by van der Drift (2021). In the same research, the authors remark that "mobility gradually increased independent of the measures taken" (van der Drift et al., p. 12. 2020). This change in behaviour is due to a lot of people being indifferent to the rising number of cases and trying to "move on" with their lives. This observation is further recorded later in chapter 5 as well.

4.2.3 Change in the Use of Public Transport in Each Phase

Although the results of the previous section showed substantial changes in public transport usage, interviews with public transport service providers were undertaken to understand how the public transport operators were affected financially and what subsequent actions the government and the commercial industry plans to take. In the following sections, different problems that the public transport sector faced are further discussed based on the results of the interviews.

4.2.3a Onset of the Pandemic and Expected Changes

The common expectation from all the respondents was that due to the government's mandate of public transport operation on limited capacity, the number of passengers will significantly reduce. According to the respondent from the company Arriva, the company kept the business running at about 35% - 40% of the capacity. Similarly, the respondent of the company MuConsult, who works in public transport provision in the province of Noord-Holland, remarked that there was an extreme drop in the frequency of buses provided. Further elaborating on that, he explained that public operators get a budget based on the passengers and subsidies from provinces which varies from region to region. Areas with a high number of users have a smaller subsidy as compared to rural areas. Hence, with the onset of the pandemic, the number of users sharply fell and there was a big budget gap. This led to the providers changing the timetable and between March to June 2020 only 60% of the timetable was operated. Additionally, the respondents from OV-Bureau for Groningen and Drenthe remarked that only 8% of their users continued using their services when the pandemic hit.

Lastly, one of the responders from MuConsult, while explaining a probable future scenario noted that in the next 2-3 decades, they are expecting public transport use to reduce as WFH scenarios will be more common after the pandemic and commuting will reduce about 5-20%. This means that after the pandemic, it is highly likely that because of increasing WFH, trips taken to/from work will decrease, making it a significant travel behaviour change.

4.2.3b Unexpected Changes

Along with changes that were expected, some situations during the pandemic also came as unpleasant surprises. One responder from the Noord-Holland Province recalls that in Amsterdam, community services which are done in collaboration with PT providers had to stop as the volunteers were mainly formed by people in the risk group (60 years or older), which also included bus drivers in that age group which led to some routes staying without service. Additionally, it was also remarked that the general expectation of all the major transport providers was that things would "go back to normal" by June or July of 2020 but it wasn't the case. Thus, the providers started planning with a more long-term approach and decided to not keep the plans made when the pandemic began in place.

4.2.3c Change in Passenger Behaviour According to Transport Operators

When asked about their opinion on the change in passenger behaviour, all the respondents had a varied outlook. The (two) consultants in the province of Noord-Holland believe that even after the reopening of educational institutions, only 70% of the passengers would come back. They expect mobility behaviour to change significantly, not only because of the pandemic but also because of flexible work schemes. However, it was also noted that, despite the pandemic, during bad weather conditions (rain or snow) public transport is expected to be at full capacity still. The capacity fluctuates between specific seasons, winter mostly when there are too many people. Hence, it leads to the quality of the service fluctuating. Commuters going to work are also expected to cause congestion during peak rush hours, but it has reduced considerably during the pandemic. Additionally, one of the respondents noted that they expect 40% more people would work from home, which will imply that people will only commute to work 2-3 days a week and they will choose these days. Now it is not possible to work with the idea of peak days, but instead, the focus should be shifted to peak weeks. He believed that this will be a long-term effect of the pandemic. However, he also stated that it remains to be seen if this change is going to be temporary or permanent. He added that their idea is that in the short term, like 1-2 years, people will still have a negative feeling when it comes from public transportation as a result of the pandemic.

Interestingly, the responder from Arriva did not share the same viewpoints. He noted that the pandemic in general did not cause a negative impact on how people look at public transport as a business, but it has made people rethink the way they travel. The evaluation of people remains the same, but people are expected to opt for different travel choices. He thinks people follow one another, so at some point the industry will get back on business as usual. Although he also noted that some people adapted to the new situation, but the majority is expected to eventually go back as normal.

The respondent from OV Bureau Groningen-Drenthe expressed uncertainty when asked about whether the changes in people's travel behaviour that they perceived were permanent or temporary. He remarked that they understand the fear people have developed over the past year when it comes to being in public spaces, especially in public transport and that this fear has damaged the image of the industry. However, their organization, like many other public transport providers are working on various marketing strategies in order to improve this negative image, more of which will be further discussed in section 4.2.3g.

4.2.3d Change in Passenger Behaviour According to Passengers

These observations are collected from responses from the Focus Group Discussion and the Digital Survey. The passengers noted a general aversion towards public transport. Most passengers expressed that they were much more careful about hygiene, if travelling in Public Transport. Additionally, it was observed that almost all respondents lowered their use of public transport; if there was no other option for them, some respondents noted that they would try to travel outside of peak hours in order to avoid crowds. One respondent also noted that

"In the beginning, I was afraid to use it, but now I don't bother. I only hate to wear the mask all the time, but it doesn't stop me if I need to use public transport",

and another respondent said that

"I definitely feel that I'm more likely to take a personal vehicle or cycle to an appointment now and in the future to avoid the busy and crowded trains I used to take".

A big portion of respondents also indicated a changed preference in transport modes – from public transportation to personal vehicles like cars, or bikes. However, not everyone shared the same outlook. One respondent noted that they feel

"The (public transport) is more important than I thought for living in the Netherlands, and Amsterdam in specific".

The implications of these findings will be further discussed in section 4.2.4.

4.2.3e Public Transport Operations' Response to the Pandemic

IThe common observation reported was a change in timetables and a lower frequency of services. Further elaborating on that, the responder from Arriva noted that in their company, they predicted and drew different scenarios. These scenarios focused on how the general public was responding to the change in PT frequency and was developed in the local contexts. The accuracy of these scenarios was being checked regularly. Furthermore, he noted that in the western part of the country, there were more business commuters and in the eastern part there were more students, between the ages of 12-24 years. He also remarked that from these scenarios, they discovered that in the beginning, online schooling was working well but over time the students expressed frustration. It was observed that these scenarios, which were now being planned until 2025 showed that there will be a significant drop in passenger demand due to the pandemic in the coming years. For Arriva in particular, their bus lines operated at 90% of their original capacity, and each timetable was adjusted according to their local need. Meaning that they made their services less frequent but still provided 90% of their buses.

Another consequence of the reduced service meant that the companies were running at losses. So, the companies, as noted by the responder from OV-Bureau Groningen and Drenthe, had a massive optimization goal which meant that with lowering passenger numbers (50% in October to 40% in November and 25% in January), they needed to redesign their network in a way that was better but cheaper.

4.2.3f Financial Losses Incurred and Aid from the Government

It was noted from all the respondents that the public transport industry suffered significant losses. In terms of passengers, one responder remarked that there was an overall loss of 70% of travellers. Due to the financial losses, the government developed a subsidy plan in order to aid the public transport providers' operations. This subsidy plan was introduced in collaboration with all public transport providers and the municipalities. Additionally, it was also noted by one of the respondents that in order to get this subsidy from the government, the PT provider had to give the Ministry a concrete plan on how they will become a profitable industry again. The respondent from the province of Noord-Holland elaborated that the government offered one billion to the industry where they covered 90% of the operation costs and the operators had to pay 10% themselves. Additionally, the respondent from OV Bureau noted that during the pandemic they were only left with about 8% of their passengers, meaning that they suffered enormous financial losses. With the subsidy from the government, they tried to use it to optimize the system. This optimization led to them reducing the number of bus lines which deducted around 4-5 million euros on the time-table. The respondent from Arriva noted that although their financial losses incurred could not be

spoken about in detail, they were able to maintain 93% of their capacity. He also mentioned that the losses that were incurred were highly region-specific. Some regions did not have any significant loss whereas other regions faced enormous losses.

4.2.3g Future Plans

Because of the bad image attributed to public transport use due to the pandemic, the public transport industry has had to think of ways to make travel attractive again. As noted previously, people are not very inclined towards travelling in public transport again due to fear of exposure to the virus. The following actions are thus planned:

- Offer concessions: such as discounted rides,
- Change in modes of payment: it was also discussed that payment methods and ticketing systems can be reformulated in the future. Elaborating more on that, it was noted that there are plans to completely remove the OV-Chipkaart system and making it possible to pay the transit fee with bank cards.
- Region-specific marketing programmes

4.3 Comparison of Changes in Travel Behaviour (Before, During & After the Pandemic)

This section focuses on the comparison of changes in travel behaviour (before, during & after the pandemic). The results are derived from the focus group discussion and digital survey digital survey that were undertaken. For the focus group discussion, the sample comprised of 8 people and the session was conducted on Google Meet. For the digital survey, the sample size was 170 and was created on Maptionnaire. The sample characteristics for both these methods can be found in Table 5 and 6.

As discussed in section 4.1 the results also have been classified in a temporal manner, with the timeline for the digital survey being before, during, and after the pandemic. Here, it is important to note that as the pandemic is still going on, and there hasn't been an "after" yet, the responses in this category are what the respondents expect their behaviour to be once the situation normalises again. Furthermore, as explained in section 3.6, in order to understand all the different aspects of travel behaviour in the context of this study, this section has been further divided into sub-sections on the basis of the Trip Purpose. Additionally, in the sections discussing Mode Choices, PT comprises of buses, trains, trams, and metros, just like the Translink data. Lastly, as discussed in section 3.6, the aspect of travel time was also explored. However, no significant observations were made, and thus excluded from this chapter (chapter 4). The responses for this section can be found in the appendix.

Table 5: Sample Characteristics - Focus Group Discussion

Sample Characteristics - Focus Group Discussion	
Sample Size	9
Age Composition	22-69
Gender Composition	Male: 44% Female: 56%
Socio-Economic Background	Students: 2 Professionals: 7

Table 6: Sample Characteristics – Digital Survey

Sample Characteristics - Digital Survey	
Sample Size	170
Age Group Composition	18-34: 58% 35-49: 28% 51+: 9% Unknown: 5%
Gender Composition	Male: 24% Female: 74% Non-Binary: 1% Others: 1%

4.3.1 Trip Purpose: To/From Work

The trips in this category concern the trips taken to and from workplaces. As it can be observed in figure 21 below, for the trips made to and from work, the highest frequency before the pandemic was 5 or more times a week and the most popular mode of transport were bikes. Furthermore, it can also be seen that walking, cars, and trains are three other popular modes of transport. Comparing the before and during trip choices, it is determined that regular work trips had a significant decrease between the two timelines and the use of public transport, among other mode choices, reduced considerably. Moreover, it is also noted that bus trips reduced completely for the sample during the pandemic for work trips taken 5 or more times in the week. This, and the decrease in the use of trains can further be corroborated by the following remarks from the respondents – "I travel much less often by public transport to avoid extra (strange) contacts", and "I prefer to travel less (in public transport) to minimize risk of getting sick". Another responded noted that "I try to use bike more than public transport", a behaviour which can be observed in figure 21 as bike trips still remain consistently higher than all other modes while the use of public transport considerably reduces.

4.3.1a Trip Frequency

Due to the measure of work from home being made a norm by the Dutch government, the number of work trips taken decreased significantly, which was observed in figure 21. In this section, this change in travel behaviour is discussed in further details. As it can be observed in figure 22, the number of informed trips before/during the pandemic decreased about 64%. This stark decrease is a direct result of the work from home measure. Due to all virtually adaptable work being shifted online, the general consensus among the sample remained that even after the situation returns to normal, they would still like to continue having some days as work from home, rather than returning to work as "normal" or every day of the week. This observation is further confirmed from the expected number of trips taken after the pandemic (decrease of 37% from before the pandemic) as indicated in both figures 21 and 22.

4.3.1b Mode Choices

As it can be observed in figure 23 that before the pandemic, the share of PT usage is 35%, bikes is 30%, walking is 21%, and for cars is 13%. During the pandemic, the share of PT usage reduced to 18%, bikes increased to 39%, walking increased to 22%, and for cars increased to 20%. After the pandemic, it is expected that PT usage is likely to increase to 29%, bikes to decrease to 34%, walking to decrease to 20%, and cars to decrease to 17%. The reason for the decrease in PT usage

is directly related to the PT operation at a limited 40% capacity, and people's apprehension towards travelling in public transport. This is observed in all trip purposes. The increase in usage of bikes, walking and cars, is partly due to the apprehension of travelling in PT. Elaborating more on that, the increase in bike usage and walking is also explained by respondents wanting to maintain an active lifestyle during the pandemic. According to one respondent, who uses car as their primary mode of transport, remarked that they now prefer to walk or bike for their work trips instead of using their car because they feel its healthier. A similar consensus was also observed from some other respondents who expressed that due to their regular trips coming to a halt, they aim to find other means by which they can have an active lifestyle. Thus, despite working from home more often, they would like to choose alternative modes of transport (like bikes and walking) in whatever capacity possible in order to have a healthier lifestyle.

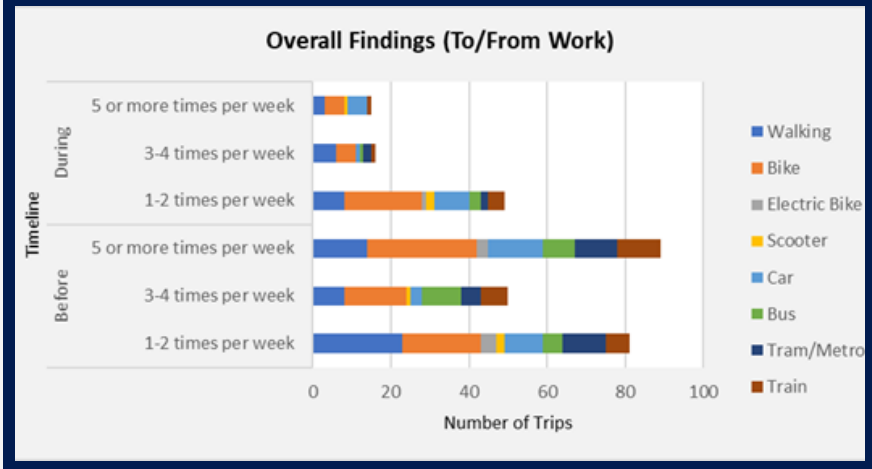


Figure 21: Overall Findings for To/From Work

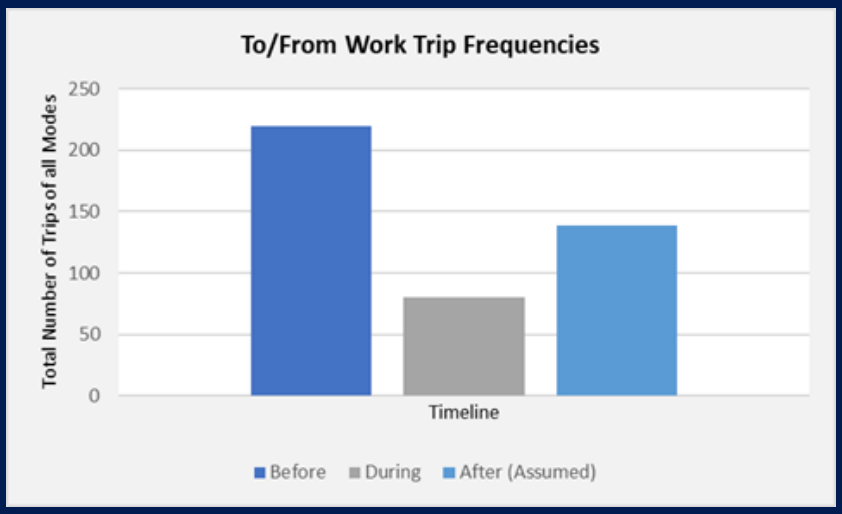


Figure 22: To/From Work Frequencies

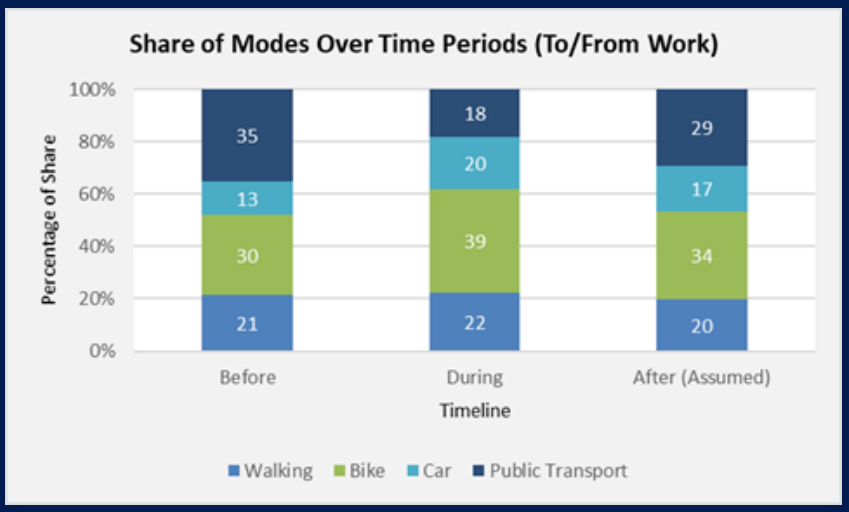


Figure 23: Share of Modes Over the Timeline (To/From Work)

4.3.2 Trip Purpose: For Work/Business

The trips in this category concern the trips taken for work- or business-related reasons. As it can be observed in figure 24 below, for the trips made for work or business, the highest frequency before the pandemic was 1-2 times a week and the most popular mode of transport were bikes and cars. Furthermore, it can also be seen that walking is another popular mode of travel. Comparing the before and during trip choices, it is determined that business related trips had a significant decrease between the two timelines and the use of public transport, among other mode choices, reduced considerably – to practically no usage during the pandemic. Moreover, it is also noted that bus trips reduced completely for the sample during the pandemic for work trips taken 3-4 times a week and 5 or more times in the week.

4.3.2a Trip Frequency

Due to the measure of work from home being made a norm and negative advice against travelling even within the country was propagated by the Dutch government, the number of trips for business reasons taken decreased significantly, which was observed in figure 24. In this section, this change in travel behaviour is discussed in further details. As it can be observed in figure 25, there was a 49.47% decrease in the number of trips taken before and during the pandemic. This stark decrease is a direct result of the work from home measure as well as the negative travel advice as mentioned previously. Due to all virtually adaptable work being shifted online, the general consensus among the sample remained that they would like to carry out whatever business activities are virtually permissible. However, all the activities that cannot be done online (for example site audits, etc.) will be done in person, thus explaining the higher rate of predicted trips after the pandemic as indicated in figure 25.

4.3.2b Mode Choices

As it can be observed in figure 26 that before the pandemic, the share of PT usage is 32%, bikes is 26%, walking is 22%, and for cars is 20%. During the pandemic, the share of PT usage reduced to 16%, bikes increased to 31%, walking increased to 24%, and for cars increased to 29%. After the pandemic, it is expected that PT usage is likely to increase to 31%, bikes to decrease to 29%, walking to decrease to 19%, and cars to decrease to 21%. Similar to the previous trip purpose, the reason for the decrease in PT usage is directly related to the PT operation at a limited 40% capacity, and people's apprehension towards travelling in public transport. Furthermore, as most work was virtually adapted, these trips also became redundant and resulted in a decrease in overall trip frequency.

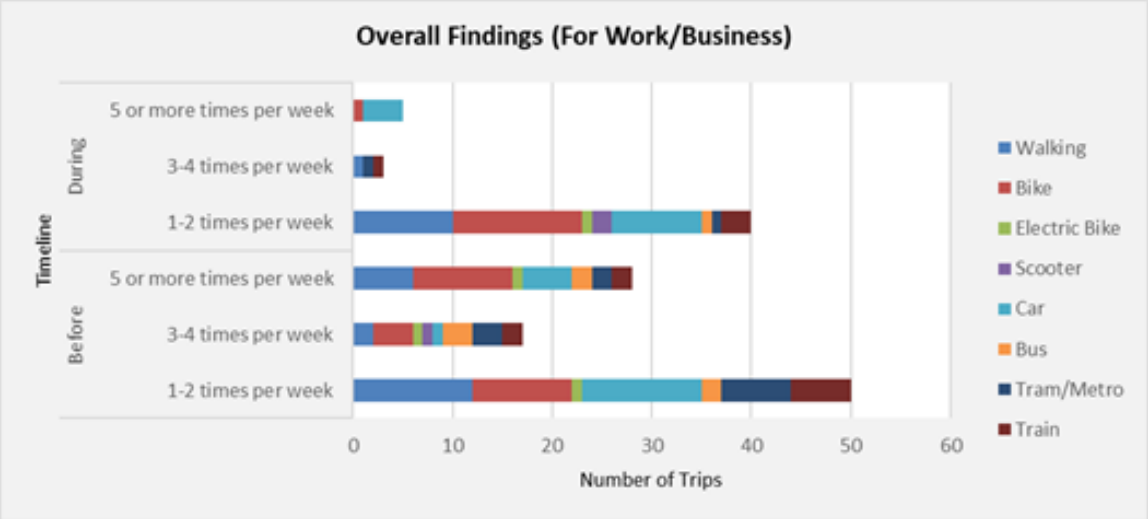


Figure 24: Overall Findings for Work/Business

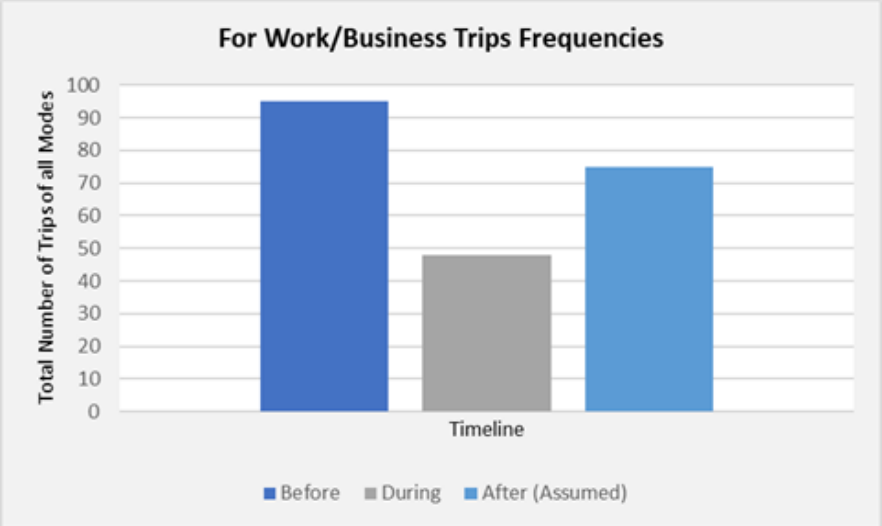


Figure 25: Trip Frequencies for Work/Business

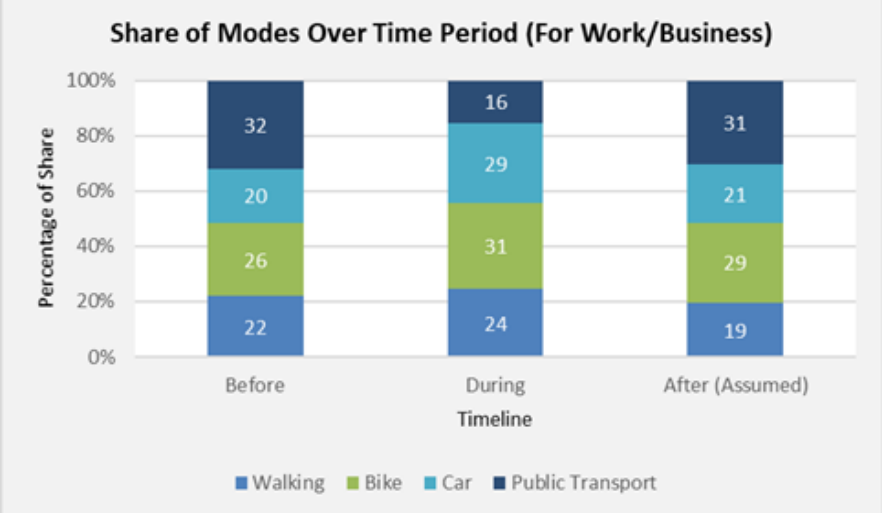


Figure 26: Share of Modes Over the Timeline (For Work/Business)

4.3.3 Trip Purpose: Grocery Shopping

The trips in this category concern the trips taken for grocery shopping. As it can be observed in figure 27 below, for the trips made for grocery shopping, the highest frequency before the pandemic was 1-2 times a week and the most popular mode of transport were bikes and walking. Furthermore, it can also be seen that car usage is also significant. Comparing the before and during trip choices, it is determined that grocery shopping trips had a significant decrease between the two timelines. Moreover, as it can be observed in figure 27, before the pandemic, trips taken 3-4 times a week and 5 or more times a week were considerably higher as compared to during the pandemic, where those trips decreased significantly, and trips taken 1-2 times a week increased. This behaviourial change is related to people feeling unsafe in public spaces about getting infected. Additionally, the use of public transport, among other mode choices, reduced considerably – to practically no usage during the pandemic. Moreover, it is also noted that bus trips reduced completely for the sample during the pandemic for trips taken 3-4 times a week and 5 or more times in the week.

4.3.3a Trip Frequency

Due to the fear of exposure to the virus the number of grocery shopping trips taken decreased significantly, which was observed in figure 27. In this section, this change in travel behaviour is discussed in further details. As it can be observed in figure 28, there was a 21.8% decrease in the number of trips taken before and during the pandemic. This slight decrease is because grocery shopping trips are essential and cannot be avoided. However, as previously noted, although the number of overall trips taken during the pandemic is less, there were other changes that were indicated by the sample. For example, some respondents noted that their eating habits changed during the pandemic, for some they started eating less, thus reducing their number of grocery trips. However, for some their food intake increased, which led to them spacing out their trips during the week and going to the supermarket multiple times. a direct result of the work from home measure as well as a growing preference for the same. Yet, due to the fear of exposure to the virus, everyone in the sample indicated that they tried to limit their trips as much as possible. Furthermore, as it can be observed in the predicted trip frequency after the pandemic, it is only slightly higher than that of during the pandemic, which is due to the fact that a lot of respondents who are employed are choosing to get their groceries delivered at home. As it is an added expense, this option was not popular among students.

4.3.3b Mode Choices

As it can be observed in figure 29 that before the pandemic, the share of PT usage is 5%, bikes is 36%, walking is 44%, and for cars is 15%. During the pandemic, the share of PT usage reduced to 3%, bikes slightly decreased to 34%, walking increased to 48%, and for cars remained the same. After the pandemic, it is expected that PT usage is likely to slightly increase to 4%, bikes to increase to 37%, walking to decrease to 41%, and cars to increase to 18%. As discussed in the

previous section, the most popular mode choice remains to be walking all throughout the timeline. For this trip purpose, PT usage is not significant, and walking and bike are the most popular mode choices. The expected increase in bike usage might just be indicative of the fact that people want to have a more active lifestyle.

Figure 27: Overall Findings for Grocery Shopping

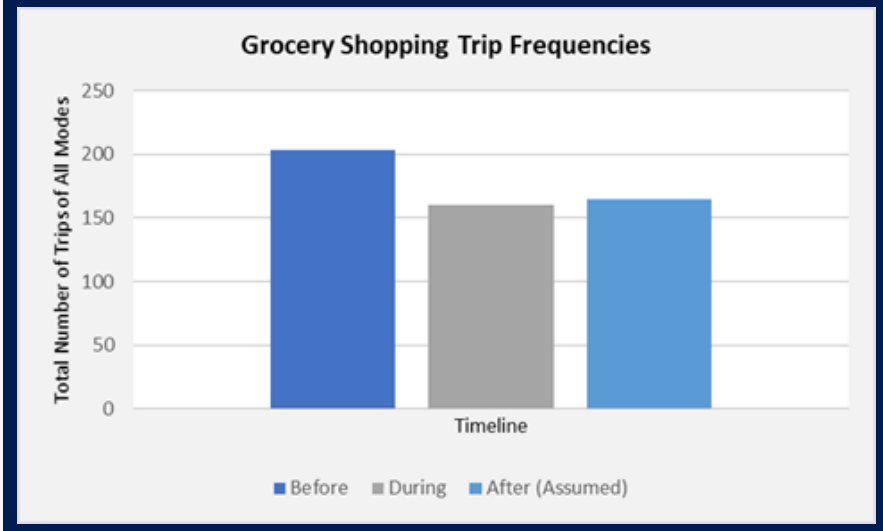


Figure 28: Trip Frequencies for Grocery Shopping

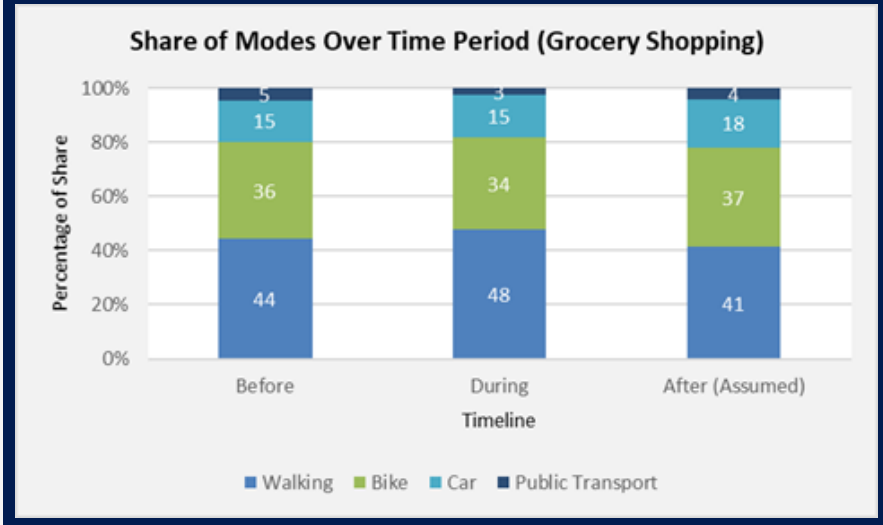


Figure 29: Share of Modes Over the Timeline (Grocery Shopping)

4.3.4 Trip Purpose: Other Shopping

The trips in this category concern the trips taken for shopping other than groceries. As it can be observed in figure 30 below, for the trips made for other shopping, the highest frequency before the pandemic was 1-2 times a week and the most popular mode of transport were bikes and walking. Comparing the before and during trip choices, it is determined that other shopping trips had a significant decrease between the two timelines. Furthermore, as observed, before the pandemic, the majority of the sample took these trips once or twice a week and although this frequency is the most common during the pandemic, there is a decrease of 48.32% between the two. Additionally, it can also be observed that the use of other modes of transport, although were not very high, still reduce significantly, especially public transport.

4.3.4a Trip Frequency

Due to the closure of non-essential shops, the number of trips for other shopping decreased significantly, which was observed in figure 30. In this section, this change in travel behaviour is discussed in further details. As it can be observed in figure 31, there was a 21.18% decrease in the number of trips taken before and during the pandemic. This decrease is a direct result of the closure of non-essential shops as well as the negative travel advice against non-essential movement. Furthermore, there is only a slight increase in other shopping trips after the pandemic, and this might be due to an increasing preference for online shopping as indicated by some respondents.

4.3.4b Mode Choices

As it can be observed in figure 32 that before the pandemic, the share of PT usage is 19%, bikes is 33%, walking is 36%, and for cars is 12%. During the pandemic, the share of PT usage reduced to 8%, bikes increased to 35%, walking increased to 45%, and for cars remained the same. After the pandemic, it is expected that PT usage is likely to slightly increase to 20%, bikes to increase to 36%, walking to decrease to 32%, and cars to remain the same.

As discussed in the previous section, the most popular mode choice remains to be walking all throughout the timeline, except in the predicted frequency for after the pandemic where bikes are indicated to be the most popular. It was also observed that tram usage was relatively high for this trip purpose. The tram users for this particular scenario are living in the Randstad region and indicated that they predict to use trams much more after the pandemic.

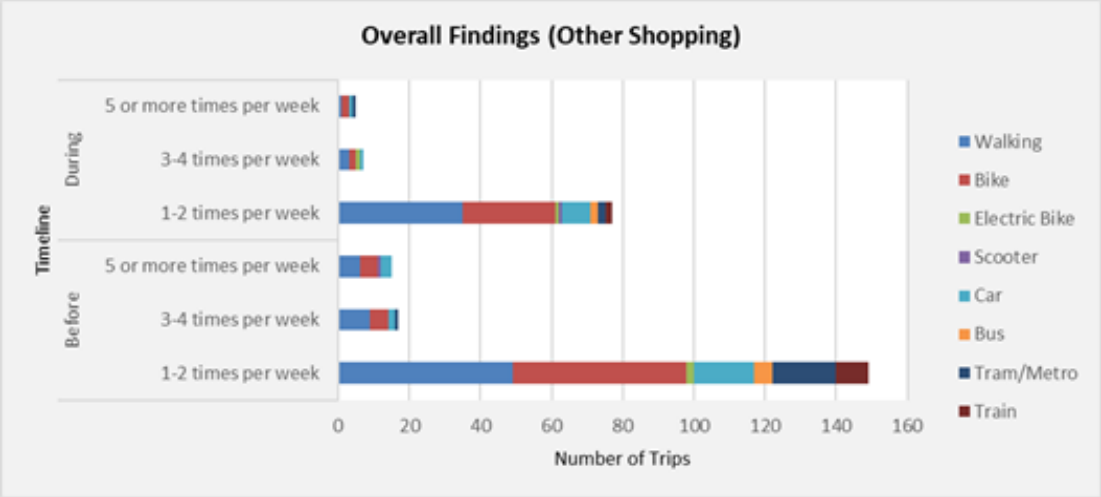


Figure 30: Overall Findings for Other Shopping

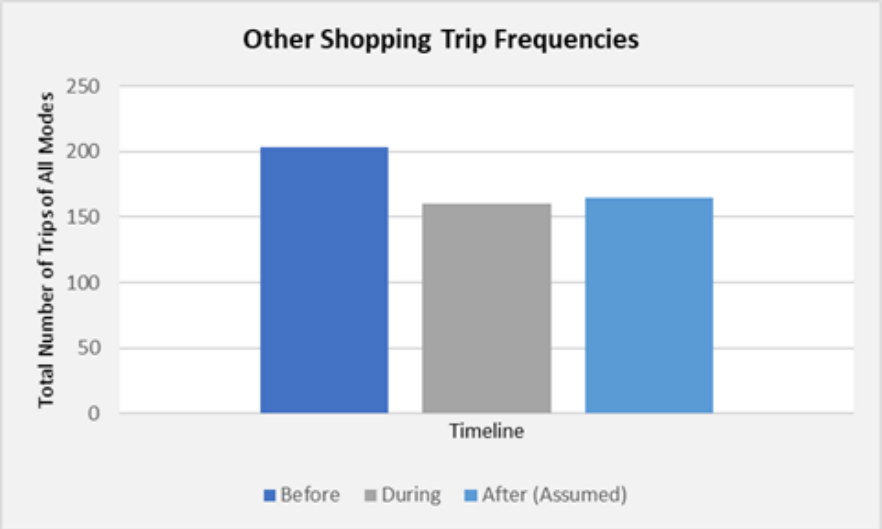


Figure 31: Trip Frequencies for Other Shopping

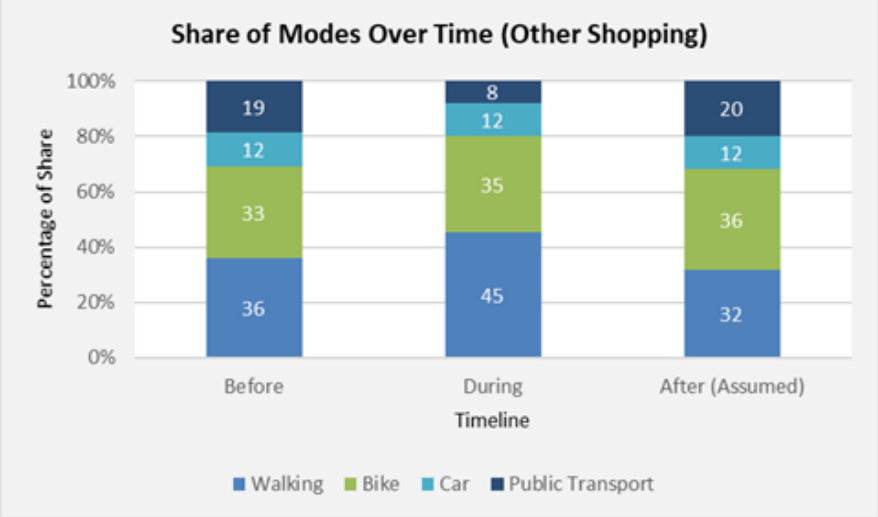


Figure 32: Share of Modes Over the Timeline (Other Shopping)

4.3.5 Trip Purpose: To/From School/University

The trips in this category concern the trips taken to and from educational institutes, i.e. schools and universities. Like the to/from work trips, it can be observed in figure 33 below, for the trips made to and from schools/universities, the highest frequency before the pandemic was 5 or more times a week and the most popular mode of transport were bikes. Furthermore, it can also be seen that walking is another popular mode of transport. Comparing the before and during trip choices, it is determined that regular education-related trips had a significant decrease between the two timelines and the use of public transport, among other mode choices, remains somewhat the same. Moreover, it is also noted that bus trips increased significantly for the sample during the pandemic for educational trips taken 1-2 times in the week. This, and the increase in the use of trains can further be corroborated by the fact that a lot of Dutch students went back to their families' homes during the pandemic and travelled by public transport to their educational institutes whenever there was a need.

4.3.5a Trip Frequency

Due to the measure of work from home being made a norm by the Dutch government, the number of educational trips taken decreased significantly, which was observed in figure 33. In this section, this change in travel behaviour is discussed in further details. As it can be observed in figure 34, there was a 30% decrease in the overall number of trips taken before and during the pandemic. This decrease is a direct result of the work/study from home measure as well as a growing preference for the same. Due to all virtually adaptable education being shifted online, the general consensus among the sample remained that even after the situation returns to normal, they would still like to continue having some days as where they can attend their lectures from home, rather than returning to the educational institutes as "normal" or every day of the week. This observation is further confirmed from the expected number of trips taken after the pandemic as indicated in both figures 33 and 34.

4.3.5b Mode Choices

As it can be observed in figure 35 that before the pandemic, the share of PT usage is 18%, bikes is 55%, and walking is 27%. During the pandemic, the share of PT usage reduced to 16%, bikes decreased to 49%, and walking increased to 35%. After the pandemic, it is expected that PT usage is likely to increase to 24%, bikes to increase to 51%, and walking to decrease to 25%. Cars were not included for this trip purpose as the reported usage was very low.

As discussed in the previous section, the most popular mode choice remains to be bikes all throughout the timeline. It can be observed in figure 35 that for walking, the popularity remains somewhat consistent even after an overall reduction in the number of trips the frequency of trips taken. Additionally, it can also be observed that in the predicted number of trips after the pandemic, the number is not expected to go back to what it was before the pandemic as all educational institutes had to adapt their curriculum virtually and the students in the sample indicated that they would prefer a mixed schedule between online and offline education instead of going to school completely.

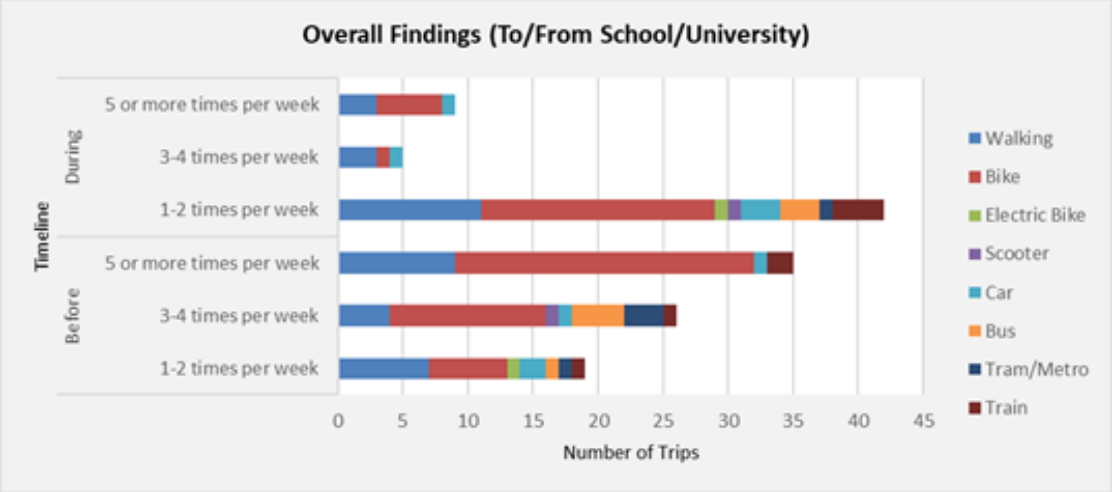


Figure 33: Overall Findings for To/From School/University

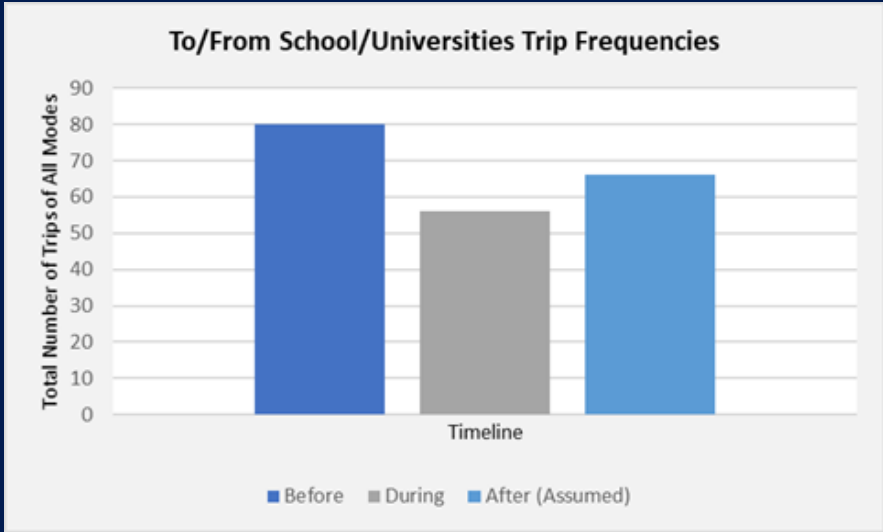


Figure 34: Trip Frequencies for To/From School/University

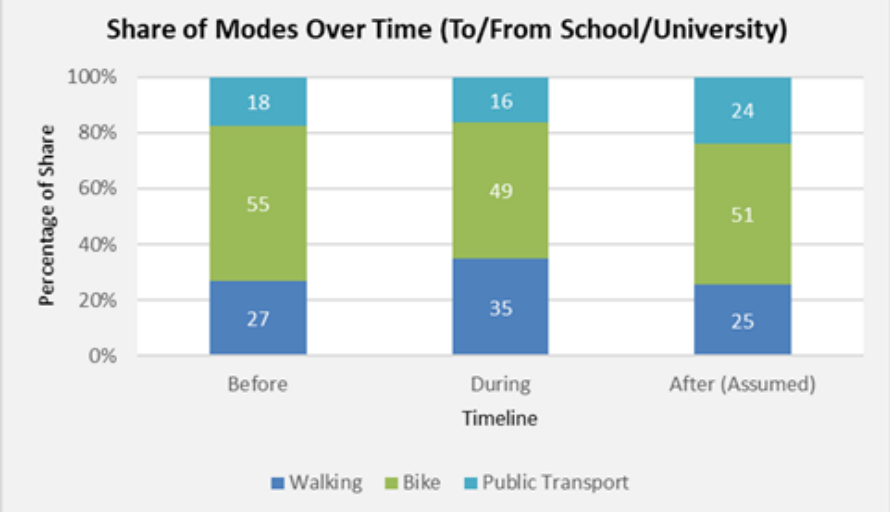


Figure 35: Share of Modes Over the Timeline (To/From School/University)

4.3.6 Trip Purpose: Sports

The trips in this category concern the trips taken for sports-related reasons. As it can be observed in figure 36 below, for the trips made for sports, the highest frequency before the pandemic was 1-2 times a week and the most popular mode of transport were bikes and walking. Comparing the before and during trip choices, it is determined that overall, sports-related trips had a significant decrease between the two timelines. Furthermore, as observed, before the pandemic, the majority of the sample took these trips once or twice a week and although this frequency is the most common during the pandemic, there is a decrease of 33.73% between the two. Additionally, it can also be observed that the use of other modes of transport, although were not very high, still reduce significantly, especially car usage.

4.3.6a Trip Frequency

Due to the measure of sport activities remaining closed by the Dutch government, the number of trips for sports taken decreased significantly, which was observed in figure 36. In this section, this change in travel behaviour is discussed in further details. As it can be observed in figure 37, there was a 42.34% decrease in the number of trips taken before and during the pandemic. This stark decrease is a direct result of the closure of group sports activities as mentioned previously. However, in order to maintain a healthy lifestyle, it was gathered from the sample that when group sports activities were finally allowed while social distancing, a lot of the respondents engaged in them. Additionally, as a replacement for sports, they adapted their way of staying active by going on more runs, walks, working out at home, etc.

4.3.6b Mode Choices

As it can be observed in figure 38 that before the pandemic, the share of PT usage is 5%, bikes is 46%, walking is 39%, and for cars is 11%. During the pandemic, the share of PT usage remained the same, bikes decreased to 38%, walking increased to 49%, and for cars decreased to 8%. After the pandemic, it is expected that PT usage is likely to slightly increase to 7%, bikes to increase and return to to 46%, walking to decrease to 38%, and cars to very slightly increase to 9%.

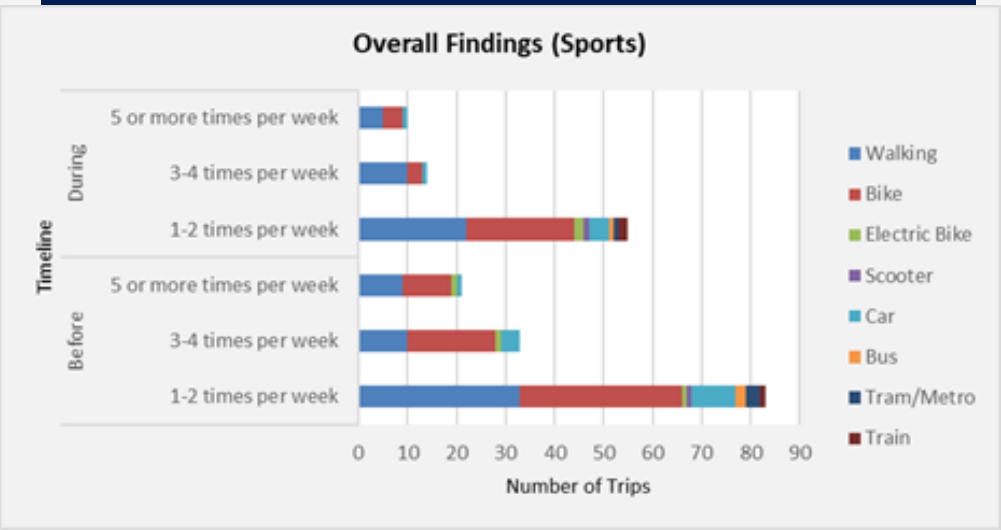


Figure 36: Overall Findings for Sports

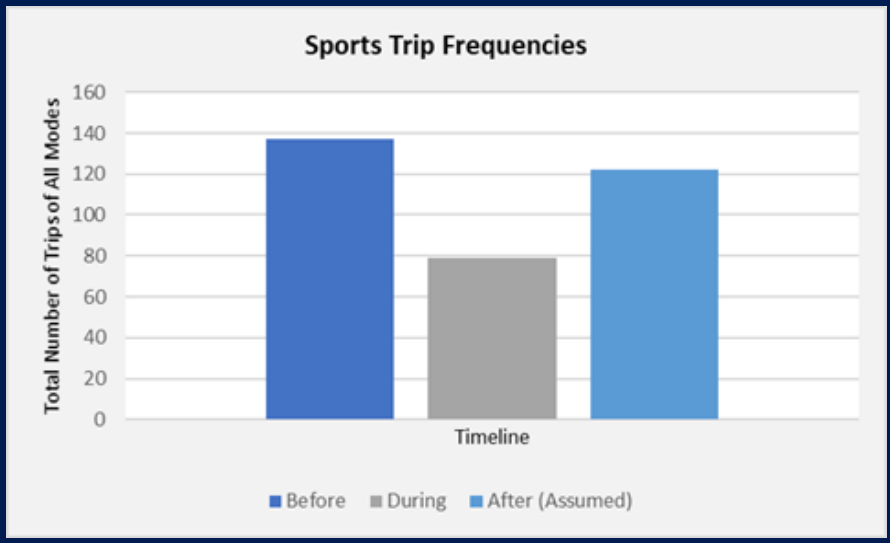


Figure 37: Trip Frequencies for Sports

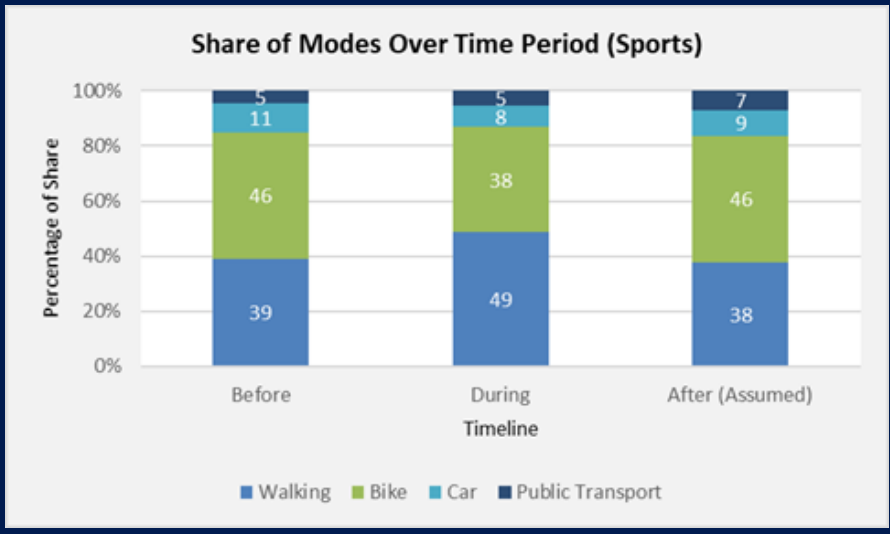


Figure 38: Share of Modes Over the Timeline (Sports)

4.3.7 Trip Purpose: Hobbies

The trips in this category concern the trips taken for hobby-related reasons. Like trips made for sports, it can be observed in figure 39 below, for the trips made for hobbies, the highest frequency before the pandemic was 1-2 times a week and the most popular mode of transport were bikes and walking. Comparing the before and during trip choices, it is determined that overall, hobby-related trips had a significant decrease between the two timelines. Furthermore, as observed, before the pandemic, the majority of the sample took these trips once or twice a week and although this frequency is the most common during the pandemic, there is a decrease of 38.53% between the two. Additionally, it can also be observed that the use of other modes of transport, although were not very high, still reduce significantly, especially public transport usage.

4.3.7a Trip Frequency

Due to the measure of cultural institutions like museums, art shows, etc. remaining closed by the Dutch government, the number of trips for hobbies taken decreased significantly, which was observed in figure 39. In this section, this change in travel behaviour is discussed in further details. As it can be observed in figure 40, there was a 43.95% decrease in the number of trips taken before and during the pandemic. This stark decrease is a direct result of the closure of cultural institutions as mentioned previously. However, in order to keep themselves occupied while social distancing and staying home, it was gathered from the sample that they took up new hobbies which could be done from home, like playing an instrument, painting, etc.

4.3.7b Mode Choices

As it can be observed in figure 41 that before the pandemic, the share of PT usage is 20%, bikes is 38%, walking is 32%, and for cars is 10%. During the pandemic, the share of PT usage decreased to 10, bikes decreased to 35%, walking increased to 44%, and for cars increased to 12%. After the pandemic, it is expected that PT usage is likely to go back to 20%, bikes to increase to 40%, walking to decrease to 33%, and cars to decrease to 7%.

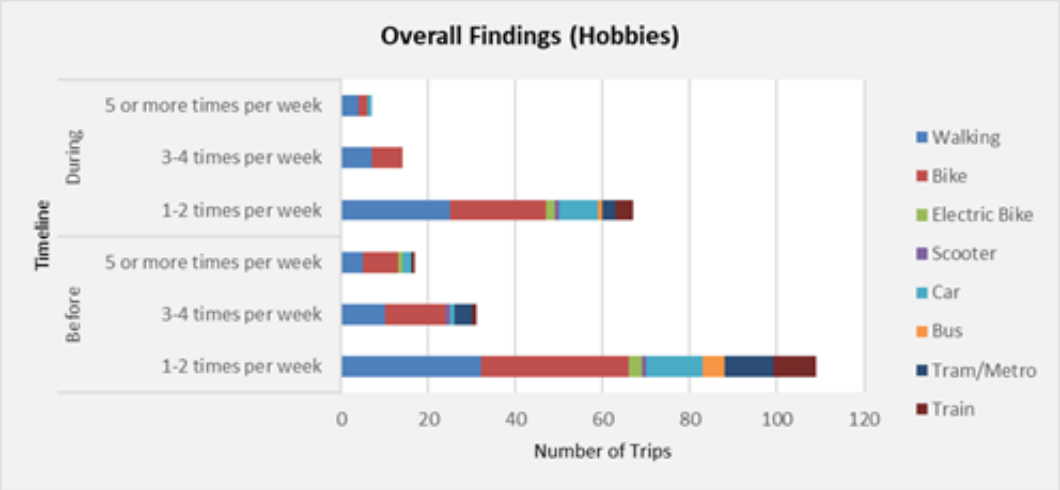


Figure 39: Overall Findings for Hobbies

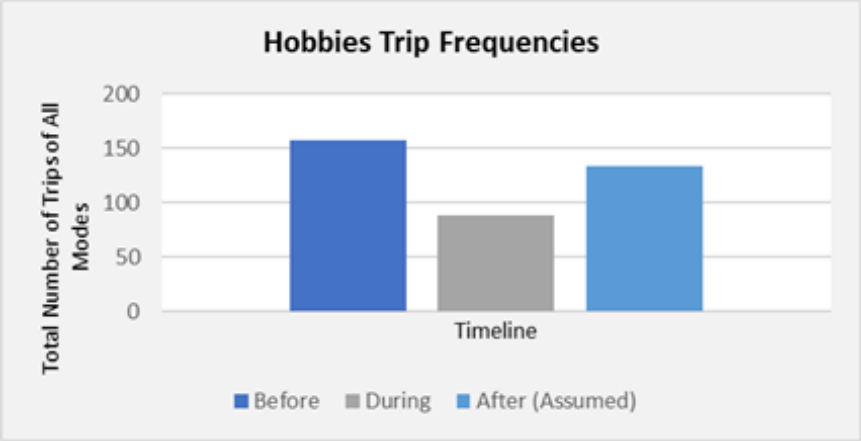


Figure 40: Trip Frequencies for Hobbies

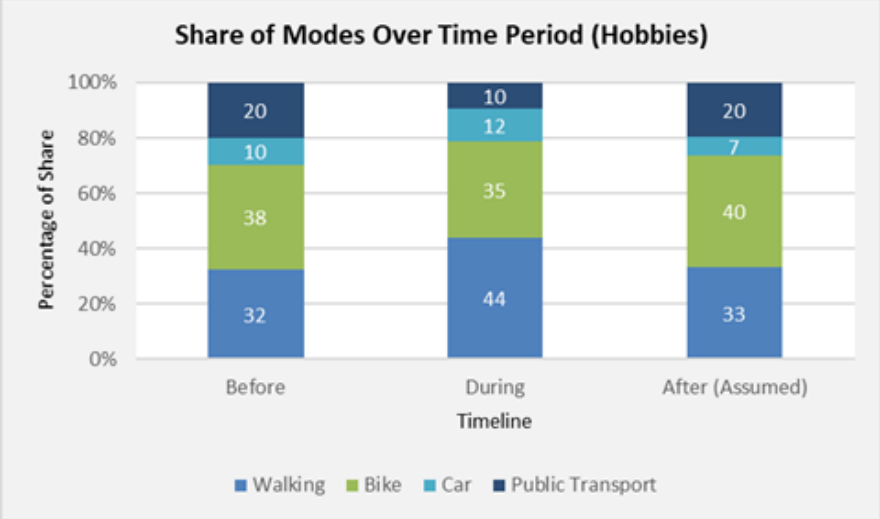


Figure 41: Share of Modes Over the Timeline (Hobbies)

4.3.8 Trip Purpose: Visit Friends & Family

The trips in this category concern the trips taken for visiting friends and family reasons. As it can be observed in figure 42 below, for the trips made for visiting friends and family, the highest frequency before the pandemic was 1-2 times a week and the most popular mode of transport were bikes, walking, cars and public transport (specifically tram/metro and trains). Comparing the before and during trip choices, it is determined that overall, visitation related trips had a significant decrease between the two timelines, especially for trip frequencies of 3-4 times a week and 5 or more times a week. Furthermore, as observed, the before the pandemic, majority of the sample took these trips once or twice a week and although this frequency is the most common during the pandemic, there is a decrease of 51.43% between the two.

4.3.8a Trip Frequency

Due to the measure of social distancing and constant advice of staying home by the Dutch government, the number of trips for visiting friends and family taken decreased significantly, which was observed in figure 42. In this section, this change in travel behaviour is discussed in further details. As it can be observed in figure 43, there was a 38.74% decrease in the number of trips taken before and during the pandemic. This significant decrease is a direct result of social distancing and reducing the spread of the virus as mentioned previously. However, for the predicted frequency for after the pandemic, it can be seen that the number increases sharply and is even more than that of before the pandemic. This is a direct results of post-social distancing effects.

4.3.8b Mode Choices

As it can be observed in figure 44 that before the pandemic, the share of PT usage is 34%, bikes is 30%, walking is 20%, and for cars is 16%. During the pandemic, the share of PT usage decreased to 22, bikes decreased to 28%, walking increased to 30%, and for cars increased to 20%. After the pandemic, it is expected that PT usage is likely to increase to 35%, bikes to slightly increase to 29%, walking to decrease to 19%, and cars to decrease to 17%. This is because travel too much within the country was being discouraged and whichever friends and families people met were in the same city and in close proximity.

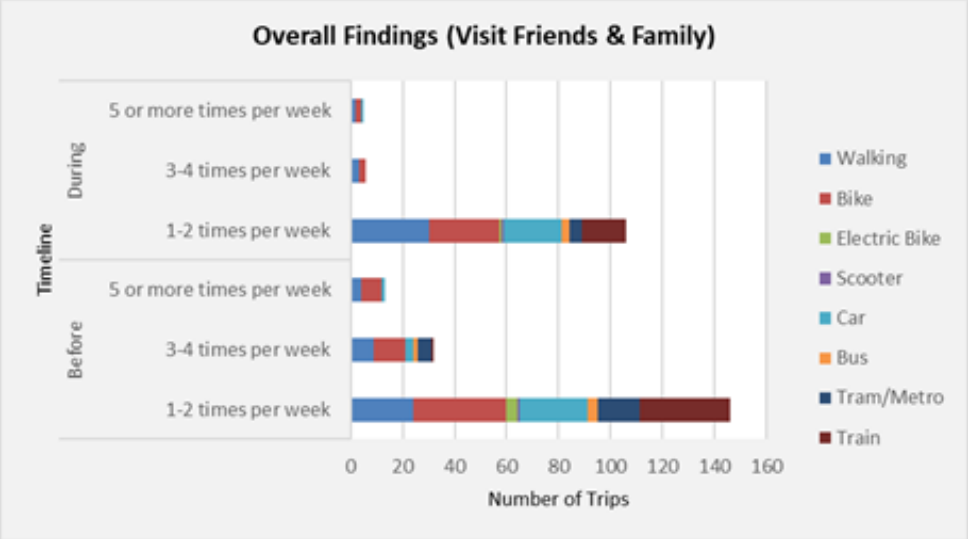


Figure 42: Overall Findings for Visit Friends & Family

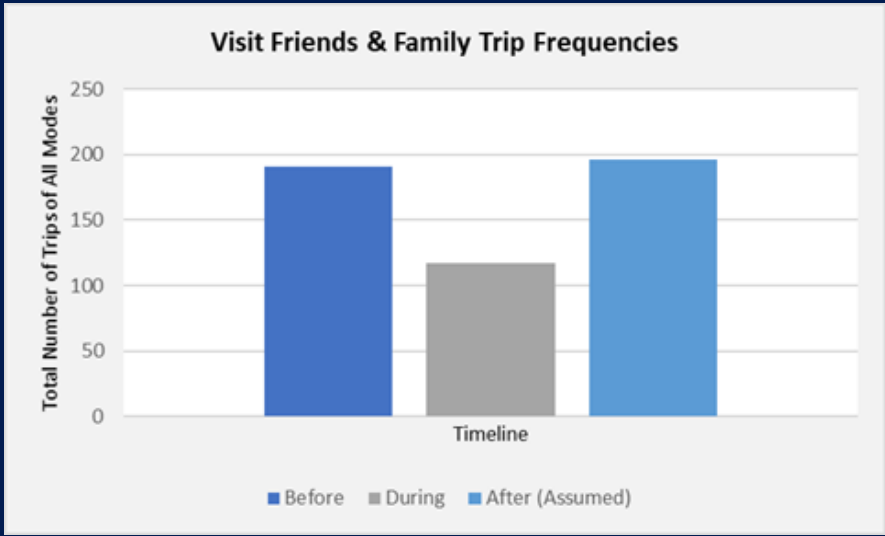


Figure 43: Trip Frequencies for Visit Friends & Family

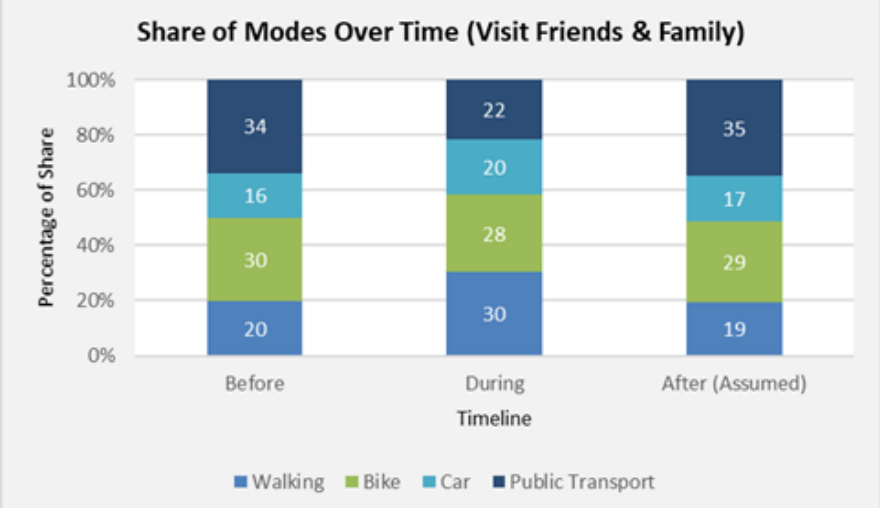


Figure 44: Share of Modes Over the Timeline (Visit Friends & Family)

4.3.9 Trip Purpose: Leisure Activities

The trips in this category concern the trips taken for leisure activities like going to the park, running, etc. As it can be observed in figure 45 below, for the trips made for leisure activities, the highest frequency before the pandemic was 1-2 times a week and the most popular mode of transport were bikes and walking. Comparing the before and during trip choices, it is determined that overall, these trips had a significant decrease between the two timelines, especially for trip frequencies of 3-4 times a week and 5 or more times a week, similarly to the trip purpose of visiting friends and family. Furthermore, as observed, the before the pandemic, majority of the sample took these trips once or twice a week and although this frequency is the most common during the pandemic, there is a decrease of 78.57% between the two.

4.3.9a Trip Frequency

Due to the measure of social distancing and constant advice of staying home by the Dutch government, the number of trips for leisure activities decreased significantly, which was observed in figure 45. In this section, this change in travel behaviour is discussed in further details. As it can be observed in figure 46, there was a 47.57% decrease in the number of trips taken before and during the pandemic. This significant decrease is a direct result of social distancing and closing of sports and cultural institutions as mentioned previously. However, for the predicted frequency for after the pandemic, it can be seen that the number increases sharply and is due to the reopening of all facilities.

4.3.9b Mode Choices

As it can be observed in figure 47 that before the pandemic, the share of PT usage is 28%, bikes is 32%, walking is 27%, and for cars is 13%. During the pandemic, the share of PT usage decreased to 14, bikes decreased to 31%, walking increased to 39%, and for cars increased to 17%. After the pandemic, it is expected that PT usage is likely to increase to 32%, bikes to slightly decrease to 30%, walking to decrease to 25%, and cars to decrease to 13%. If looked at closely, it can be seen in figure 47 that the mode share is quite similar between before the pandemic and the expected numbers for after the pandemic. This is because people are likely to go back to the same leisure activities they part-take in after the reopening of cultural and recreational places.

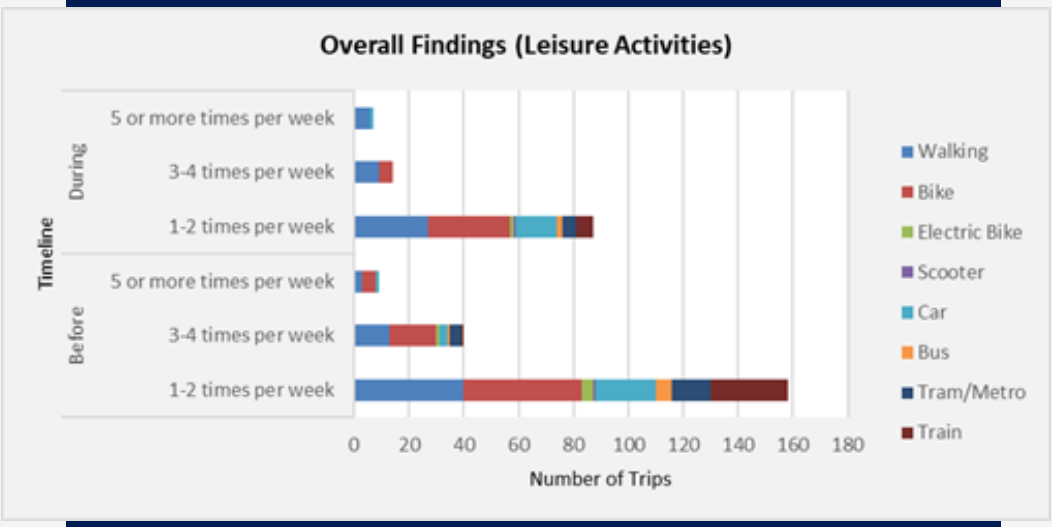


Figure 45: Overall Findings for Leisure Activities

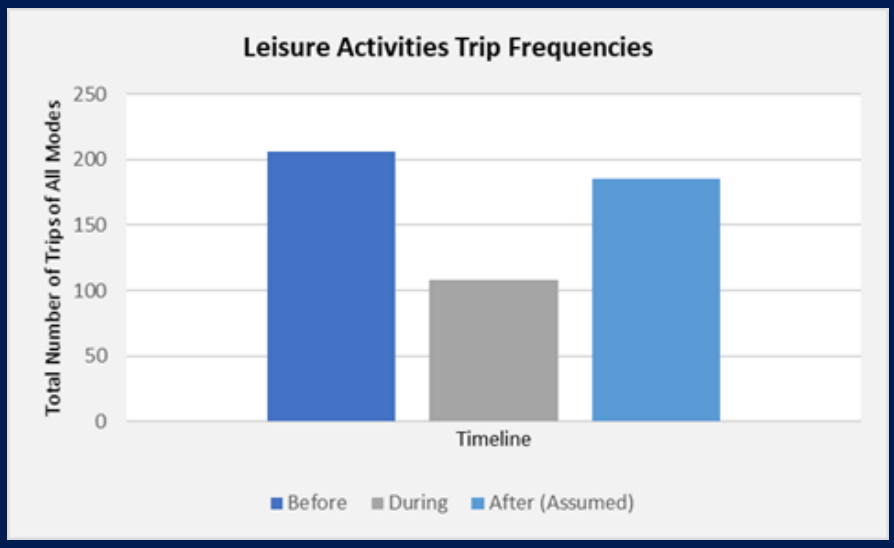


Figure 46: Trip Frequencies for Leisure Activities

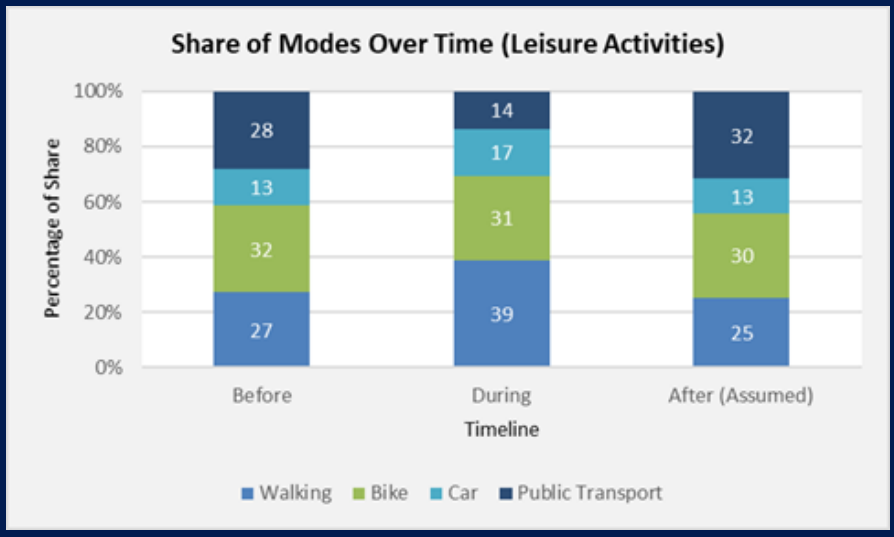


Figure 47: Share of Modes Over the Timeline (Leisure Activities)

Chapter Summary

The pandemic led to many changes in terms of travel behaviour. It was observed that the number of check-ins reduced significantly between January 2019 and April 2021, which also was a result of passengers having an apprehension towards travelling in public transport. This apprehension is justified by the fear of exposure to the virus, as well as the social distancing measures enforced by the Dutch government. The public transport providers faced a number of challenges while managing bus and train services. The frequency of services provided reduced, which led to huge financial losses. However, the government approved a 1.5-billion-euro budget to help the companies make up for the loss. Additionally, the companies also plan on introducing new promotional marketing campaigns after the pandemic in order to bring back passengers.

From a people-centric point of view, it was observed that due to the social distancing and work from home norms, trip frequencies for all trip purposes significantly reduced. Furthermore, it was observed that with the decrease in preference for public transport, bike usage and walking significantly increased. In some cases, even car use increased.

All the observations made in this chapter will aid in determining the policy recommendations which are to be provided to the authorities as an objective of this research.

CHAPTER 5

Discussion

The main rationale behind this study was to understand how people's behaviour changed as a result of the coronavirus pandemic. The government's policies, as well as the behavioural change of people was hypothesized to not only exist during the pandemic, but also have a long-lasting and structural effect on travel behaviour. Compared to previous studies (de Haas, 2020; van der Drift, 2021), the results of this study also indicate the following - the increasing preference for working from home, using more sustainable transport modes (e.g., biking and walking), findings ways to lead a more active lifestyle, etc., all seem to continue. As van der Drift et al. (2021) also remark "Cycling increased substantially as an alternative mode, not only in terms of the number of trips, but also distance travelled" (p.3). The peak demand for cycling showed similar or higher usage of bicycles and substantially higher usage during off-peak periods compared with before the 'intelligent' lockdown'. Additionally, the findings of this research regarding the increase in the use of bikes are also like that of de Haas et al. (2020) where they report that 20% of their sample expect to cycle and walk more in the future. Furthermore, as it was discussed in the study conducted by TU Delft and NS (2020), the results in this study also show a significant decrease in public transport usage.

Dividing the data in this study in the different phases helped put the situation in a clearer perspective: it showed the significant differences in each phase and how as time and the measures progressed, people's attitudes towards their mode choices and trip purposes changed. The interviews helped in gauging how the operations of PT had to drastically change due to the pandemic. This qualitative data determined the adjustments that had to be made to public transportation on short notice and how it affected the functioning over time. It also helped in understanding how the public transport sector plans to recover from the losses it incurred over the course of this pandemic. Lastly, the focus group discussion and the digital survey provided a closer look at how the pandemic affected people's daily travel behaviours and their life in general.

The pandemic can be regarded as a once-in-a-lifetime event (de Haas et al. 2020) and looking at this from a behavioural studies perspective (e.g., the concepts of beliefs, attitudes, and intentions from Ajzen's theory of Planned Behaviour (1991) can be fruitful for further research and provide an amalgamated perspective between psychology and travel behaviour. In the next sections, the results of this research are further evaluated with regards to the research objectives. Firstly, the results per research objective of this study are discussed. Secondly, policy recommendations are provided based on the results acquired from the first and second research objectives. Lastly, the limitations of this research are addressed.

5.1 General effect of the pandemic on people's lives

According to most of the respondents, the pandemic has had a negative effect on their lives. For most, personal life was reported to be very lonely. Because of the travel restrictions the respondents indicated feeling even more isolated because no one was able to visit their families. All respondents had a common feeling that their daily lives had become much more draining and lazier due to working from home and the inability to go out, apart from short walks or bike rides. However, it was also noted that working from home is a good measure and should be included in company policies under normal circumstances as well. Respondents agreed that this would help in reducing the high volume of traffic that is usually present during the weekdays, especially in the Randstad region. In addition to personal lives, their professional lives were also reported to have been affected. They felt a lack of creativity and missed working in an office environment. Due to the shock-value of the pandemic and normal circumstances changing practically overnight, it was a difficult situation to get used to. That, and the additional fear of exposure contributed to people staying indoors more and thus, furthering the isolation. Lastly, while a part of the respondents complimented the government for the taking the steps that they did to control the pandemic, a large part expressed dissidence towards the measures and how they were not very effective. This last point is further discussed in section 5.3.

5.2.1 Changes in Trip Frequencies and Mode Choices

When it came to trip frequencies, for most of the sample, due to the work from home measure, the frequency of travel had reduced quite a bit. Overall, the respondents used between 1 to 3 different modes of transport on a daily basis before the pandemic, which continued during the pandemic as well. An apprehension towards travelling in trains and other public transport modes was also noted. It was determined from the focus group discussion that none of the respondents used a car as a mode of travel before but some of them considered buying a car during the pandemic. However, the previously mentioned apprehension towards public transport was not agreed upon by everyone as some participants said that due to the low volume of people in trains, they actually feel safer. Overall, the different modes of transport consistently used before and during the pandemic were bikes and walking. Additionally, the respondents of the focus group discussion were also asked whether the Dutch government's mandate about public transport operating at 40% capacity affected them, for which most of the sample noted that it did not affect them. For trip purposes like sports, leisure activities and hobbies, travel decreased significantly which was due to the closure of all facilities during the last year. Furthermore, because overall all trips reduced, people sought different ways to keep their lifestyle active, which resulted in an increase in trips taken by walking and cycling, which was also reported in van der Drift et al. (2021) and de Haas et al. (2020)

5.2.2 Changes in Trip Purposes

It was observed that there was a significant change in the trip purposes before and during the pandemic. For example, leisure trips (like going for walks, to the park, cycling) increased for everyone, although some respondents noted that they were feeling lazy, yet they still tried to maintain a somewhat active lifestyle. Additionally, for all the respondents, the number of grocery shopping trips decreased significantly. For example, for some the frequency reduced from 3 – 4 times a week to once a week, or once in two weeks. Lastly, as expected, work trips decreased sharply for every respondent. Due to the closure of sports, cultural and educational institutes, these trips had reduced significantly, however, some responses in the digital survey show that these trips are expected to increase once the situation improves.

5.3 Policy Recommendations

The final objective of this research endeavour is to provide policy recommendations to the Dutch government. The proposed policies are compiled after careful analysis of the results, the measures that were introduced in the Netherlands during the timeline of this study, and the responses from the focus groups discussion, digital survey, and interviews. It is of paramount importance to note at this point that these policy recommendations aim to suggest policies which will help the Dutch government manage the situation better should a situation like this arise again and is not an attempt to criticise the existing measures. Keeping that in mind, the following are the policy recommendations based on this research:

- **Ensure that emergency measures are enforced properly, consistent, and follow a clear timeline**

In order to keep confusion among people out of the way, the government should take measures that are consistent and not change them frequently, keep the timeline of these measures clear and ensure that these measures are being followed properly. This can be done by introducing penalties and fines for those who are caught breaking the rules. Although the Dutch government did try to keep all these in mind, it was discovered from a lot of survey responses that people felt that the measures weren't being enforced properly by the local authorities and appropriate importance was not given enough to the situation. To avoid that in future, these measures should be made stricter.

- **Compensation for transport providers, both regional and long-distance**

The Dutch government received approval for a €1.5 billion to compensate transport providers during the pandemic. This was appreciated by the transport providers in the sector who were interviewed for this research. As the Dutch government already put a compensation plan in place for financial support to this sector, the recommendation is to continue this financial aid for a longer period of time. This is because the apprehension towards public transport is

expected to last longer, and financial aid for the providers would help keep their services running.

- **Promotion of particular modes (bikes, walking) of transport during emergency situations**

If a situation like this were to arise again, the government is advised to encourage its people to use certain modes of transport more than others. For example, using bikes more than public transport to travel short distances, and adjust these advices according to the situation at hand. A possible method to achieve this could be through promotional campaigns through advertisements on television, radio, newspapers, etc.

5.4 Limitations of this study

The main limitation of this study was the generalized nature of the research. The study was set up in such a way to gain most insights on the major aspects of travel behaviour in the limited time frame. With the study area being the whole country, it was not possible to obtain a representative sample. Firstly, with a larger sample, it would have provided a much more representative insight into the situation. Meaning that, with a larger sample size, the results would have been more reliable. Additionally, the aspects that were considered in this study were limited to trip purposes, trip frequencies, and mode choices in a temporal plane, however, specific age groups or income groups weren't considered explicitly in order to remain in the scope of the study.

If these aspects were studied in more detail, it would have sharpened the study more. Thus, this study could have involved a broader socio-economic perspective in addition to the travel behaviour perspective.

Secondly, with the entire situation being extremely dynamic, it was difficult to decide when to stop the timeline for the data collection. This led to the study's timeline being only until April 2020, when only a very small part of the population had been vaccinated and the number of infections was still increasing (more than 8000 daily cases in March 2021). Consequently, the decision was made to keep the timeline of the study until 4th April 2021 because the Translink data was collected until then and the survey was also closed by that time.

Thirdly, while developing the survey, only the Onderweg in Nederland (ODiN) 2019 survey was used. For travel behaviour in the Netherlands, other surveys like the Mobiliteitspanel Nederland (2013)and the Dutch Mobility Panel (2019) are also used in studies by van der Drift (2021) and de Haas (2020), however, for this study they were not used as the researcher was not aware of them during the development of this phase.

Fourthly, other factors like using smartphone data (significant locations, traffic congestions, etc.) were also not used in this study which would have sharpened the research more.

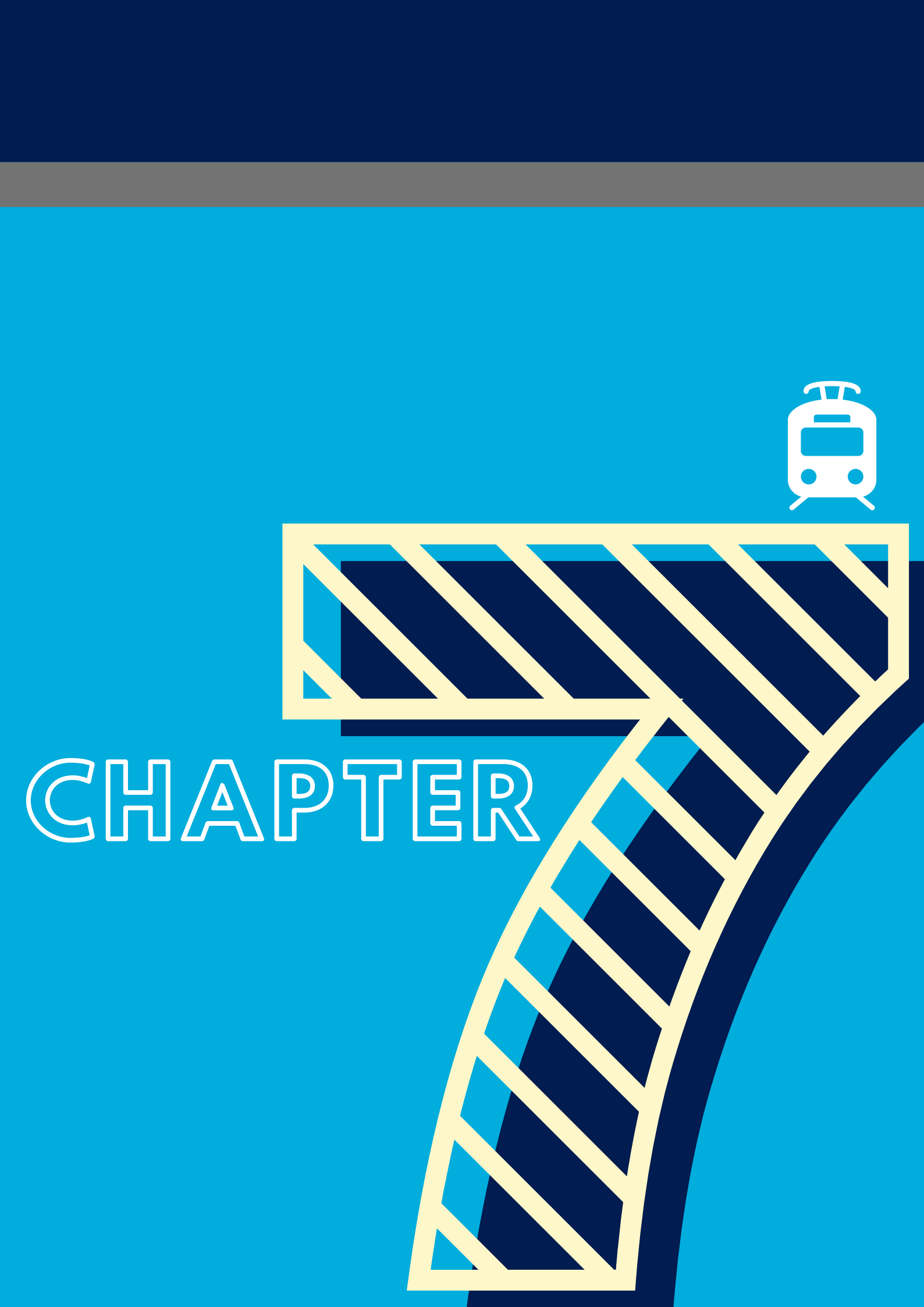
CHAPTER

Conclusion

The COVID-19 pandemic has had an incredibly negative impact on society, with millions of unfortunate deaths worldwide. What once started as a small news headline about a strange virus being detected in China, turned into months of dismay, apprehension, confusion, fear, and more. Moreover, the pandemic has cost economies everywhere billions and have set back economic growth significantly. This study started as a curiosity about how something as basic as how individuals' daily movement could be affected by a global health crisis and in the end provided many insights about how travel behaviour changed in the Netherlands. As discussed in the previous sections, due to the introduction of work from home, social distancing, and discouraged travel in public transport were put in place, there was a significant decrease in number of trips taken. Naturally, due to the nature of the situation, the mode choices also changed and preference towards more individual modes like biking and walking were indicated. Not only that, because these modes encouraged a more active lifestyle, they were seen to be the most popular across all trip purposes during the pandemic as respondents felt that using these modes of transport was one way to have a healthy lifestyle. These modes also increased during this time period as there was a general apprehension towards travelling in public transport and people preferred other modes (bikes, walking, cars).

Future Research Opportunities

Because the scope of this study was not very broad, there is ample scope for future researchers to delve into this subject further. As this research only focused on the explicit aspects of travel behaviour and use of public transport, more research can be done by linking socio-economic factors with travel behaviour, similarly to the Mobiliteitspanel Nederland (2013) and the Dutch Mobility Panel (2019). Furthermore, more research can be done focusing on only one or two aspects of travel behaviour (trip purpose, or only specific transport modes) that were used in this study. Additionally, a perspective of sustainable mobility may also be researched further as it was observed in this study that due to the decrease in the usage of cars, the carbon emissions also reduced, and with the increase of bike usage, the mode choices became more eco-friendly. Thus, this could be one of the paths that future research could go on.


CHAPTER

Ethical Considerations

In this study, the personal data of all respondents were recorded. Before participating in the data collection process, all respondents were made aware of the following – which data was being collected, which data will be used in the study, who will have access to their personal information, how will their information be managed, and whether they agreed to provide this data. No names of the survey participants were recorded, and although names of the participants in the focus group discussions and the interviews were recorded, their responses were anonymised and only the researcher had access to that data. In this chapter, the ethical considerations of each method are explained in detail.

7.1 Focus Group Discussion

The personal data collected from the focus group discussion during the sample recruitment stage was only used to personally refer to the participants during the session. After the completion of the session, these details were deleted (apart from age and gender).

7.2 Digital Survey

The data collection for the survey lasted for 5 weeks. Maptionnaire was used to safely store their data, and apart from the email ID (which was optional to provide), no personal identifiable data were collected. The email was collected for the participants who were interested in participatingin a gift voucher lottery, and after selecting the winners, all email data was also deleted.

Similar to the focus group discussion data, any other personal data provided were all removed after the completion of data analysis.

7.3 Interviews

The data collection for the interview was done by recording the interview and making notes. This was followed by transcribing the interviews via the software Amberscript. Before the interviews were conducted, all the participants were asked to fill a consent form (can be found in the appendix). Additionally, the information on the consent form was reiterated before the start of the interview. Personal details provided in the interview were anonymised and only the name of the transport service company is used in this study to indicate viewpoints. This will ensure that the responses cannot lead to a particular individual. Moreover, any direct quotes from the interviewees were only used after taking special permission and approval from them. Lastly, the personal data collected from the interviews were deleted after the completion of the data analysis and production of results.

7.4 Data risks and contingencies

All files for this study were stored on the researcher's personal OneDrive and data backups were made on a physical hard-drive every 2 weeks. After the completion of this study, the data will not be made public and only the researcher team will have access to the data. As the data is anonymised, it can be shared but only upon special request, however, no personal data will be shared. Additionally, the data collected from transport providers will also not be shared, as specified in the consent form and only their responses may be made available upon special request and permission from the interviewees.

CHAPTER 8

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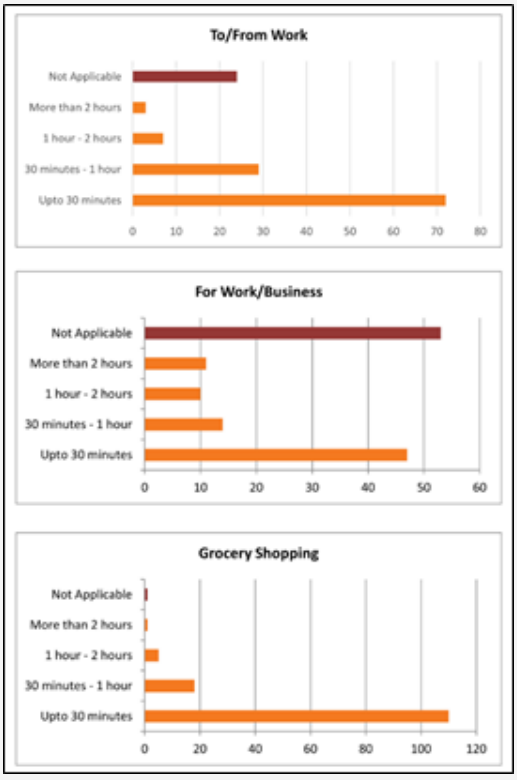
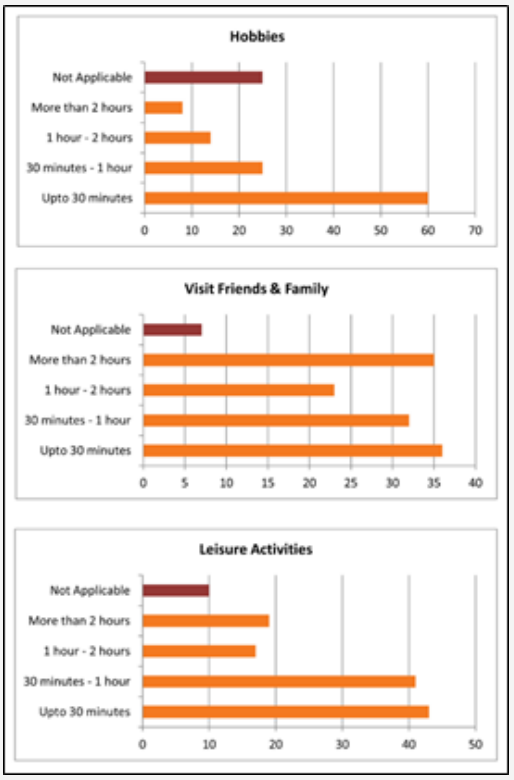
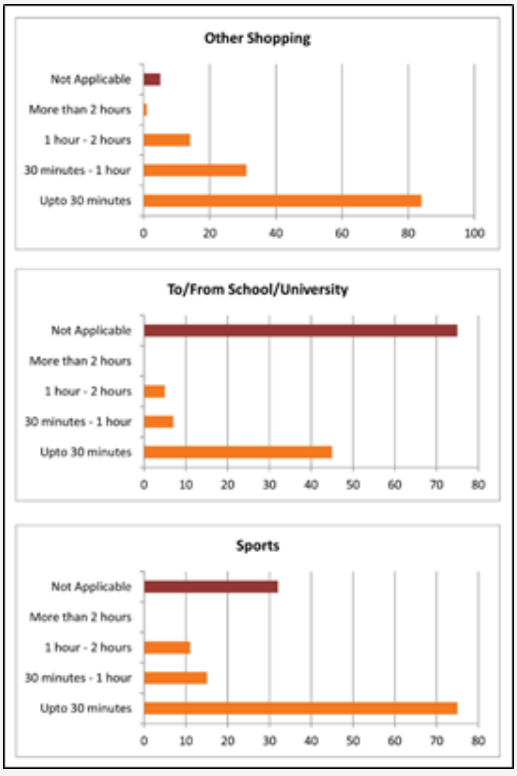
CHAPTER

Appendix

A) Travel Time Information

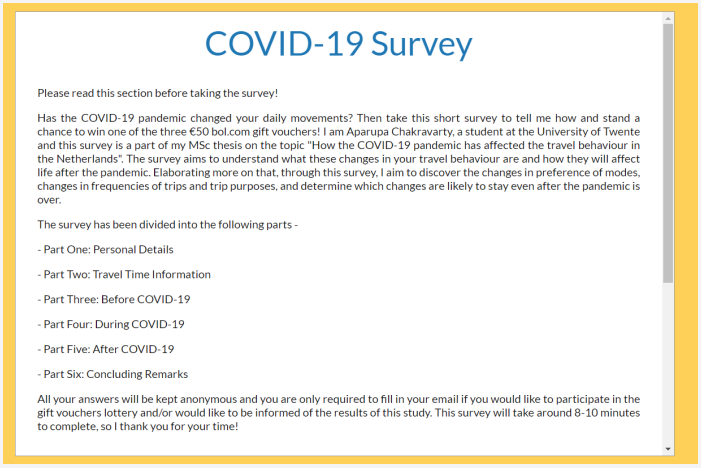






Appendix

B) Digital Survey Questionnaire



COVID-19 Survey

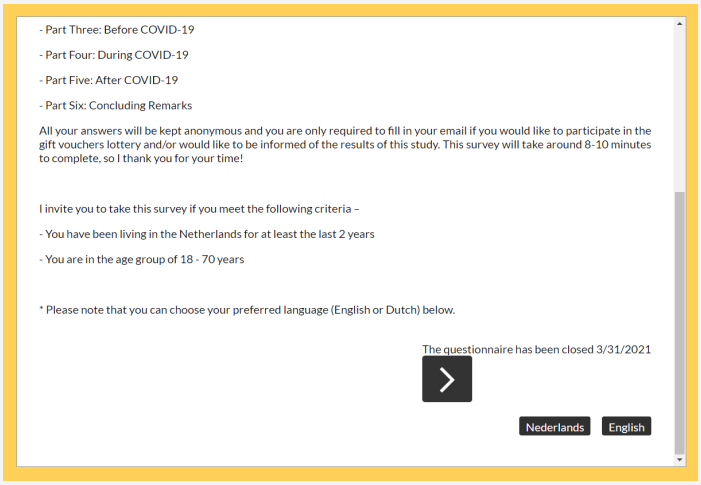
Please read this section before taking the survey!

Has the COVID-19 pandemic changed your daily movements? Then take this short survey to tell me how and stand a chance to win one of the three €50 bol.com gift vouchers! I am Aparupa Chakravarty, a student at the University of Twente and this survey is a part of my MSc thesis on the topic "How the COVID-19 pandemic has affected the travel behaviour in the Netherlands". The survey aims to understand what these changes in your travel behaviour are and how they will affect life after the pandemic. Elaborating more on that, through this survey, I aim to discover the changes in preference of modes, changes in frequencies of trips and trip purposes, and determine which changes are likely to stay even after the pandemic is over.

The survey has been divided into the following parts -

- Part One: Personal Details
- Part Two: Travel Time Information
- Part Three: Before COVID-19
- Part Four: During COVID-19
- Part Five: After COVID-19
- Part Six: Concluding Remarks

All your answers will be kept anonymous and you are only required to fill in your email if you would like to participate in the gift vouchers lottery and/or would like to be informed of the results of this study. This survey will take around 8-10 minutes to complete, so I thank you for your time!



- Part Three: Before COVID-19
- Part Four: During COVID-19
- Part Five: After COVID-19
- Part Six: Concluding Remarks

All your answers will be kept anonymous and you are only required to fill in your email if you would like to participate in the gift vouchers lottery and/or would like to be informed of the results of this study. This survey will take around 8-10 minutes to complete, so I thank you for your time!

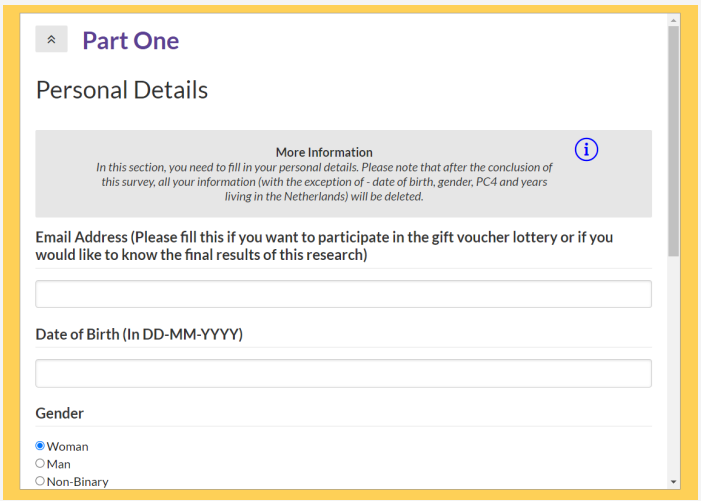
I invite you to take this survey if you meet the following criteria –

- You have been living in the Netherlands for at least the last 2 years
- You are in the age group of 18 - 70 years

* Please note that you can choose your preferred language (English or Dutch) below.

The questionnaire has been closed 3/31/2021

Nederlands English



Part One

Personal Details

More Information

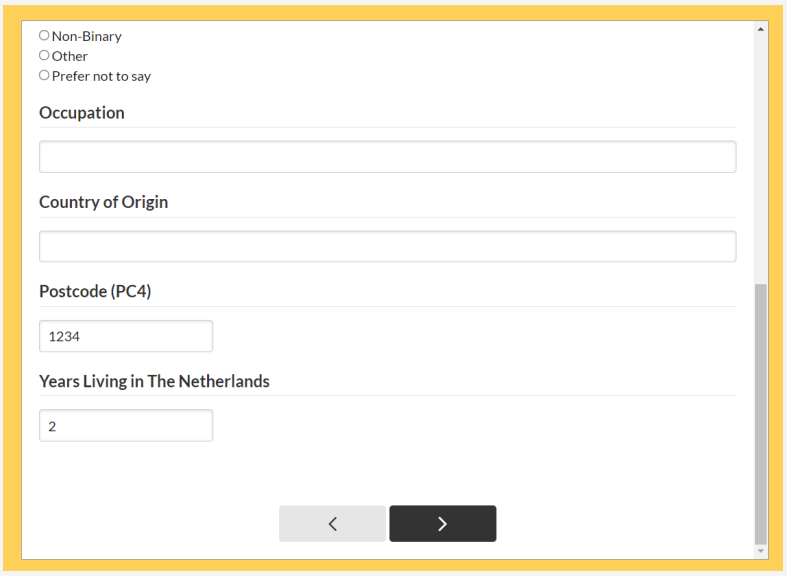
In this section, you need to fill in your personal details. Please note that after the conclusion of this survey, all your information (with the exception of - date of birth, gender, PC4 and years living in the Netherlands) will be deleted.

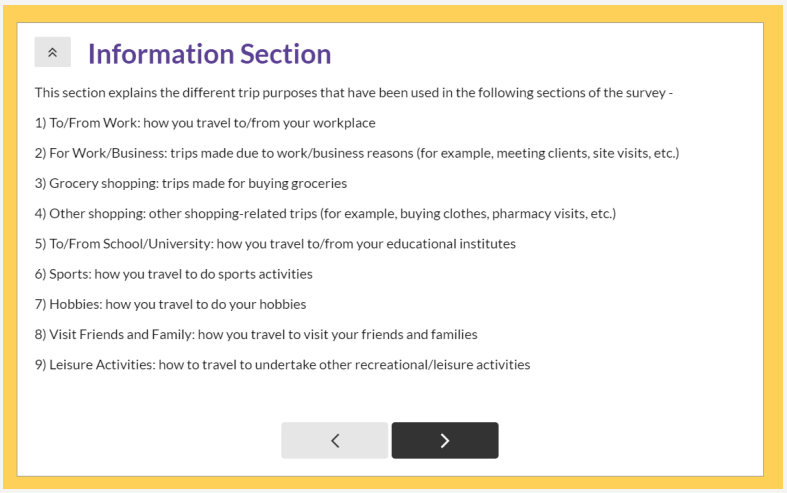
Email Address (Please fill this if you want to participate in the gift voucher lottery or if you would like to know the final results of this research)

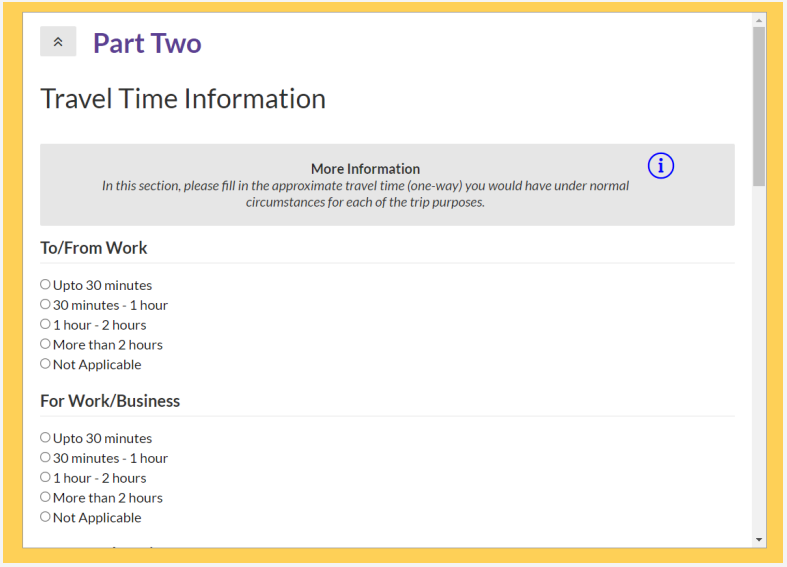
Date of Birth (In DD-MM-YYYY)

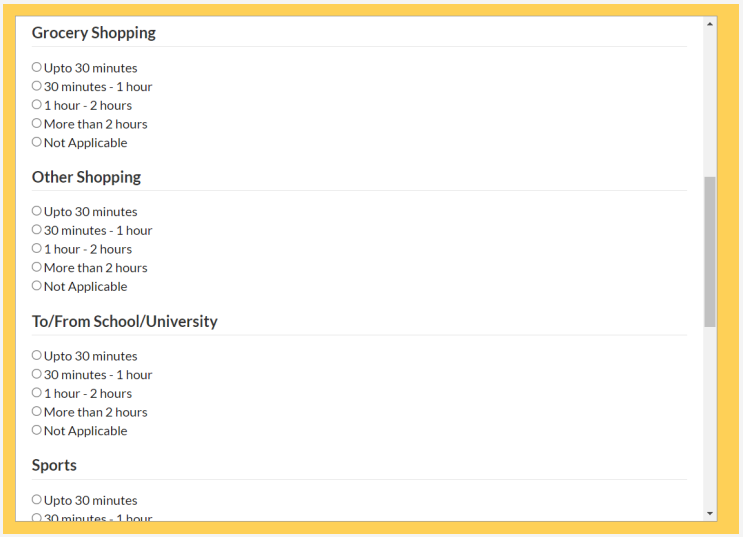
Gender

- Woman
- Man
- Non-Binary


Non-Binary
Other
Prefer not to say
Occupation
Country of Origin
Postcode (PC4)
1234
Years Living in The Netherlands
2


Information Section
This section explains the different trip purposes that have been used in the following sections of the survey -
1) To/From Work: how you travel to/from your workplace
2) For Work/Business: trips made due to work/business reasons (for example, meeting clients, site visits, etc.)
3) Grocery shopping: trips made for buying groceries
4) Other shopping: other shopping-related trips (for example, buying clothes, pharmacy visits, etc.)
5) To/From School/University: how you travel to/from your educational institutes
6) Sports: how you travel to do sports activities
7) Hobbies: how you travel to do your hobbies
8) Visit Friends and Family: how you travel to visit your friends and families
9) Leisure Activities: how to travel to undertake other recreational/leisure activities


Part Two
Travel Time Information
More Information
In this section, please fill in the approximate travel time (one-way) you would have under normal circumstances for each of the trip purposes.
To/From Work
Upto 30 minutes
30 minutes - 1 hour
1 hour - 2 hours
More than 2 hours
Not Applicable
For Work/Business
Upto 30 minutes
30 minutes - 1 hour
1 hour - 2 hours
More than 2 hours
Not Applicable



Grocery Shopping

- ○ Upto 30 minutes
- ○ 30 minutes - 1 hour
- ○ 1 hour - 2 hours
- ○ More than 2 hours
- ○ Not Applicable

Other Shopping

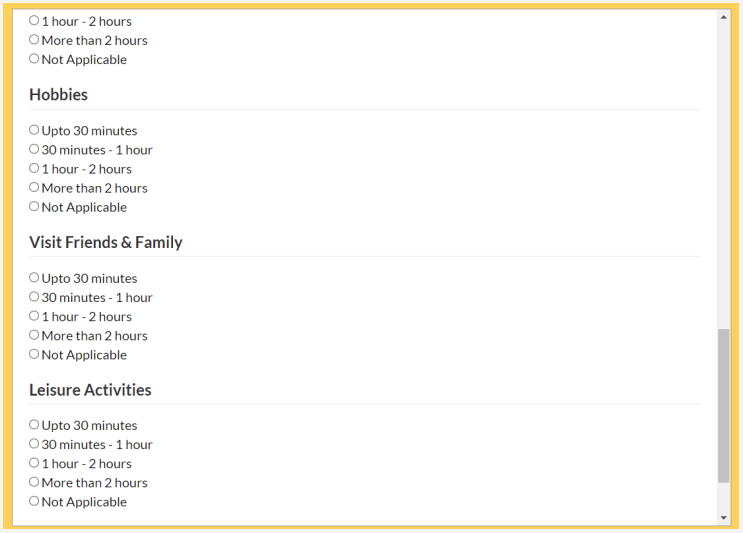
- ○ Upto 30 minutes
- ○ 30 minutes - 1 hour
- ○ 1 hour - 2 hours
- ○ More than 2 hours
- ○ Not Applicable

To/From School/University

- ○ Upto 30 minutes
- ○ 30 minutes - 1 hour
- ○ 1 hour - 2 hours
- ○ More than 2 hours
- ○ Not Applicable

Sports

- ○ Upto 30 minutes
- ○ 30 minutes - 1 hour



- ○ 1 hour - 2 hours
- ○ More than 2 hours
- ○ Not Applicable

Hobbies

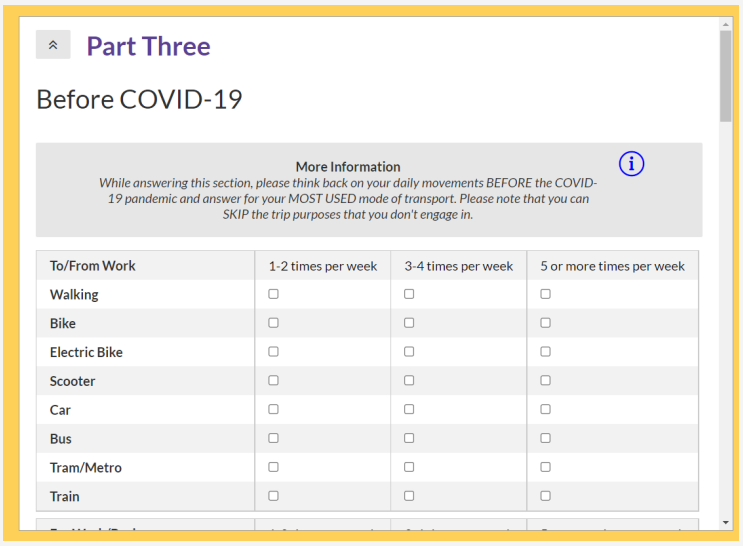
- ○ Upto 30 minutes
- ○ 30 minutes - 1 hour
- ○ 1 hour - 2 hours
- ○ More than 2 hours
- ○ Not Applicable

Visit Friends & Family

- ○ Upto 30 minutes
- ○ 30 minutes - 1 hour
- ○ 1 hour - 2 hours
- ○ More than 2 hours
- ○ Not Applicable

Leisure Activities

- ○ Upto 30 minutes
- ○ 30 minutes - 1 hour
- ○ 1 hour - 2 hours
- ○ More than 2 hours
- ○ Not Applicable



Part Three

Before COVID-19

More Information

While answering this section, please think back on your daily movements BEFORE the COVID-19 pandemic and answer for your MOST USED mode of transport. Please note that you can SKIP the trip purposes that you don't engage in.

To/From Work	1-2 times per week	3-4 times per week	5 or more times per week
Walking	☐	☐	☐
Bike	☐	☐	☐
Electric Bike	☐	☐	☐
Scooter	☐	☐	☐
Car	☐	☐	☐
Bus	☐	☐	☐
Tram/Metro	☐	☐	☐
Train	☐	☐	☐

For Work/Business	1-2 times per week	3-4 times per week	5 or more times per week
Walking	☐	☐	☐
Bike	☐	☐	☐
Electric Bike	☐	☐	☐
Scooter	☐	☐	☐
Car	☐	☐	☐
Bus	☐	☐	☐
Tram/Metro	☐	☐	☐
Train	☐	☐	☐

Grocery Shopping	1-2 times per week	3-4 times per week	5 or more times per week
Walking	☐	☐	☐
Bike	☐	☐	☐
Electric Bike	☐	☐	☐
Scooter	☐	☐	☐
Car	☐	☐	☐
Bus	☐	☐	☐
Tram/Metro	☐	☐	☐

Other Shopping	1-2 times per week	3-4 times per week	5 or more times per week
Walking	☐	☐	☐
Bike	☐	☐	☐
Electric Bike	☐	☐	☐
Scooter	☐	☐	☐
Car	☐	☐	☐
Bus	☐	☐	☐
Tram/Metro	☐	☐	☐
Train	☐	☐	☐

To/From School/University	1-2 times per week	3-4 times per week	5 or more times per week
Walking	☐	☐	☐
Bike	☐	☐	☐
Electric Bike	☐	☐	☐
Scooter	☐	☐	☐
Car	☐	☐	☐
Bus	☐	☐	☐
Tram/Metro	☐	☐	☐
Train	☐	☐	☐

Sports	1-2 times per week	3-4 times per week	5 or more times per week
Walking	☐	☐	☐
Bike	☐	☐	☐
Electric Bike	☐	☐	☐
Scooter	☐	☐	☐
Car	☐	☐	☐
Bus	☐	☐	☐
Tram/Metro	☐	☐	☐
Train	☐	☐	☐

Hobbies	1-2 times per week	3-4 times per week	5 or more times per week
Walking	☐	☐	☐
Bike	☐	☐	☐
Electric Bike	☐	☐	☐
Scooter	☐	☐	☐
Car	☐	☐	☐
Bus	☐	☐	☐
Tram/Metro	☐	☐	☐
Train	☐	☐	☐

Visit Friends & Family	1-2 times per week	3-4 times per week	5 or more times per week
Walking	☐	☐	☐
Bike	☐	☐	☐
Electric Bike	☐	☐	☐
Scooter	☐	☐	☐
Car	☐	☐	☐
Bus	☐	☐	☐
Tram/Metro	☐	☐	☐
Train	☐	☐	☐

Leisure Activities	1-2 times per week	3-4 times per week	5 or more times per week
Walking	☐	☐	☐
Bike	☐	☐	☐
Electric Bike	☐	☐	☐
Scooter	☐	☐	☐
Car	☐	☐	☐
Bus	☐	☐	☐
Tram/Metro	☐	☐	☐
Train	☐	☐	☐

Part Four

During COVID-19

More Information

While answering this section, please think back on your daily movements DURING the COVID-19 pandemic and answer for your MOST USED mode of transport. Please note that you can SKIP the trip purposes that you don't engage in.

To/From Work-	1-2 times per week	3-4 times per week	5 or more times per week
Walking	☐	☐	☐
Bike	☐	☐	☐
Electric Bike	☐	☐	☐
Scooter	☐	☐	☐
Car	☐	☐	☐
Bus	☐	☐	☐
Tram/Metro	☐	☐	☐
Train	☐	☐	☐

For Work/Business-	1-2 times per week	3-4 times per week	5 or more times per week
Walking	☐	☐	☐
Bike	☐	☐	☐
Electric Bike	☐	☐	☐
Scooter	☐	☐	☐
Car	☐	☐	☐
Bus	☐	☐	☐
Tram/Metro	☐	☐	☐
Train	☐	☐	☐

Grocery Shopping-	1-2 times per week	3-4 times per week	5 or more times per week
Walking	☐	☐	☐
Bike	☐	☐	☐
Electric Bike	☐	☐	☐
Scooter	☐	☐	☐
Car	☐	☐	☐
Bus	☐	☐	☐
Tram/Metro	☐	☐	☐
Train	☐	☐	☐

Other Shopping-	1-2 times per week	3-4 times per week	5 or more times per week
Walking	☐	☐	☐
Bike	☐	☐	☐
Electric Bike	☐	☐	☐
Scooter	☐	☐	☐
Car	☐	☐	☐
Bus	☐	☐	☐
Tram/Metro	☐	☐	☐
Train	☐	☐	☐

To/From School/University-	1-2 times per week	3-4 times per week	5 or more times per week
Walking	☐	☐	☐
Bike	☐	☐	☐
Electric Bike	☐	☐	☐
Scooter	☐	☐	☐
Car	☐	☐	☐
Bus	☐	☐	☐
Tram/Metro	☐	☐	☐
Train	☐	☐	☐

Sports-	1-2 times per week	3-4 times per week	5 or more times per week
Walking	☐	☐	☐
Bike	☐	☐	☐
Electric Bike	☐	☐	☐
Scooter	☐	☐	☐
Car	☐	☐	☐
Bus	☐	☐	☐
Tram/Metro	☐	☐	☐
Train	☐	☐	☐

Hobbies-	1-2 times per week	3-4 times per week	5 or more times per week
Walking	☐	☐	☐
Bike	☐	☐	☐
Electric Bike	☐	☐	☐
Scooter	☐	☐	☐
Car	☐	☐	☐
Bus	☐	☐	☐
Tram/Metro	☐	☐	☐
Train	☐	☐	☐

Visit Friends & Family-	1-2 times per week	3-4 times per week	5 or more times per week
Walking	☐	☐	☐
Bike	☐	☐	☐
Electric Bike	☐	☐	☐
Scooter	☐	☐	☐
Car	☐	☐	☐
Bus	☐	☐	☐
Tram/Metro	☐	☐	☐
Train	☐	☐	☐

Leisure Activities-	1-2 times per week	3-4 times per week	5 or more times per week
Walking	☐	☐	☐
Bike	☐	☐	☐
Electric Bike	☐	☐	☐
Scooter	☐	☐	☐
Car	☐	☐	☐
Bus	☐	☐	☐
Tram/Metro	☐	☐	☐
Train	☐	☐	☐

Part Five

After COVID-19

While answering this section, please predict how daily movements might be AFTER the COVID-19 pandemic and answer for your MOST USED mode of transport. Please note that you can SKIP the trip purposes that you don't engage in.

To/From Work--	1-2 times per week	3-4 times per week	5 or more times per week
Walking	☐	☐	☐
Bike	☐	☐	☐
Electric Bike	☐	☐	☐
Scooter	☐	☐	☐
Car	☐	☐	☐
Bus	☐	☐	☐
Tram/Metro	☐	☐	☐
Train	☐	☐	☐

For Work/Business--	1-2 times per week	3-4 times per week	5 or more times per week
Walking	☐	☐	☐
Bike	☐	☐	☐
Electric Bike	☐	☐	☐
Scooter	☐	☐	☐
Car	☐	☐	☐
Bus	☐	☐	☐
Tram/Metro	☐	☐	☐
Train	☐	☐	☐

Grocery Shopping--	1-2 times per week	3-4 times per week	5 or more times per week
Walking	☐	☐	☐
Bike	☐	☐	☐
Electric Bike	☐	☐	☐
Scooter	☐	☐	☐
Car	☐	☐	☐
Bus	☐	☐	☐
Tram/Metro	☐	☐	☐
Train	☐	☐	☐

Other Shopping--	1-2 times per week	3-4 times per week	5 or more times per week
Walking	☐	☐	☐
Bike	☐	☐	☐
Electric Bike	☐	☐	☐
Scooter	☐	☐	☐
Car	☐	☐	☐
Bus	☐	☐	☐
Tram/Metro	☐	☐	☐
Train	☐	☐	☐

To/From School/University--	1-2 times per week	3-4 times per week	5 or more times per week
Walking	☐	☐	☐
Bike	☐	☐	☐
Electric Bike	☐	☐	☐
Scooter	☐	☐	☐
Car	☐	☐	☐
Bus	☐	☐	☐
Tram/Metro	☐	☐	☐
Train	☐	☐	☐

Sports--	1-2 times per week	3-4 times per week	5 or more times per week
Walking	☐	☐	☐
Bike	☐	☐	☐
Electric Bike	☐	☐	☐
Scooter	☐	☐	☐
Car	☐	☐	☐
Bus	☐	☐	☐
Tram/Metro	☐	☐	☐
Train	☐	☐	☐

Hobbies--	1-2 times per week	3-4 times per week	5 or more times per week
Walking	☐	☐	☐
Bike	☐	☐	☐
Electric Bike	☐	☐	☐
Scooter	☐	☐	☐
Car	☐	☐	☐
Bus	☐	☐	☐
Tram/Metro	☐	☐	☐
Train	☐	☐	☐

Visit Friends & Family--	1-2 times per week	3-4 times per week	5 or more times per week
Walking	☐	☐	☐
Bike	☐	☐	☐
Electric Bike	☐	☐	☐
Scooter	☐	☐	☐
Car	☐	☐	☐
Bus	☐	☐	☐
Tram/Metro	☐	☐	☐
Train	☐	☐	☐

Leisure Activities--	1-2 times per week	3-4 times per week	5 or more times per week
Walking	☐	☐	☐
Bike	☐	☐	☐
Electric Bike	☐	☐	☐
Scooter	☐	☐	☐
Car	☐	☐	☐
Bus	☐	☐	☐
Tram/Metro	☐	☐	☐
Train	☐	☐	☐

Part Six

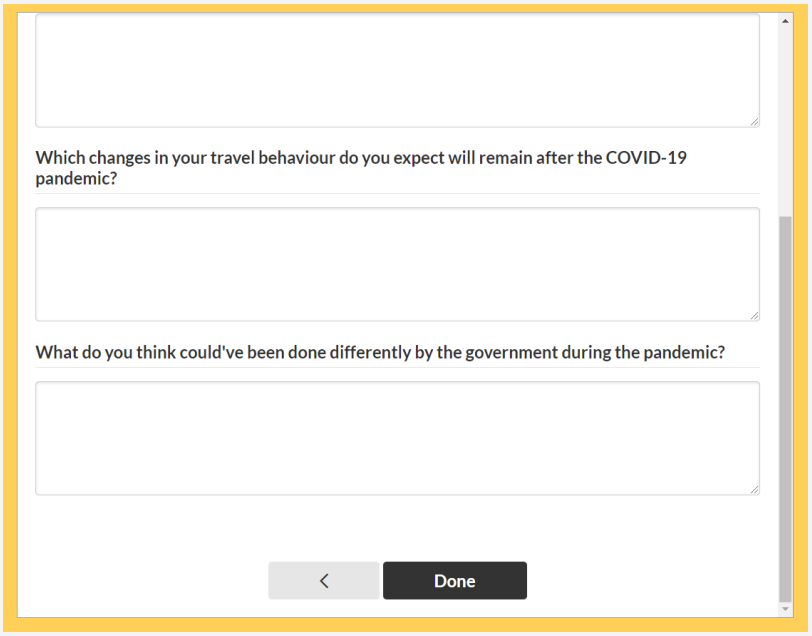
Concluding Remarks

More Information

This the the concluding section of the the survey where you need to answer a few open-ended questions.

Have your opinions regarding the use of Public Transport changed because of COVID-19? If yes, please indicate why.

Which changes in your travel behaviour do you expect will remain after the COVID-19 pandemic?


Which changes in your travel behaviour do you expect will remain after the COVID-19 pandemic?
What do you think could've been done differently by the government during the pandemic?
Done