# Chapter 3
# Use of Traffic Simulation to Analyze the Changes in City Mobility During the COVID-19 Pandemic

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## ABSTRACT

*It seems that the COVID-19 pandemic, which started in December 2019, will have longer and more profound consequences on our lives than initially foreseen. Among the most obvious are everyday decisions about the mode of transport. From related research, it can be seen that the most affected transport mode is public transport, which had the greatest decline. The reason for lesser use of public transport is in complete closure of public transport in some parts of the world. However, where this measure has not been applied, the reason for the reduction is people's fear of infection when using public transport or any shared modes of transportation. The fear stems from the fact that the COVID-19 virus is spreading extremely fast in densely populated rooms. All these changes are affecting the changes in city mobility. Related research shows a decrease of mobility in general and an increase in the use of individual modes of transportation. Distinct changes can be observed in different environments as compared to previous travel behaviour.*

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## INTRODUCTION

The pandemic caused by the SARS-CoV-2 (COVID-19) pandemic impacts every aspect of our lives and represents the unique situation in the last few decades (de Haas, Faber & Hamersma, 2020). All the consequences caused by the virus are not seen yet when the spreading is not entirely stopped at the time (Award- Núñez, Julio, Gomez, Moya- Gómez & González, 2021).

The beginning of the spread of the virus dated to 2019 when it was detected in the Chinese city of Wuhan. However, due to the rapid spread, the first cases of the disease around the world were soon detected, so on January 30, 2020, the World Health Organization (WHO) declared COVID-19 as an international public health concern, and on March 11, 2020, declared a pandemic (WHO, 2020).

The virus impact is also noticeable in people's activity patterns, the workplace (many people started to work from home, where this is possible), and how they travel (de Haas et al., 2020). The outbreak of the virus has caused lead not only to work from home but also higher unemployment (De Vos, 2020). Different measures have been taken to prevent the spread of the virus worldwide (Fisher & Wilder-Smith, 2020; Sohrabi et al., 2020; Wilder-Smith & Freedman, 2020; Zhang et al., 2020). The measures taken are labelled as "social distancing" measurements (Wilder-Smith & Freedman, 2020). They are very suitable for preventing the infection with the viruses transmitted by exhaled droplets and requiring a certain closeness of people to transmit like COVID-19. Social-distancing measures, case isolation, and shielding have been used to limit transmission of the virus and protect the most vulnerable groups (Chen, Yang, Yang, Wang, & Bärnighausen, 2020; Tian et al., 2020). Human mobility is considered the primary driver of the virus spreading in several parts of the world. So the many restrictions were just in the field of mobility (Li et al., 2020). Several studies based on comparing the mobility data before the virus outbreak and the first wave have shown that mobility had undergone a significant change (Oliver et al., 2020). The first studies focused on mobility trends, and their most important finding is the noticeable reduction in mobility. A decrease in mobility depends on the countries and measures taken, but the reduction is seen everywhere (Gao et al., 2020; Lee et al., 2020; Pepe et al., 2020). Furthermore, the first studies also noticed the importance of demographic characteristics on reactions to the virus situation (Van Dorn, Cooney, & Sabin, 2020). For example, people with higher socioeconomic status are more likely to avoid the city (Coven & Gupta, 2020).

Mobility restrictions were taken on different levels. Some of them were taken on a local or regional level. The most common was limiting the length of walking or motorized movements from home. On an international level, the most common was the closure of entire regions or counties (Cereda et al., 2020). Such rigorous measures were taken mainly were because the burden on COVID-19 patients in hospitals was very high.

In many countries, mobility restrictions have proved to be an effective way to reduce the spread of the virus (Nouvellet et al., 2021). But to apply measures in the future and add some new one, it is important to understand their effects in detail (Schlosser et al., 2020).

The first important fact that need to be mentioned is a general reduction in the number of trips caused by the mentioned measures. This reduction is the consequence of e-learning, remote working and cancelling the cultural and sporting events and other social events (Shi et al., 2019). In France, the study has shown that reduction is most noticeable in the usual rush hours because of the school closing and working from home (Pullano, Valdano, Scarpa, Rubrichi & Colizza, 2020). Some other study reveals reduced grocery shopping trips (de Haas et al., 2020). The grocery shopping trips reduction might be the consequence of increased ordering of the grocery with home delivery (Shi et al., 2019).

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