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Unlocking the Potential of Sustainable Transportation for working people in Mexico City

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Abstract

This report provides an extensive examination of commuting practices and sustainable transportation options in Mexico City's Polanco area, uncovering the challenges involved in promoting and adopting sustainable commuting practices within organizations of the area. By emphasizing the importance of implementing sustainable transportation alternatives and reducing dependence on private cars, this study highlights the potential to address these issues and enhance the overall well-being of urban residents through the creation of a healthier and more livable environment.

The research employed a mixed-method approach, combining surveys and interviews to gather data from commuters. The surveys collected quantitative data on transportation modes, commute duration, and environmental awareness, while interviews provided qualitative insights into sustainable mobility initiatives implemented by companies. The findings highlight the existing state of commuting practices, motivations for adopting Mobility as a Service (MaaS), and current efforts by companies to facilitate sustainable transportation. The study contributes to the understanding of commuting behavior and supports the development of sustainable transportation strategies in urban areas.

Keywords Sustainable transportation, commuting practices, Mexico City, mixed-method approach, transportation modes, environmental awareness, sustainable mobility initiatives.

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1. Introduction

Transportation plays a crucial role in urban areas, connecting people to various destinations and facilitating economic activities. However, the rapid growth of urbanization has resulted in numerous challenges, including increased traffic congestion, air pollution, and energy consumption. These issues necessitate the adoption of sustainable transportation solutions that can mitigate the negative environmental impacts while meeting the mobility needs of the population.

This thesis focuses on exploring the transition towards sustainable mobility and development. Specifically, it examines the factors that influence the adoption and usage of sustainable transportation options among workers in Polanco, a specific area of Mexico City. The study aims to understand the role of social practices in shaping individuals' transportation choices and identify key factors that contribute to the adoption of sustainable mobility practices. The central research question guiding this study is: "***What are the key factors that influence the adoption and usage of sustainable transportation options among workers in Polanco, Mexico City?***" By addressing this question, the research seeks to contribute to the knowledge and understanding of sustainable mobility transitions in urban contexts.

In Chapter 1 outlines the research goals and questions. Chapter 2 offers a comprehensive Literature Review that explores sustainable transportation, Mobility as a Service (MaaS), Social Practices and the specific context of Mexico City. Chapter 3 delves into the Methodology describing the approach taken for data collection and analysis. The findings of the study are presented and discussed in Chapter 4. Chapter 5 summarizes the key findings, discussing their implications, and offering recommendations for future research and practical applications. Finally, Chapter 6 serves as the concluding chapter.

1.1 Research Gap

Despite the growing recognition of the importance of sustainable transportation, there is still a research gap regarding the implementation and evaluation of innovative approaches in different urban contexts (Banister, 2008). Furthermore, while Mobility-as-a-Service (MaaS) has emerged as a promising solution to promote sustainable transportation (Lindkvist & Melander, 2022), there is a lack of comprehensive studies that explore its potential and applicability in specific cities, such as Mexico City.

Mexico City faces significant transportation challenges, including high levels of pollution, health problems, and traffic congestion. According to data from the National Institute of Statistics and Geography (INEGI, 2017), most daily trips within Mexico City are work-related, indicating that people commute frequently to get to their workplaces. This consistent flow of commuters contributes to the ongoing problems of pollution, health issues, and traffic congestion in the city.

Given this context, there is an opportunity to delve deeper into understanding how the citizens of Mexico City are attempting to address and reduce these transportation-related problems.

Research can focus on exploring the strategies and behaviors adopted by individuals to mitigate the issues of traffic and pollution, such as using public transportation, carpooling, cycling, or adopting alternative work schedules.

Moreover, it is important to consider the role of different stakeholders, particularly companies, in addressing these transportation challenges. Companies have the potential to play a significant role in promoting sustainable transportation practices among their employees. This could include offering incentives for using public transportation, implementing flexible work arrangements to reduce commuting trips, supporting initiatives for carpooling, or cycling. Often, institutions promote the use of private cars by subsidizing parking, providing gasoline vouchers, car purchase bonuses, or assigning drivers, among other incentives. However, there are few companies that support or encourage their staff to use fewer polluting modes of transportation, such as bicycles, walking, public transport, or even carpooling among colleagues. Some companies do offer free corporate transportation services (IDEAMOS, 2023).

Therefore, the private sector has a social and environmental co-responsibility, which can be addressed through measures to improve the daily mobility of people traveling for work or study (IDEAMOS, 2023). By conducting comprehensive studies that investigate the specific context of Mexico City, researchers can gain insights into the effectiveness of different strategies, interventions, and policies aimed at reducing traffic congestion and pollution. This knowledge can help inform policymakers, city planners, companies, and other stakeholders in developing targeted and evidence-based approaches to address these pressing transportation challenges.

1.2 Research Goals and Questions

There are several compelling reasons for selecting Polanco as the research area. Firstly, the 2017 Survey to Origin revealed that it is the second most traveled area, both for trips within and outside the city (INEGI,2017). Secondly, the primary reason for commuting to this area is for work, as reported in the Survey to Origin of 2017 INEGI,2017). Lastly, Polanco is the second most prominent corporate area in the city, according to the government of Mexico City in 2022 (Alpha Hardin, 2021). Taken together, these factors make Polanco an ideal location for research.

The objective of this study is to examine ways to stimulate the use of sustainable transportation means among people working in the Polanco area of Mexico City. The specific sub-questions include investigating the current state of mobility practices in the area, identifying strategies for private sector companies to promote sustainable transportation among their workers, and evaluating the impact of Mobility as a Service on people's commuting decisions.

Main Question: *"What are the key factors influencing the adoption and usage of sustainable transportation options among workers of Polanco, Mexico City?"*

Sub-questions:

- What is the existing state of the commuting practices of people working in the Pol area?

- What motivates commuters to use and adopt Mobility as a Service (MaaS) for their daily commute to work?
- What are companies currently doing to facilitate the use of sustainable transportation?
- How can sustainable commuting practices be encouraged in the Polanco area, and what roles can companies, commuters, and policymakers play in achieving this goal?

2. Literature Review

The literature review explores the concept of sustainable transportation, emphasizing its significance in addressing climate change, air pollution, and urbanization issues. After, the Social Practices theory and MaaS are discussed. Social practice theory emphasizes the interdependence of materials, competence, and meaning in shaping practices, while MaaS is presented as a solution to reduce private car dependency and promote intermodal travel options. Finally, Mexico City context and the area of study are shown.

2.1 Sustainable Transportation

In recent years, transportation geographers have shown a significant interest in understanding the mobility patterns of the growing global population and the future requirements of transportation systems (Schwanen and Paéz, 2010). This interest arises from the recognition that the field of transport planning is currently in a crisis, as it fails to adequately acknowledge and address the considerable challenges faced by urban planners (Banister, 2008). Policymakers have also emphasized the urgent need for decarbonization in the transportation sector to mitigate climate change (Canzler and Wittowsky, 2016; Pathak et al., 2019).

The concept of sustainable transportation improvement is often referred to as the avoid-shift-improve framework, encompassing strategies such as reducing unnecessary trips, transitioning to alternative transportation modes beyond private cars, and enhancing vehicle efficiency (Banister, 2008). As we confront the issues of climate change, air pollution, and urbanization, sustainable mobility is gaining increasing importance.

Sustainable mobility is a concept that refers to the use of transportation modes and systems that have minimal impact on the environment, while still meeting the mobility needs of individuals and communities (Gallo & Marinelli, 2020). It derives from the concept of sustainable development, aims to meet current needs without compromising the ability of future generations to meet their own needs. It goes beyond environmental aspects and considers social and economic impacts (Gallo & Marinelli, 2020). This approach emphasizes the importance of reducing greenhouse gas emissions, air pollution, and other environmental impacts of transportation, additionally, it wants to improve access and equity in transportation systems (WWF,2017).

Transportation's role in sustainable development has gained global recognition, with Agenda 21

in 1992 identifying it as a driver of energy demand. United Nations Department of Economic and Social Affairs, 2021). The 2030 United Nations Agenda and Sustainable Development Goals (SDGs) acknowledge the importance of sustainable mobility as a worldwide issue. SDG 11.2 (Affordable and Sustainable Transport System) specifically emphasizes the need to provide safe, affordable, accessible, and sustainable transport systems for all, with a focus on expanding public transportation and addressing the needs of vulnerable groups such as women, children, people with disabilities, and older people (The Global Goals, 2023).

The latest IPCC's (Intergovernmental Panel on Climate Change) Sixth Assessment Report 2023 highlights in two key solutions to mitigate climate change which include the shift to electric vehicles and the increase of public transport, biking, and walking (IPCC, 2023).

The European Commission presented in 2021 their Sustainable and Smart Mobility Strategies which included sustainable, smart, and resilient transportation (Mobility Strategy, 2021). The European Green Deal, aimed at meeting sustainability and policy objectives, can only be accomplished if transportation emissions are reduced by 90% by 2050 (European Environment Agency, 2020). Examples of such initiatives include encouraging the use of public transportation, cycling, and walking, promoting electric and hybrid vehicles, implementing smart transportation systems, creating pedestrian-friendly urban areas, and promoting carpooling and shared mobility services.

Urban Transportation

It is crucial for cities, as the most sustainable urban form, to adapt and provide suitable living environments for most of the world's population (Banister, 2008). Governments and individual citizens are actively working together to improve urban environments by implementing sustainable transport policies. Various stakeholders, including governments, industries, organizations, and individuals, are invested in finding sustainable solutions for urban transportation (Lindkvist & Melander, 2022).

Commuting in cities presents challenges such as air pollution, exposure to motor noises, and complicated transfers between different modes of transportation within mass transit systems (Martinez, 2015). The IBM Global Commuter Pain Survey in 2010 highlighted cities with the highest average commute times, including Nairobi, Mexico City, Johannesburg, Beijing, Bangalore, and Moscow (IBM, 2010).

The COVID-19 pandemic has led to a decline in global energy demand and CO₂ emissions (Griffiths et al., 2021). Policy responses targeting the transportation sector can drive a sustainable mobility transition. Additionally, the shift to remote work and increased productivity at home have positively impacted low-mobility societies, aligning with the goal of reducing environmental damage (Griffiths et al., 2021). The lack of flexibility in working from home can contribute to environmental challenges in the city. With a considerable number of employees commuting daily, there is an increased demand for transportation, leading to higher traffic congestion, air pollution,

and energy consumption. Additionally, the reliance on traditional commuting methods, such as private cars or public transport, further exacerbates the environmental impact.

The attractiveness of local public transport, cycling, and walking has declined, leading to a greater reliance on cars and making it challenging to reverse this trend (Banister, 2008). The decentralization of cities and the resulting car dependence are shaping the future of transportation. While buses play a significant role in urban passenger transportation, they are increasingly viewed as inefficient and major contributors to pollution, noise, and road hazards (Gakenheimer, 1999). Despite these challenges, buses remain a cost-effective and space-efficient mode of travel. Consequently, there is a growing recognition of the need to maintain and improve bus travel, leading city authorities worldwide to demand sustainable and affordable urban bus transit systems. These systems aim to increase the share of mobility for buses as cities expand.

The rapid growth in vehicle registrations can be attributed to factors such as population growth, increased wealth, commercial influence, and the perception of cars as a symbol of an international lifestyle (Gakenheimer, 1999). However, long-distance commuting in cities like Mexico City has resulted in higher private and social costs. A survey by IBM in 2010 revealed negative impacts on the jobs, studies, and health of private drivers due to road traffic (IBM, 2010). As a result, there is a noticeable shift towards public transportation in developing cities such as Nairobi, Mexico City, Shenzhen, Buenos Aires, and Beijing.

In recent years, there has been a notable surge in transportation services within cities (Hasselwander et al., 2021). This rise includes popular options like ride-hailing and ride-sharing platforms such as Uber and Lyft, as well as bike-sharing, scooter-sharing, car-sharing, and carpooling services, also called new mobility services (NMS). Additionally, options like electric bicycles and scooters have gained popularity. Integrated mobility platforms are also emerging, allowing users to access multiple transportation options through a single app (Hasselwander et al., 2021). These services are driven by advancements in technology, evolving consumer preferences, the demand for sustainable transportation, and the need to alleviate congestion.

The specific focus of this study is on urban transportation within organizations and exploring the potential shift towards sustainable options for individuals employed in those organizations.

2.2 Social practices

The theory of social practices involves three elements: materials, competence, and meaning. Materials refer to objects, infrastructures, tools, hardware, and the body, while competence encompasses different forms of understanding and practical knowledge. Meaning includes emotional and motivational knowledge as well as the symbolic significance of participation.

Practices are defined by the interdependent relations between these three elements, and the connections between them must be renewed for specific configurations to remain effective. Stability and routinization are not the end points of a linear process of normalization, and

instances of integration can transform and generate new competences, meanings, and materials (Shove et al., 2012).



Social practices are made of three types of element:
material, competence and meaning
(Shove et al., 2012, p.23).

Materials	Objects, tools, infrastructures.
Competence	Knowledge and embodied skills.
Meanings	Cultural conventions, expectations and socially shared meanings.

Figure 1. Elements of Social Practices (Strengers & Maller, 2015).

In social practice thinking, policies are viewed as interventions that have both intended and unintended effects within the dynamics of social practices (Shove et al., 2012). This approach recognizes the complexity of the mobility domain and distinguishes between different types and scales of intervention strategies. It emphasizes the potential for changing patterns of demand for alternative modes of mobility and for mobility. Overall, this approach redefines conventional intervention strategies and highlights new opportunities for achieving desired outcomes (Strengers & Maller, 2015).

Three intervention framings:

1. Recrafting resource-intensive practices: The concept of recrafting practices involves changing the components of existing practices to make them less resource-intensive. This approach is particularly useful for interventions such as implementing industry standards for products, adopting new technologies like low-emission vehicles, providing training like driving tests, and conducting social marketing and information campaigns that aim to change the meanings associated with social practices.

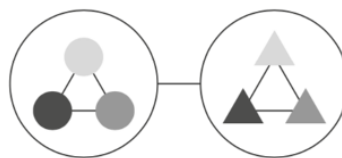


Figure 2. Re-crafting practices (Strengers & Maller, 2015).

Example: Bike North Birmingham demonstrates the concept of “recrafting” by transforming various elements of cycling practice. They offer free bike rentals and loans, invest in new cycle routes, establish cycling hubs with storage and maintenance facilities, and provide free cycle training and maintenance classes. The program aims to promote freedom, convenience, health, fun, and affordable mobility (Strengers & Maller, 2015).

2. Substituting practices: Involves discouraging unsustainable practices and replacing them with sustainable alternatives to meet the same needs or wants. It aims to intervene in both practices to change the balance of competition between them. For transport policy, the approach focuses on changing the mode of movement rather than reducing the overall need for mobility. Policy

interventions aim to shift the balance of competition between sustainable and unsustainable practices by changing the practices themselves, rather than solely focusing on individual behavior (Strengers & Maller, 2015).

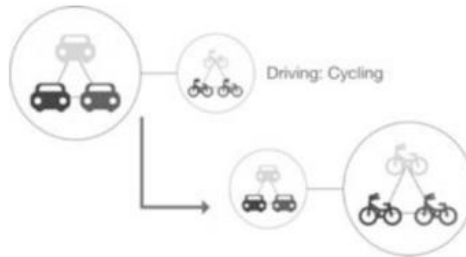


Figure 1. Substituting practices (Strengers & Maller, 2015).

Example: Transport for Greater Manchester's Cycling Hub scheme aims to promote cycling for commuting purposes. The city center hub provides dedicated cycle parking, lockers, showers, maintenance services, and skills training, all geared towards making cycling a more competitive option compared to driving for daily commuting (Strengers & Maller, 2015).

3. Changing how practices interlock: Practices are linked together to form patterns, which are called "complexes" and "bundles" (Shove et al., 2012). These bundles are formed by regularly performing interconnected practices in everyday life. The concept of "bundling" means focusing on changing how practices fit together, rather than just looking at one practice at a time. Instead of only focusing on mobility practices, the approach involves changing how multiple practices are connected to each other, such as how households get their supplies, where kids go to school, and how people spend their leisure time.

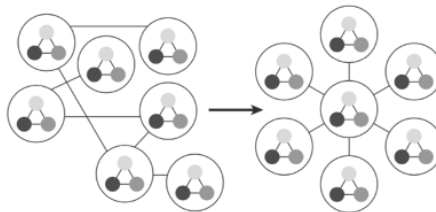


Figure 3. Changing how practice interlock (Strengers & Maller, 2015).

Example: The refurbished Liverpool Central Library exemplifies how spaces like community hubs can reshape work practices by providing local working environments and addressing the challenges of working from home. It has the potential to reconfigure interlocking practices of work, commuting, eating, and socializing (Strengers & Maller, 2015).

2.3 MaaS Concept

The concept of Mobility as a Service (MaaS) was originated in Sweden with a successful trial of MaaS was carried out in Gothenburg using a monthly subscription model (Hesselgren et al., 2020). In 2014, the concept of Mobility as a Service (MaaS) was presented during the European Union

ITS Conference to address individual travel demand and to offer concrete proof, frameworks, and tools to surmount barriers and create a unified and collaborative transport market within the European Union for Mobility as a Service (Kostov, 2018).

MaaS revolutionizes transportation by offering a convenient and comprehensive solution through a single mobile application (Kriswardhana & Esztergár-Kiss, 2023). With a unified platform encompassing all transportation providers, MaaS coordinates and streamlines the mobility experience, simplifying the planning, booking, payment, and ticketing process. It prioritizes user needs by providing a customizable and convenient mobility service that adapts to their preferences (Lindkvist & Melander, 2022). By integrating diverse transportation options such as public transport, car sharing, taxis, and bikes, MaaS becomes a practical choice, particularly in urban environments (Lindkvist & Melander, 2022). However, it requires gathering real-time information from various sources, including schedules, traffic data, and user demand, within a complex system (Lindkvist & Melander, 2022).

Numerous MaaS apps have gained recognition worldwide for their innovative approaches to urban mobility. Whim by MaaS Global, an app developed in Finland, offers integrated transportation services across multiple cities, while Reach Now, from Germany, provides diverse mobility options such as ride-hailing and public transit integration. Citymapper, originated in UK, stands out for its comprehensive navigation features, combining real-time data from various transportation modes.

The Whim app developed by MaaS Global serves as a successful example of a MaaS application. This integrated platform enables users to effortlessly plan, book, and pay for their trips using various modes of transport. By offering convenience, flexibility, and sustainable options, the app has gained popularity in multiple cities, contributing to improved urban mobility and greener transportation choices.

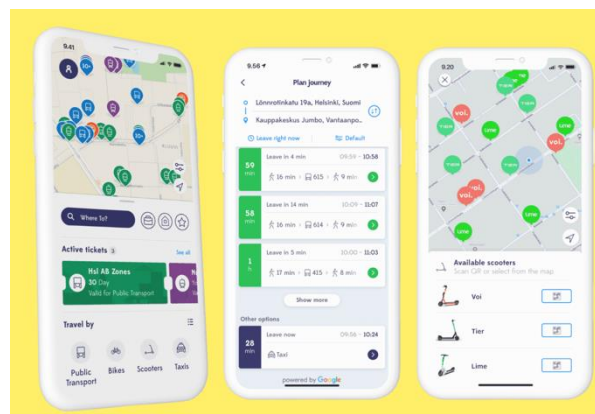


Figure 4. Example of Whim MaaS app.

By offering affordable access to different modes of transportation, MaaS aims to promote shared transportation options over private car usage, which can help decrease carbon emissions within the transportation sector (Zong et al., 2022). It aims to provide travelers with a range of transportation options through a single, integrated platform.

MaaS is closely related to sustainable transportation because it encourages people to use more efficient and environmentally friendly modes of transportation. For example, instead of driving alone, a person can use MaaS to plan a trip that involves walking, biking, and taking public transit. This can help to reduce the number of cars on the road, decrease emissions, and promote more sustainable mobility practices. Overall, MaaS has the potential to revolutionize the way we think about transportation and help shift us toward a more sustainable future.

The rise in travel demand and the increasing use of digital technology has led to the development of new forms of mobility services. Mobility as a Service (MaaS) is one of these emerging solutions that can help decrease the reliance on private cars and encourage intermodal travel options. Figure 5 presents a diagram of different streams of shared mobility align with the various services that can be part of a MaaS platform. For instance, the sharing vehicles stream in the diagram includes motorbike sharing, carsharing, and e-bike sharing. These are examples of services that could be integrated into a MaaS platform, allowing users to access and book shared vehicles as part of their overall mobility solution.

Similarly, the sharing passenger rides stream in the diagram includes on-demand services and ridesharing. These types of services can also be integrated into a MaaS platform, providing users with options to request on-demand transportation or share rides with others going in the same direction. In summary, the diagram's streams of shared mobility align with the various components of a MaaS platform, demonstrating how shared vehicle and shared passenger services can be part of an integrated and comprehensive mobility solution.

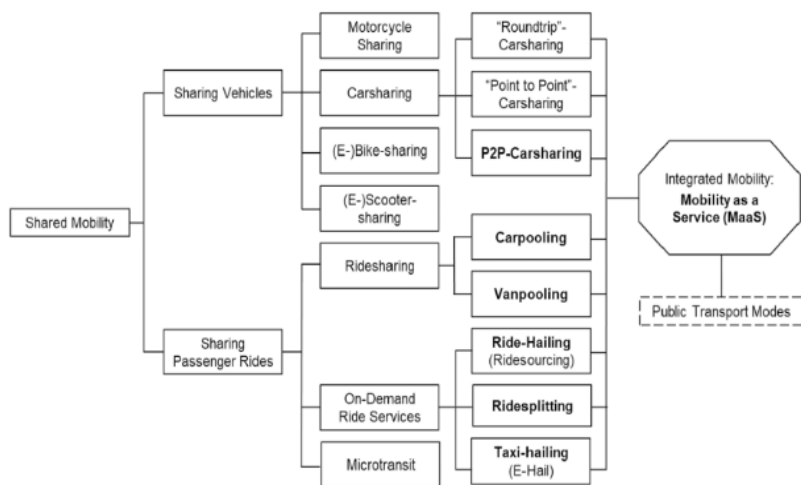


Figure 5. Integrated Mobility (Hasselwander et al., 2021).

The following Socio-Technical factors have been found important in the implementation of MaaS:

Table 1. Socio-Technical factors of MaaS

Concept	Summary
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Socio-demographic characteristics	Socio-demographic factors such as age, gender, and educational level can influence the adoption of MaaS. Younger individuals (18 to 34) and females are more likely to be interested in adopting MaaS, while elderly individuals may prefer sticking to their current transportation modes (Farahmand et al., 2021; Zijlstra et al., 2020).
Travel characteristics	Individuals' travel behavior, attitudes toward different transport modes, and intermodal travel patterns can affect their preferences for MaaS. Intermodal travelers and those with longer daily travel distances are more likely to be interested in MaaS (Fioreze et al., 2019). There is a positive coefficient for travel distances between 20 to 40 km, this range tend to be more favorable towards e-car-sharing (Caiati et al., 2020).
Built environment factors	The built environment, including urban development and density, can impact mode choice. However, research results on the influence of built environment factors on MaaS adoption are mixed due to various factors and contexts (Kriswardhana & Esztergár-Kiss, 2023).
Psychological Factors	Individuals with a focus on environmental conservation and healthy commuting habits are more inclined to use MaaS. MaaS enthusiasts tend to shift to sustainable transportation modes and reduce their reliance on private cars due to environmental awareness (Fioreze et al., 2019).

MaaS implementation: Case study in Italy

This case study focuses on the analysis of travel user behavior in Mobility as a Service (MaaS) scenarios. The study utilized a survey questionnaire divided into three parts. The first part gathered demographic and household information. The second part collected data on the most frequent trip, including departure time, origin, destination, frequency, and mode of transport. The third part examined a predefined trip that participants had to identify with. The study aimed to improve survey methodologies and experimentation related to MaaS. The identified transport system variables were used in a pilot survey conducted in a specific territorial context. The results indicated a willingness among users to change their travel habits when MaaS was available, particularly for journeys involving the crossing of physical barriers, such as the Strait of Messina. However, the study acknowledged the limitation of being a pilot survey and emphasized the need for a larger sample size to obtain more reliable estimates. Further developments suggested including MaaS design, user behavior modeling, calibration of Transport System Models, optimal service configuration, and extension of survey experimentation to other territorial contexts. Additionally, the use of ICT tools for data collection and integration of information from various sources was highlighted (Musolino et al., 2023).

2.3.1 CMaaS: Corporate Mobility as a Service

CMaaS (Corporate Mobility as a Service) possesses the primary characteristics of MaaS, which include the integration of various transportation modes using information and communication technology providing a one-stop-shop for mobility and requiring some form of registration or subscription (Jittrapirom et al. 2017). What makes CMaaS unique is that it is typically implemented in a company's context and facilitates mobility for employees both within and to and from a worksite. CMaaS employs a business-to-employee model (Jittrapirom et al. 2017). Focusing on lifestyle and community-based messages could be a potentially effective approach when handling campaigns (Kriswardhana & Esztergár-Kiss, 2023).

MaaS and Cmaas are innovative approaches to transportation based on social practice theory. They redefine the meaning of transportation by encouraging employers to provide sustainable alternatives to individual car ownership. MaaS and Cmaas address meanings by setting new expectations and norms regarding transportation options. Traditionally, individuals have relied on private cars for commuting. However, MaaS promotes the idea that sustainable transportation options should be provided by employers, challenging the prevailing notion of individual car ownership. This shift in meaning sets the expectation that employers play a role in providing sustainable transportation alternatives for their employees, such as carpooling or bus services. Materials are addressed as well; it involves the provision of tangible resources and infrastructure to support sustainable transportation practices. For example, companies implementing Cmaas may invest in resources like carpooling programs, shuttle services, or bike-sharing facilities to facilitate employee mobility. By providing these materials, organizations enable and encourage employees to adopt sustainable transportation practices as part of their daily routines. Competences are also relevant; it involves the development of new skills and capabilities related to using and navigating the available transportation options. With MaaS, individuals need to learn how to use the platform, access different modes of transportation, and plan their journeys effectively. Similarly, Cmaas may require employees to acquire new competences, such as understanding the carpooling system or effectively utilizing the company-provided transportation resources, or even cycling workshops.

Case Study CMaaS: Stockholm

This case study examined the implementation of Corporate Mobility as a Service (CMaaS) at a workplace in Sweden. Employees who used the commuter bus service found it convenient and comfortable, especially if they lived near pick-up points or had access to public transportation. The transportation practices within the workplace involved moving between different office buildings for meetings, and accessing lunch places, and sports facilities during lunch hours. The material elements supporting internal transport included vehicles like commuter buses, shuttle buses, taxis, and electric bikes. The service application facilitated on-the-go information search. The CMaaS system aimed to align with the company's vision of sustainable transportation. Employees developed competencies for pre-trip planning, wayside planning, and onboard planning. They recognized the importance of the CMaaS system in executing the company's

sustainability goals and took pride in their employer's leadership. Overall, the study highlights the convenience, comfort, and positive perceptions associated with CMaaS adoption in the workplace (Hesselgren et al., 2020).

2.4 Integration of Analytical Framework

Social practices and Mobility as a Service (MaaS) are interrelated in several ways. Social practices refer to the habitual patterns of behavior and practices that people engage in within a particular social context. These practices can include transportation behavior, such as commuting to work.

MaaS, on the other hand, is a transportation concept that integrates different modes of transportation, such as public transit, bike-sharing, and ride-sharing, into a single platform that provides users with access to a range of transportation options. MaaS aims to make transportation more convenient, affordable, and sustainable.

The relationship between social practices and MaaS lies in the potential for MaaS to influence and change social practices related to transportation. By providing users with a more diverse range of transportation options, MaaS can encourage users to adopt new transportation behaviors and habits. For example, a user who typically drives alone to work may be encouraged to take public transit or carpool instead if these options are more convenient and affordable through the MaaS platform.

At the same time, social practices can also influence the development and success of MaaS. For instance, the demand for MaaS may be influenced by existing social practices related to transportation, such as car ownership rates or commuting patterns. Similarly, social practices related to trust and privacy may also impact user adoption of MaaS platforms.

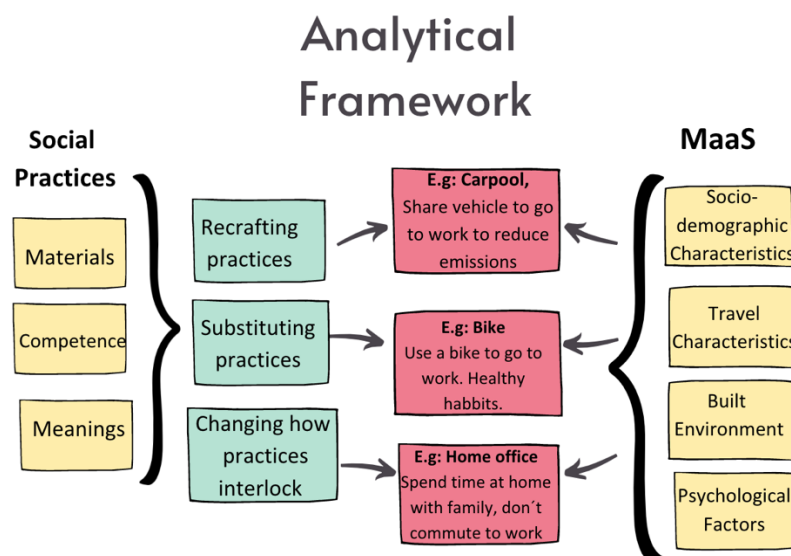


Figure 6. Analytical Framework.

2.5 Mexico City Context

Mexico City is a part of the Metropolitan Area of the Mexican Valley (ZMVM in Spanish), which consists of 16 municipalities within the city and 60 municipalities across two other states. The total population of these areas is more than 20 million people. Mexico City has a population of 9,209,944 million (INEGI, 2020).

Mexico City is situated in a valley surrounded by mountains, which exacerbates the effects of air pollution. In recent years, the city has faced serious air quality issues, with high levels of particulate matter and ozone that exceed the World Health Organization's guidelines (WHO, 2018).

The city's transportation system is heavily reliant on private cars, with more than 4 million registered vehicles in the city (SEDEMA, 2021). This has led to a high level of congestion on the city's roads, particularly during rush hour.

The transportation policies of the city promote long-distance journeys, as the city has undergone territorial expansion and centralization over the last sixty years. (Ramírez Kuri, 2007) According to the 2017 Origin-Destination Survey (EOD in Spanish) of Mexico City, from the 19.4 million people surveyed aged 6 and over in the ZMVM, more than 80% travel at least one day during the week. Only inside Mexico City, 15.1 million trips are made on weekdays, with an average time journey time of 48 minutes. (INEGI,2017)

Mexico City's Environmental Challenges

A crucial aspect of the transportation sector is to reduce emissions. However, with the increasing mobility needs of the population, there is a rise in individual modes of transportation and low-capacity vehicles. This, combined with a saturated road network and inadequate public transportation, creates an urgent need to address environmental concerns effectively. Although it can vary depending on the specific area and time of day, these issues are commonly experienced in many parts of the city, particularly during peak commuting hours and in areas with high population density.

These factors contribute to environmental concerns, including high emissions and energy consumption, which directly impact the effectiveness of sustainable transportation initiatives. If there were more or better roads and an improved public transportation network in Mexico City, a substantial portion of the problems related to sustainable transportation could be addressed. Enhancing the road infrastructure and expanding public transportation options would encourage a shift from private car usage to more sustainable modes of transportation, such as buses, trains, and cycling. This would help alleviate congestion, reduce emissions, and promote a more sustainable and efficient transportation system overall.

Based on the most recent emissions inventory, the transportation sector consumes the most fossil fuels and is responsible for over 50% of the energy consumption in the ZMVM (SEMOVI,

2020). Figure 8 displays a comparison of the number of CO₂ emissions per km/passenger for various transportation modes, including SUVs, motorcycles, sedans, hybrid cars, electric cars, buses, and metro buses, plotted against the number of passengers per unit, highlighting the potential environmental impact of each mode of transportation. For example, a bus in Mexico City usually carries 40 passengers and has 27g of CO₂ emissions compared to a hybrid car that usually carries 1.5 passengers with 55g of CO₂ emissions.

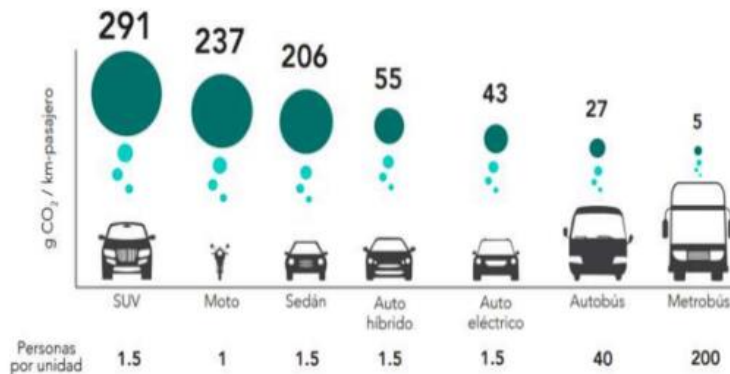


Figure 7. Comparative CO₂ emissions per vehicle. (Secretary of Environment of Mexico City, 2018).

Exposure to air pollution has been linked to a range of health problems, including respiratory illness, cardiovascular disease, and cancer. In urban areas, transportation-related air pollution is a significant contributor to poor air quality, particularly in areas with high traffic density (NatCen Social Research, 2019). It was estimated that in 2017, 1,050 people died directly from obesity and 201,549 from cardiovascular diseases and diabetes caused by obesity and lack of physical activity and a sedentary lifestyle in daily activities (Polea, 2019).

In addition, mobility choices have a significant impact on air quality, with transportation being a major source of air pollution. In the country's 20 largest cities, 14,666 people died in 2018 due to poor air quality, specifically from delicate particulate matter (such as PM_{2.5} and PM₁₀), according to estimates from the Citizen Observatory for Air Quality (Polea, 2019). This highlights the importance of promoting sustainable transportation options that can reduce air pollution and its associated health risks, while also improving overall mobility and well-being.

Figure 9 was sourced from the government's Quality of Air page, depicts the air quality status in different areas of Mexico City during a typical weekday at 8:00 am. Most regions are categorized as having "Acceptable air quality" (indicated by yellow dots) or "Bad air quality" (represented by orange dots). The specific study area is zoomed in the map.

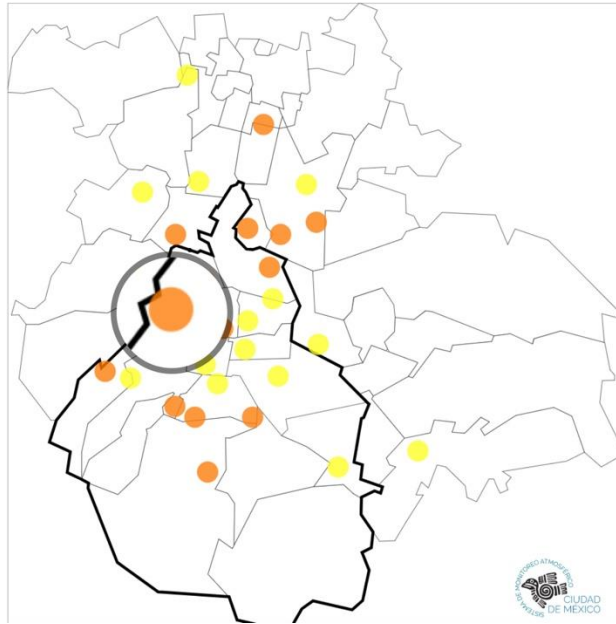


Figure 8. Air Quality in different areas of the city (Dirección de Monitoreo, 2023).

Transportation System in Mexico City

The metro is the primary means of urban transport in the city (INEGI 2017). It consists of twelve lines that intersect throughout the city, connecting various major areas. On a typical weekday, around four and a half million people rely on the metro system for their daily commute (Mexperience, 2022). The Metrobus system, a bus rapid transit system with exclusive lanes and prepaid cards, has experienced significant growth in number of routes in all the city since its introduction in 2005 (J, Villena-Sanchez et al., 2022). The city government runs the RTP, a bus system that offers ordinary and express services. The city also has trolleybuses and light rail services, though these have seen a decline in passenger numbers.

Ecobici, the city's bike-share system, has been in place since 2010, it allows residents and visitors to rent bicycles from designated stations throughout the city. Users can take a bike from one station and return it to another station. According to the last Survey made by the company in 2017, the primary use for this service was to go to work (Ecobici, 2017). Ride-hailing services like Uber and Lyft have been operating in the city since 2014 (J, Villena-Sanchez et al., 2022).

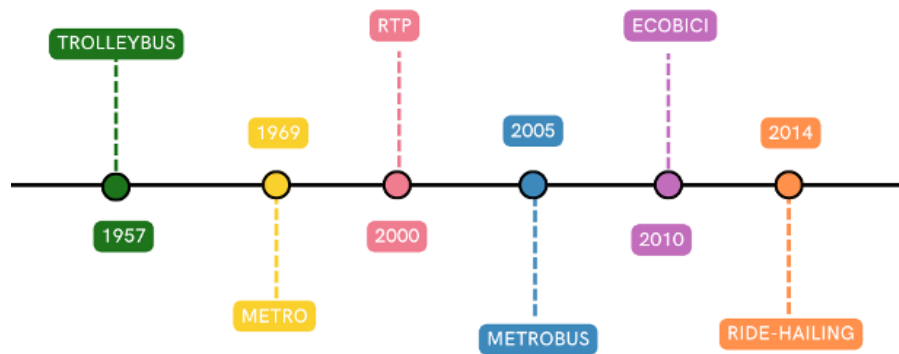


Figure 9. Timeline of transportation options in Mexico City.

Importance of Addressing Sustainable Transportation in Mexico City

As mentioned before, Mexico City is a metropolitan area facing severe air pollution and congestion problems due to the increasing number of private cars, high levels of particulate matter, and ozone. Long-distance commuting, inadequate public transportation, and a saturated road network are major contributors to environmental concerns. The transportation sector is responsible for more than 50% of the energy consumption in the area and has the highest carbon dioxide emissions (SEMOVI,2020). To address these issues, the city has implemented various initiatives, including expanding the metro system, building dedicated bus lanes, and introducing a bike-sharing program.

The rise in individual modes of transportation, including low-capacity vehicles, calls for an urgent need to address environmental concerns. With work-related trips being the most frequent during the week, reducing the commute time, and increasing public transportation's capacity can significantly impact environmental and health issues.

Overall, transportation and mobility remain major challenges in Mexico City. While the city has made progress in addressing these issues, there is still much work to be done to ensure safe, reliable, and sustainable transportation options for all residents.

Therefore, there is a problem to address the rising mobility needs of the population while reducing the negative impacts on the environment and public health in Mexico City, with a specific focus on people working in the Polanco area. The goal is to stimulate these individuals to move to sustainable alternatives of transportation, such as walking, biking, or using public transportation.

Polanco Area

Polanco is a neighborhood located in the Miguel Hidalgo municipality of Mexico City. According to the most recent population census conducted by the National Institute of Statistics and Geography (INEGI) in 2020, the total population of the Miguel Hidalgo borough was 386,027. It is

a lively and upscale neighborhood known for its commercial, residential, and cultural offerings. It is characterized by its tree-lined streets, contemporary architecture, high-end shops, restaurants, and prestigious art galleries. It attracts a diverse mix of residents, business professionals, tourists, and visitors who come to explore its diverse attractions.



Figure 10. Map of Polanco.

Polanco's central location and connectivity make it a desirable destination for both businesses and commuters. Numerous companies and organizations have their offices in Polanco, attracting a significant number of daily commuters to the area. The neighborhood's proximity to other commercial and financial districts in Mexico City, such as Reforma and Lomas de Chapultepec, adds to the volume of commuter traffic experienced in the area.

Polanco has the highest concentration of jobs in the Metropolitan Area of the Mexican Valley, as well as being the second most frequent destination in Mexico City with five hundred and twenty-two thousand trips (including internal and external trips) just behind the Historical City Center with five hundred thirty-six thousand trips (EOD,2017).

When it comes to transportation, Polanco benefits from its central position and well-developed infrastructure. The neighborhood has a good connectivity, providing convenient options for commuters and residents to navigate the city. Public transportation services, including the Metro system, serve the Polanco area effectively. The nearby Polanco and Auditorio metro stations offer easy access to various parts of the city, enabling commuters to connect seamlessly to different areas. Metrobus systems provide efficient public transportation with stations located near the neighborhood. Taxis and ride-sharing services like Uber are readily available, providing convenient and flexible transportation. Microbuses, small vans operating on fixed routes, offer localized transportation within and around Polanco.

Furthermore, Polanco embraces sustainable mobility by offering a range of transportation alternatives. The Ecobici bike-sharing program operates in the area, providing a convenient and environmentally friendly means of transportation for residents and visitors. The presence of dedicated bike lanes and cycling infrastructure further supports and facilitates this sustainable transportation option. Furthermore, Polanco's walkable streets and well-maintained sidewalks encourage walking as a popular mode of transportation within the neighborhood.

Regulation Programs for vehicles in Mexico City

The government of Mexico City has implemented three programs to regulate vehicle circulation, control emissions, and mitigate environmental contamination. The "Hoy No Circula" program and the Vehicle Verification program are conventional strategies backed by official decrees. These measures aim to address the environmental impact of vehicles within the city. Additionally, the "Fondo para el Taxi y el Peatón" (Fund for Taxis and Pedestrians) serves as another initiative to promote sustainable transportation practices. This program, which provides financial support for taxis and pedestrian infrastructure, can be categorized as a practice-based strategy, as it focuses on specific interventions and investments to improve the transportation system and enhance pedestrian safety.

"Hoy No Circula" (No Driving Today)

It is a program is a decree issued in Mexico City to regulate vehicle circulation and control the emission of pollutants. The program applies to the entire territory of Mexico City and sets criteria for vehicle circulation based on specific days and hours. The implementation of the program falls under the responsibility of the Secretary of the Environment of Mexico City (Del Medio Ambiente, 2023). The objective of the program is to establish measures that limit vehicle circulation to prevent, minimize, and control the emission of pollutants from mobile sources in Mexico City, regardless of the vehicle's origin or license plate, thereby reducing environmental contamination.

Vehicle Verification

The main goals are to set forth a calendar and guidelines for the evaluation of combustion engine vehicles registered in the city or opting for voluntary verification. The program's objectives include assessing emissions limits from vehicle exhaust and examining the operational condition of environmental control components in vehicles running on gasoline, gas, diesel, or alternative fuels, regardless of their registration or circulation on city roads. Additionally, the program aims to identify vehicles with high emission rates and promote emission reduction by implementing necessary corrective maintenance measures. It also focuses on establishing mechanisms, procedures, and processes that contribute to the prevention, control, and reduction of atmospheric pollutant emissions originating from motor vehicles (Del Medio Ambiente, 2023).

Fondo para el Taxi y el Peatón (Fund for Taxis and Pedestrians)

The government of Mexico City introduced a new tax in September 2016 to create a special trust for sustainable urban mobility as part of the Urban Mobility Law. The tax imposed a 1.5% contribution on on-demand ride-hailing services for each trip with the goal to use this trust to improve the public transport in the city (SEMOVI,2020). The government was motivated by the need to improve transportation services for both taxis and pedestrians, aiming to enhance safety, accessibility, and overall mobility in the city (SEMOVI,2020). The fund was established as part of the city's broader efforts to address transportation challenges and create a more sustainable and efficient urban environment. One of the objectives was to support the modernization and improvement of the taxi industry in Mexico City. The creation of the "*Fondo para el Taxi y el Peatón*" in Mexico City aimed to improve pedestrian infrastructure and promote a pedestrian-

friendly urban environment. With bustling streets and high pedestrian volumes, prioritizing pedestrian safety and comfort became crucial. It aimed to drive positive change by promoting sustainable and safe transportation options, improving the overall quality of transportation services, and creating a more inclusive and pedestrian-friendly urban environment.

3. Methodology

This section outlines the data collection and research methods used in the study. The data collection describes the data gathering and the limitations of the study. The research methods section includes all the approaches used for the investigation.

3.1 Data Collection

For the data collection, two methods were chosen: surveys and interviews. Surveys were used to collect quantitative data from a larger sample size, while interviews were conducted to gain more detailed insights into the motivations and experiences of individual commuters. The main goal of using these methods was to better understand the commuting patterns, preferences, and attitudes of people who work in the Polanco area in Mexico City. The survey and interview questions covered topics such as the mode of transportation used, the duration and distance of the commute, the frequency of the commute, the use of shared mobility services, and environmental awareness. The survey data was analyzed using statistical techniques to identify patterns and correlations between different variables, while the interview data was analyzed qualitatively to identify common themes and trends. This mixed-method approach provides a more comprehensive understanding of commuting behavior in the area and will help to inform recommendations for sustainable transportation initiatives. The following table 2 shows in detail the source of data, the method of gathering, and the analysis used for each sub-question.

Table 2. Data Gathering

SUB-QUESTION	SOURCE OF DATA	GATHERING METHOD	ANALYSIS METHOD
What is the existing state of the commuting practices of people working in the Pol area?	<ul style="list-style-type: none"> • Grey literature • Reports • Governmental sites 	<ul style="list-style-type: none"> • Survey • Desk Research 	Mixed method: Qualitative and Quantitative
What motivates commuters to use and adopt Mobility as a Service (MaaS) for	<ul style="list-style-type: none"> • Employees in the area • Literature review. 	<ul style="list-style-type: none"> • Survey • Desk research 	Mixed method: Qualitative and Quantitative

their daily commute to work?			
What are companies currently doing to facilitate the use of sustainable transportation?	<ul style="list-style-type: none"> • HR experts in companies. • Case studies. 	<ul style="list-style-type: none"> • Semi-structured interview 	Qualitative Method
How can sustainable commuting practices be encouraged in the Polanco area, and what roles can companies, commuters, and policymakers play in achieving this goal?	<ul style="list-style-type: none"> • Case studies 	<ul style="list-style-type: none"> • Desk research • Case studies 	Qualitative Method

Limitations

This research project had several limitations. Firstly, the absence of the researcher in the research area limited the ability to observe other behaviors and specific situations that could have influenced the findings. The lack of firsthand observation may have overlooked important contextual factors that could have contributed to the understanding of sustainable transportation practices in Polanco.

Another limitation is the reliance on statistical information primarily available at a regional level (Mexico City) rather than at the more localized levels of municipality or neighborhood. The absence of specific neighborhood-level statistics hindered the ability to analyze the data at a more granular level, potentially missing important variations and nuances that could exist within Polanco.

Additionally, the study's sample bias is another potential limitation. The research primarily focused on individuals and companies in corporate jobs, neglecting other working jobs within the area. This limitation restricted the generalizability of the findings, as the experiences and perspectives of other job types could significantly differ and contribute additional insights to the research.

It is important to acknowledge these limitations as they provide opportunities for future research to address these gaps and provide a more comprehensive understanding of sustainable transportation practices in Polanco.

3.2 Research Methods

The research methods employed in this study included desk research, survey, interviews, and a case study. Desk research involved comprehensive article analysis and literature review. A survey gathered data on commuting practices and motivations. Interviews provided deeper insights from HR representatives and the Institute of Transportation and Mobility Planning. Finally, a Case study from CMaaS implemented in Mexico City.

3.2.1 Desk Research

Desk research was conducted to delve into the concepts of Sustainable Transportation, MaaS Theory, and Social Practices. This thorough exploration involved an analysis of various articles sourced from reputable platforms like Scopus, as well as a comprehensive literature review recommended by our supervisors. The data collection process involved targeted searches using keywords such as Sustainable Transportation, MaaS case study, and Social Practices in Transportation.

Additionally, to gather specific insights about Mexico City in relation to the environment, mobility plans, and transportation, we diligently examined Mexican governmental platforms. This enabled us to gain valuable information and a comprehensive understanding of the city's current landscape.

3.2.2 Survey

The purpose of this report is to present the findings of a survey conducted among individuals who commute to work in a specific area of Mexico City. The survey aims to answer two of the study's sub-research questions: (1) *What is the existing state of the commuting practices of people working in the Ch-Pol area?* and (2) *"What motivates commuters to use and adopt Mobility as a Service (MaaS) for their daily commute to work?"* It aims to gather information on the commuters' age, gender, mode, and duration of commuting, frequency of work travel, environmental awareness, and willingness to use shared mobility options. These factors align with the concepts shown in Table 3 based on the MaaS framework. The survey also seeks to understand the motivations behind commuters' choice of transportation modes. To facilitate the data collection process, the survey was conducted using the software platform Qualtrics. This choice was made considering its alignment with the regulations and guidelines set forth by the University of Twente. By utilizing Qualtrics, a reliable and user-friendly tool, the survey administration process was streamlined, allowing for efficient data gathering and analysis.

The questions were based on the theoretical framework from MaaS and Social Practices Frameworks explained in Chapter 2. In Annex 1 the questions and the background they were based on can be found.

Selection of sample

The Mexican Ministry of Commerce and Industrial Development has issued an agreement to classify micro, small, and medium-sized enterprises based on their size and sector. The agreement outlines criteria for classification, considering the number of employees in different sectors: industry, commerce, and services. Moreover, it permits government departments and business organizations to propose tailored stratification criteria (De Desarrollo Social, 2022).

In the following table it is explained the size of the company and the different sectors established in the classification of the agreement (industry, commerce and services) with the approximate number of employees for each sector depending on the size of the company (micro, small, medium or large):

Table 3. Classification of Companies by Size and Sector with Employee Counts.

Size	Industry	Commerce	Services
Micro company	0-30	0-5	0-20
Small company	31-100	6-20	21-50
Medium company	101-500	21-100	51-100
Large company	More than 500	More than 101	More than 101

Adapted from De Desarrollo Social, I. N. (2022). Ley Orgánica De La Administración Pública Federal. <https://www.gob.mx/indesol/documentos/ley-organica-de-la-administracion-publica-federal-62720>

The commerce sector primarily involves activities related to buying and selling goods or services. The service sector, on the other hand, focuses on providing intangible services rather than tangible goods. The industry sector encompasses companies involved in manufacturing, construction, and other industrial activities.

The study focused on a sample size consisting of five companies located in the Polanco area of Mexico City. The selection aimed to ensure representation and diversity among different sectors and sizes of businesses. By including a range of sectors, the study aimed to gain a comprehensive understanding of the implications and impact of the stratification criteria on various types of enterprises. While commerce and service sectors dominate the Polanco area, the limited presence of the industry sector suggests that the area is more oriented towards commercial and service-oriented activities rather than industrial production. This sample size was chosen to ensure sufficient data for analyzing trends and drawing meaningful conclusions while considering the resource constraints of the study.

Table 4. Selection of Companies.

Company	Size	Sector	Employees
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1	Medium	Commerce	100
2	Medium	Service	100
3	Small	Commerce	50
4	Small	Service	31
5	Micro	Service	19
Total			300

To estimate the number of commuters based on the provided data, the Slavin formula was used. The Slavin formula is commonly used to calculate sample sizes for surveys and research studies.

$$n = N / (1 + N * e^2)$$

Where:

n = sample size

N = population size

e = margin of error (expressed as a proportion)

The estimated sample size using Slovin's formula for a population of 300 with a 95% confidence level and 5% margin of error is 171.

3.2.3 Semi-Structured Interview

Semi-structured interviews were employed as a collection. The interviews must be designed to be flexible, incorporating both predetermined questions and open-ended prompts to encourage participants to share their unique perspectives and experiences (Fylan, A., 2005). While a set list of questions covered the main topic, the interviews allowed for adaptability, enabling the exploration of additional themes and insights that emerged organically during the discussions. This method facilitated conversational exchanges aimed at uncovering the underlying motivations and practices related to sustainable transportation

This method was used to answer SRQ 3: *What are companies currently doing to facilitate the use of sustainable transportation and how can companies facilitate the adoption of sustainable transportation options by their employees?*

A series of interviews have been conducted with HR management positions from selected companies in the area to gain deeper insight into their views and initiatives regarding sustainability in mobility. The interviewees from prominent companies, namely Netflix, Ernst and Young, and an Independent HR consultant, were asked questions about the company's sustainability goals, awareness of employees' commuting patterns, and any challenges faced by the employees in terms of commuting. The interviews also investigated if there are any current strategies or programs in place to promote sustainable transportation options and if there are any incentives for employees who use such options.

Furthermore, the interviews aimed to discover if there are any new or upcoming initiatives to facilitate commuting to employees in a more sustainable manner. Alongside these interviews, valuable insights were obtained through an interview with the Institute of Transportation and Mobility Planning (IDTP) of Mexico. The IDTP interview provided an additional understanding of their project: MOVIN Reforma strategies, and future plans for enhancing sustainable mobility in Mexico City. This comprehensive approach, which included interviews with HR representatives from companies such as Netflix, Ernst and Young, and an Outsourcing firm, as well as the IDTP, facilitated a comprehensive understanding of sustainable mobility initiatives and practices in Mexico City across various sectors.

Table 5. Interviewee list.

Code	Institution	Company Size	Position
Interviewee 1	Ernst & Young	Medium	Senior Associate Human Resources Enablement
Interviewee 2	Netflix	Medium	Global Tech Talent Acquisition Researcher
Interviewee 3	Independent HR Consultant	Micro	HR consultant in Polanco
Interviewee 4	Institute for Transportation and Development Policy	Small	Transportation Analyst

The interviews were conducted using the Google Meet platform, as provided by the researcher. Participants and the interviewer connected remotely through this video conferencing tool, allowing for convenient and flexible communication. During the interviews, the conversations were recorded to ensure accurate capturing of the participants' responses and maintain a comprehensive record of the discussions.

Following the interviews, the recorded audio or video files were transcribed using transcription software or services. The transcriptions were then transferred into a Word document format, allowing for easier organization and analysis.

A comparative analysis technique called Qualitative Comparative Analysis was employed to examine and compare the initiatives and perspectives of different companies regarding sustainable transportation and their engagement with employees. This method helps explore the relationships between conditions and outcomes, gain case intimacy and establish a dialogue between theories and data (Pagliarin, S., et al,2023).

This approach facilitated the identification of similarities, differences, and patterns among individual perspectives, resulting in a comprehensive understanding of the topic. By analyzing data from multiple interviews, variations and insights into diverse views and practices of sustainable transportation in different organizational contexts were explored. This methodological approach provided valuable insights into the topic of sustainable transportation and its implementation within organizations.

3.2.3 Intervention CMaaS Case Study

The last method of data collection involved a case study of the "MOVIN Reforma" project, which was undertaken by seven socially and environmentally conscious companies located along Paseo de la Reforma in Mexico City. Led by the Institute for Transportation and Development Policy (ITDP) and CoRe Ciudades Vivibles y Amable, A.C., the project aimed to promote and transition towards a more sustainable mobility system. The case study analyzed the social practice interventions implemented as part of the project to gain insights into the strategies and actions taken to achieve sustainable mobility goals. By examining the MOVIN Reforma project, valuable knowledge and lessons were derived to inform future initiatives and contribute to the development of sustainable transportation systems.

3.3 Data Analysis

The survey data was analyzed using statistical techniques to identify patterns and correlations between variables. Descriptive statistics was one of the techniques used in which it summarized the survey responses, while inferential statistics may be used to explore relationships and test hypotheses. Cross-tabulations were used to understand relationships between different variables of the survey to identify patterns. The interview data was analyzed qualitatively, examining transcripts for common themes and insights. The findings from both analyses were compared and integrated to provide a comprehensive understanding of commuting behavior in the Polanco area and inform sustainable transportation recommendations.

4. Findings

This study aims to provide insights into commuting patterns and preferences among individuals working in five different companies located in Polanco, Mexico City. A survey was conducted, and a total of 188 responses were gathered from the target population. However, fifteen responses were excluded from the analysis due to incomplete answers, resulting in a final sample size of 173 respondents. The survey data collected from these individuals will be analyzed to uncover valuable information regarding their commuting practices, mode preferences, travel distances, and motivations behind their transportation choices. By examining these factors, this study seeks to contribute to a better understanding of commuting behaviors and provide meaningful insights for the development of sustainable mobility solutions in the Polanco area.

4.1 Current State of Commuting Practices in Polanco

The primary objective of the survey was to examine the commuting patterns within this sample group. Specifically, the survey sought to address the sub-question: *"What is the existing state of the commuting practices of people working in the Pol area?"* This sub-question aimed to gain insights into the travel characteristics and the transportation modes employed by individuals to commute to their workplaces. By examining the current state of commuting practices, this study aims to provide a comprehensive understanding of the transportation behaviors and choices prevalent among the surveyed population in the Polanco area.

The next section begins by describing relevant characteristics of the surveyed population, followed by an exploration of their current commuting practices.

General Results of the Survey

Among the 173 respondents of the survey, women constituted a larger portion, with 111 responses, while men accounted for 62 responses. Interestingly, both genders showed a higher concentration within the age range of 20 to 30 years old.

Table 6. Demographics of the survey.

Age	Men	Women
18-20		5
20-25	37	55
25-30	16	22
30-40	3	19
More than 40	6	10
Total	62	111

The findings from Figure 12 align with previous research conducted by Kriswardhana and Esztergár-Kiss (2023), emphasizing the significance of age and gender as sociodemographic factors influencing the adoption of Mobility as a Service (MaaS). Specifically, individuals between the ages of 18 to 34 demonstrated a higher propensity for MaaS adoption, indicating a potential cluster of individuals more inclined towards embracing MaaS solutions. These insights highlight the relevance of considering age and gender demographics when designing and promoting MaaS initiatives, as targeting this age range may yield greater success in encouraging MaaS adoption. In Figure 12, it is evident that all age groups demonstrate a strong inclination to adopt Mobility

as a Service (MaaS), with a particularly notable trend observed among individuals aged 18 to 40 years.

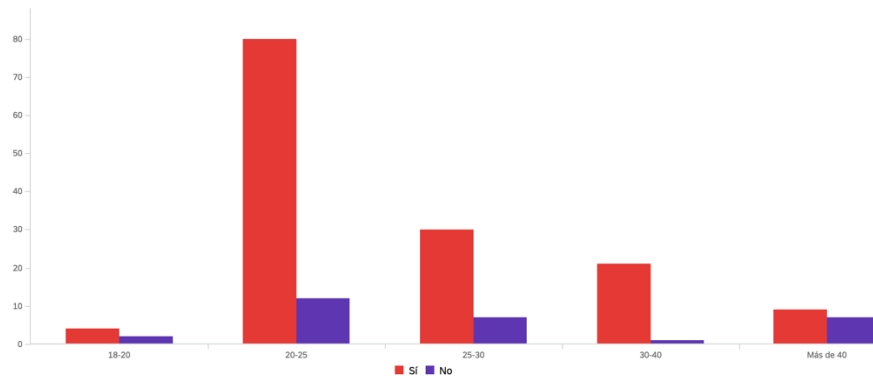


Figure 11. Adoption of MaaS by age.

The results of Figure 13 reveals interesting findings regarding the materials or objects related to commuting practices within the framework of social practice theory. Among the surveyed population, it was observed that 50% of the respondents relied on private cars as their primary mode of transportation to commute to work. This indicates the significance of private vehicles as a material element within the commuting practice. Public transport emerged as the second most popular choice, with 31.23% of respondents utilizing it. This highlights the role of public transport systems as another material element in commuting practices. Additionally, 7.21% of respondents reported walking as their preferred mode of commuting, showcasing the significance of physical activity as a material element in commuting practices. Furthermore, a smaller percentage of respondents opted for alternative materials such as taxis, Uber, or bicycles, indicating the presence of diverse material elements associated with commuting behaviors. These findings contribute to a deeper understanding of the materials(objects) involved in the social practices of commuting, emphasizing the need for sustainable transportation options to reduce reliance on private cars and promote alternative modes of commuting.

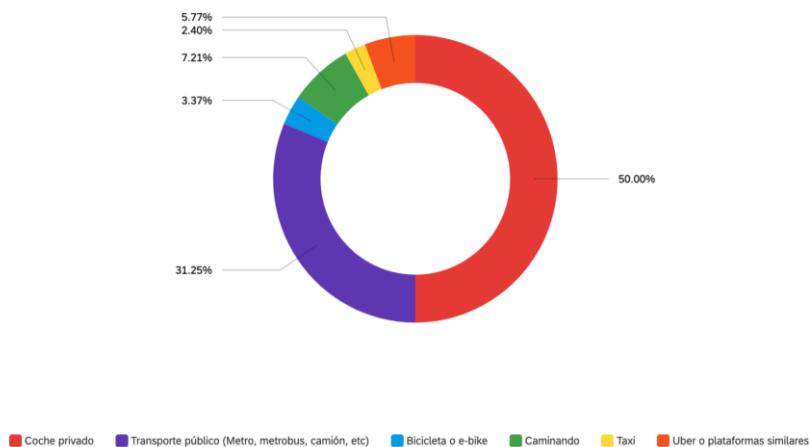


Figure 12. Transportation mode used to get to work.

Figure 14 illustrates the relationship between distance traveled and the corresponding travel time. The data clearly demonstrate that as the distance increases, so does the travel time, with a notable observation in the 10–20-kilometer range, where commuters typically experience a commute time of 30-60 minutes. The survey results provide valuable insights into the commuting distances and associated travel times for individuals traveling to work. These findings are consistent with a study by Caiati et al. (2020) mentioned in Chapter 2, which highlights the importance of daily travel distance. Among the survey respondents, a notable 43.79% reported commuting distances ranging from 10 to 20 kilometers. This distance range is particularly significant as the study by Caiati et al. identified a positive coefficient for travel distances between 20 to 40 kilometers, indicating a higher inclination towards e-car-sharing among individuals within this range.

The survey data also revealed a diverse distribution of commuting distances within the surveyed population, encompassing both short commutes and longer journeys exceeding 30 kilometers. Commuting distance plays a crucial role in determining the overall duration of the commute, with longer distances generally requiring more time for travel. Factors such as road congestion significantly impact commuting time, particularly in urban areas like Mexico City, where heavy traffic congestion can lead to prolonged travel times and heightened frustration among commuters. The availability of dedicated bicycle and bus lanes presents an opportunity to influence commuting patterns, particularly for shorter distances.

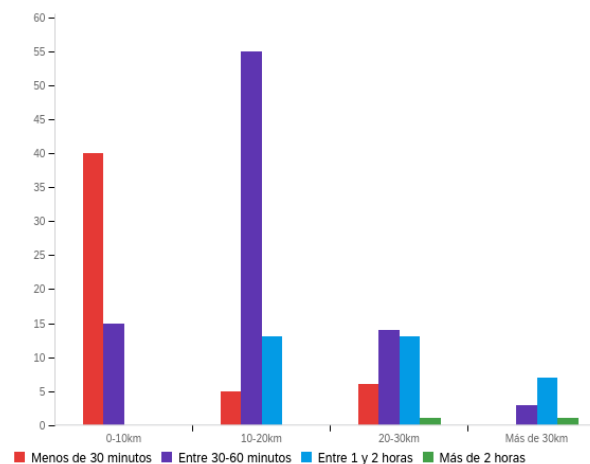


Figure 13. Km travelled, and time spent.

Figure 15 provides insights into the frequency of office attendance for work. Among the participants, a significant majority of 62.79% reported going to the office five days a week, indicating a full workweek schedule. Additionally, 14.53% stated that they go to the office two days a week, suggesting a part-time or flexible work arrangement for a portion of the respondents. Furthermore, 12.79% indicated going to the office three days a week, reflecting another common work pattern. Lastly, 9.88% reported going to the office four days a week, indicating a slightly less prevalent but still significant frequency. These findings demonstrate the

distribution of office attendance patterns within the surveyed population, with various arrangements ranging from full-time to part-time work schedules throughout the week.

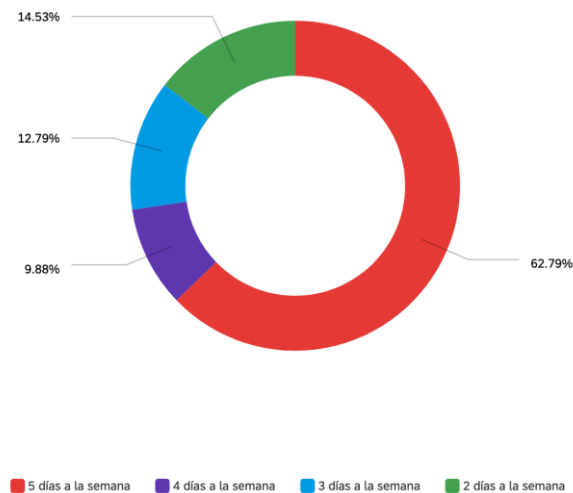


Figure 14. Frequency to go to work.

4.2. Motivations for adopting MaaS for daily commuting

The second subquestion of the survey, *"What motivates commuters to use and adopt Mobility as a Service (MaaS) for their daily commute to work?"* delves into the motivations and interests of commuters regarding the adoption of Mobility as a Service (MaaS) and explores how it connects to the meanings associated with commuting to work. This subquestion aims to understand the factors that drive individuals' interest in using MaaS and the underlying motivations behind their transportation mode choices. By examining the implications of MaaS for commuting to work, the survey seeks to uncover the potential appeal and relevance of integrated mobility solutions in meeting commuters' needs and aspirations. This analysis provides insights into the ways in which MaaS can align with the meanings and values individuals attribute to their daily commute, ultimately contributing to a more comprehensive understanding of the role of MaaS in shaping commuting behaviors and promoting sustainable and efficient transportation options.

This section contains the interest of the surveyed sample in utilizing shared mobility options followed by their motivations for adopting shared mobility.

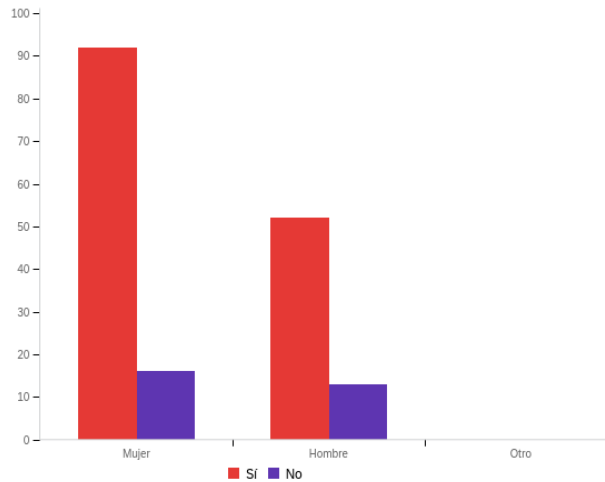


Figure 15. Interest in using MaaS by gender.

Figure 16 revealed that a significant majority of the sample expressed a keen interest in utilizing shared mobility options for their daily commute from the company. The figure shows a higher acceptance for using MaaS by women than man, this can be influenced by a sense of security, convenient and accessible. Additionally, women who have limited access to private vehicles or face transportation challenges may find MaaS to be a more accessible and suitable alternative.

This finding is particularly significant as it aligns with the concept of Corporate Mobility as a Service (CMaaS), which is designed to facilitate mobility for employees within and to and from their workplace. CMaaS operates under a business-to-employee model, emphasizing the employer's role in providing convenient and sustainable transportation solutions to their workforce. By incorporating shared mobility services as part of their CMaaS offering, companies can effectively meet the mobility needs of their employees while promoting environmental sustainability.

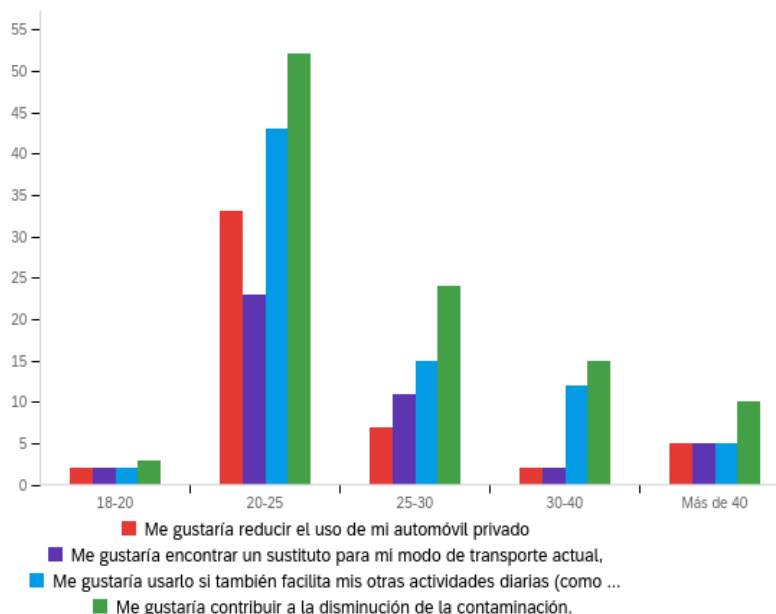


Figure 16. Motivations to use MaaS by age groups.

Figure 17 reveals significant insights into the motivations behind individuals' adoption of shared mobility for their daily routines. By categorizing these motivations into sub-age groups, a comprehensive understanding of their driving factors was achieved. Across all age groups, a consistent trend emerged with pollution reduction being the primary motivation, reflecting an increasing environmental consciousness. In the 20-25 age group, reducing the use of private cars ranked as the second motivation, indicating a willingness to embrace sustainable alternatives. Notably, this motivation ranked lower in the 25-40 and above age groups, potentially due to the younger generation's increased awareness of sustainability and their openness to innovative transportation options facilitated by technology. Another key driver identified was the desire for shared mobility to enhance daily activities, underscoring the importance of convenience. Furthermore, all age groups shared a common motivation to replace their current transportation mode, highlighting the potential for transformative changes in transportation practices.

4.3 Companies' Efforts to Promote Sustainable Transportation

The sub-question 3 *“What are companies currently doing to facilitate the use of sustainable transportation and sustainable mobility practices and how can companies facilitate the adoption of sustainable transportation options by their employees?”* examines the current efforts of companies in promoting sustainable transportation and mobility practices. It also explores how companies can facilitate the adoption of sustainable transportation options by their employees. By understanding the existing initiatives and identifying effective strategies, this investigation aims to provide insights for businesses to enhance their sustainable mobility efforts and contribute to a greener future.

This section explores the current efforts of companies in promoting sustainable transportation and mobility practices, as well as strategies for facilitating the adoption of sustainable transportation options by employees. It discusses the lack of flexibility in working from home, compensation practices for transportation, and potential solutions such as carpooling systems and company-sponsored transportation options like Uber. These findings emphasize the need for alternative work arrangements and employer support to reduce commuting impacts and promote sustainability.

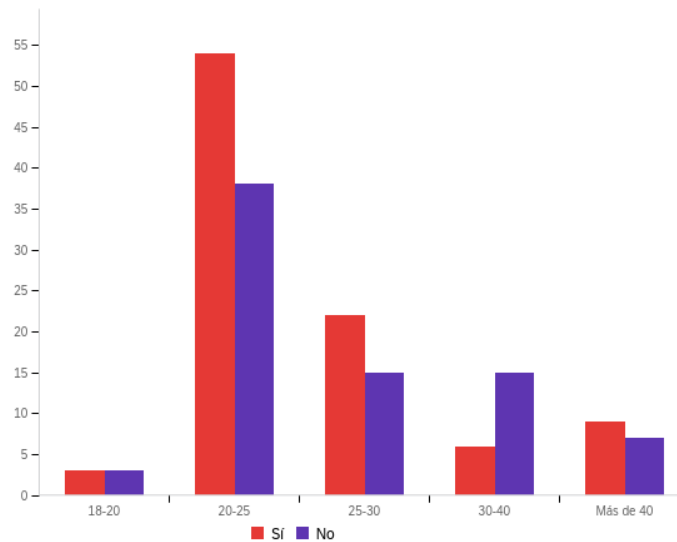


Figure 17. Flexibility to work from home by age.

Figure 18 revealed that more than half of the population working in the surveyed companies do not have the flexibility to work from home. This finding highlights a significant portion of individuals who are required to commute to their workplace, despite the potential for remote work arrangements. The figure shows an interesting flexibility for younger generations to work remotely from 20-30, while the ages from 30-40 have less flexibility. This can be attributed that younger people are more comfortable and familiar with digital platforms, while older generations aren't or might require on-site responsibilities.

The interviews conducted with HR positions revealed interesting insights regarding the flexibility to work from home. Among the interviewees, only one mentioned having 100% flexibility to work remotely. However, the other interviewee expressed a different perspective, stating, *"We are also regressing and going back to things we were doing... They are gradually bringing us back to the offices and making us go 2 or 3 times a week. This impacts sustainability because it means making people move and making the masses move, transportation, occupying time, energy, and so on."* (Interviewee 1, May 5th, 2023) This statement highlights the challenges and complexities involved in implementing remote work policies and their impact on sustainability. It suggests that not all companies are embracing remote work as a long-term solution, which can have implications for commuting patterns, energy consumption, and overall environmental sustainability.

"We are trying to ensure that flexibility, particularly in terms of time, is respected. I believe it's a win-win situation." (Interviewee 1, May 5th, 2023) This statement emphasizes the importance of flexibility in work arrangements and highlights the mutual benefits it can bring to both employees and employers. Flexibility allows individuals to better manage their time and achieve a balance between work and personal life, while also potentially contributing to increased productivity and job satisfaction. Incorporating this perspective further reinforces the significance of flexibility as a crucial aspect of modern work practices and its potential impact on commuting patterns and sustainability.

These findings underscore the need for exploring alternative work arrangements and promoting remote work options to reduce the environmental footprint associated with daily commuting in the city. Implementing flexible work policies and promoting remote work practices can help alleviate congestion and mitigate the environmental challenges faced by urban areas like Mexico City.

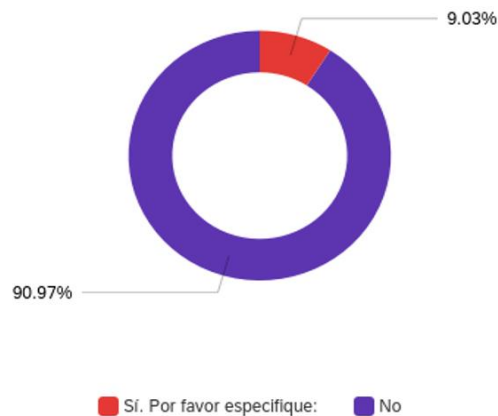


Figure 18. Compensation for transportation.

Figure 19 findings revealed that a significant majority, 90% of the respondents, do not receive any type of compensation for their travel to work. This lack of compensation highlights a common practice where employees are responsible for covering their commuting expenses. However, among the small percentage of participants who do receive compensation (9%), various forms were reported. The most mentioned form of compensation was gasoline bonuses, indicating that some individuals receive financial support specifically for their fuel expenses. Additionally, a portion of the respondents reported receiving a monthly compensation amount, suggesting that their employers provide a fixed allowance to offset commuting costs. Furthermore, a few participants mentioned that transportation to work is offered by the company, often in the form of Uber services. *"The compensation that I usually see the most that companies give are gasoline bonuses but mainly for higher positions"* (Interviewee 3, May 16th, 2023) These findings demonstrate the diversity in compensation practices related to commuting expenses and highlight the need for organizations to consider providing support or alternatives to address the financial burden associated with daily travel to work.

During the interviews, valuable insights were gathered regarding alternative transportation arrangements. One interviewee mentioned, *"At some point, it was suggested that we could organize something like a carpooling system, where colleagues living nearby could coordinate and share rides. However, this idea was only proposed and has not been implemented yet."* (Interviewee 1, May 5th, 2023) This highlights the consideration of innovative solutions to optimize commuting practices within the organization. Another interviewee shared, *"I can request an Uber to take me to the office, and the company covers the expenses."* (Interviewee 2, May 10th, 2023) who also added: *"The Head of Talent Acquisition for all of Mexico and Latin America sometimes runs to the office from his home... what encourages to do this is that we have*

exclusive showers in the office... and seeing a high-level executive doing it can inspire others." (Interviewee 2, May 10th, 2023) This behavior serves as an inspiration for others and promotes a culture of active commuting. This example showcases a company-provided transportation option, where employees can rely on Uber services for their daily commute. These interviews highlight the potential for exploring collaborative commuting initiatives and employer-sponsored transportation alternatives to enhance convenience and sustainability.

4.3.1 Impact of Sustainable Transportation on Workers' Commuting Decisions

By understanding the factors that workers in the Pol area consider important when choosing their transportation mode, we can address the question of how sustainable practices can be encouraged among them. This section examines survey findings that align with social practices theory, revealing the influence of social context and attributed meanings on individuals' behaviors and choices. It also highlights the factors that play a significant role in workers' transportation mode decisions, including availability, security, environmental impact, comfortability, time efficiency, and cost, as depicted in Figure 20.

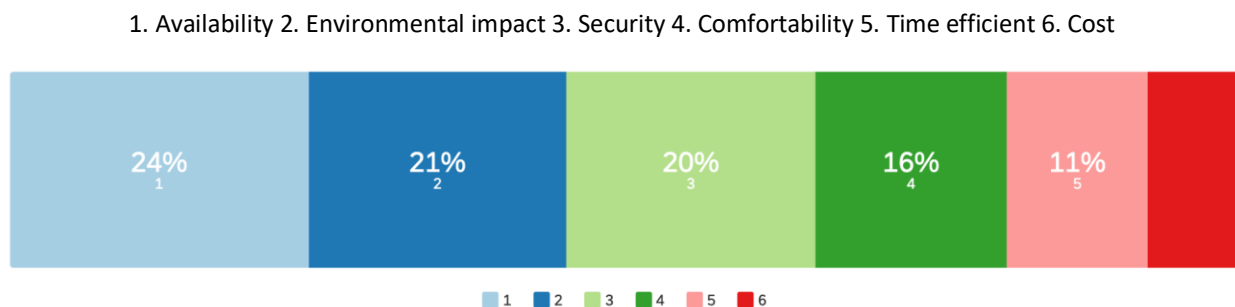


Figure 19. Importance for transportation decisions.

The survey findings align with the principles of social practices theory, which suggests that individuals' behaviors and choices are shaped by the social context and the meanings they attribute to certain practices.

Figure 20 findings shed light on the factors influencing workers' decisions regarding their transportation mode. The results revealed that availability was considered the most important factor, with 24% of respondents highlighting its significance. Following closely was security, with 21% emphasizing the importance of feeling safe during their commute. The environmental impact of transportation was ranked third, with 19% of participants considering it a crucial factor. Comfortability was the fourth most important factor, with 16% of respondents valuing a comfortable commuting experience. Time efficiency and cost were equally ranked as the fifth most important factors, indicating that workers prioritize both minimizing travel time and managing transportation expenses. The lower ranking of cost as a factor influencing transportation choices in the survey findings may be due to the relatively higher financial

resources of the respondents in the affluent Polanco area. Additionally, the availability of alternative transportation options and other considerations, such as availability, security, and environmental impact, may take precedence over cost in their decision-making process. However, individual financial situations and personal preferences may vary, warranting further research to fully comprehend the reasons behind this ranking.

In addition, one interviewee emphasized the impact of the pandemic on mobility patterns, stating, *"The pandemic greatly influenced mobility. Many people started using cars, while others began using bicycles. For most people, it's a combination of different factors."* (Interviewee 4, May 10th, 2023) This quote highlights the dynamic nature of mobility and the changing behaviors of individuals in response to external factors such as the pandemic. Understanding these shifting trends is crucial for designing effective and adaptable mobility solutions that cater to the evolving needs and preferences of commuters.

These findings highlight the multifaceted considerations that influence workers' transportation choices and provide valuable insights for companies aiming to promote sustainable transportation options that align with employees' priorities.

4.4 Intervention Case Study: "Movin Reforma, Mexico City"

The Movin case study is highly relevant for understanding what companies are currently doing to facilitate the use of sustainable transportation. It provides valuable insights into the efforts, strategies, and practices implemented by companies in promoting sustainable transportation options among their employees. By examining the case study, a comprehensive understanding of the initiatives undertaken by companies, their effectiveness, and the challenges faced in promoting sustainable transportation is highlighted.

MOVIN Paseo de la Reforma is a project undertaken by seven socially and environmentally conscious companies located along Paseo de la Reforma in Mexico City. The goal of this project, led by the Institute for Transportation and Development Policy (ITDP) and CoRe Ciudades Vivibles y Amable, A.C., is to promote and transition towards a more sustainable mobility system to improve the quality of life for employees, reduce congestion in the area, and minimize harmful emissions. This project aims to be a success story in Mexico, influencing public policies related to demand management in transportation and expanding its benefits to more companies, ultimately benefiting a larger population (Alexhdz, 2022).

It focuses on two key aspects: active mobility and shared mobility. Under the active mobility component, the plan encourages walking and promotes the use of the EcoBici bike-sharing program, providing residents with convenient and eco-friendly transportation options. The shared mobility component of the plan emphasizes carpooling, subsidies for public transport, and the establishment of corporate shared shuttles, which aim to reduce private car usage and promote shared transportation alternatives. The plan incorporates the principles of the Social Practices Theory, specifically in terms of intervention strategies; recrafting practices involve promoting active mobility and shared transportation options, substituting practices focus on

reducing private car usage through carpooling and subsidies for public transport, and interlocking practices involve integrating different modes of transport and creating a supportive ecosystem for sustainable mobility. They created a shared mobility approach which encourages people to adopt a multimodal mindset and choose the most appropriate mode of transport for their needs.

As part of this plan, an Institutional Mobility Plan (PMI) was developed to assist companies in implementing sustainable transportation practices, it serves as an effective approach to manage and encourage sustainable transportation options for commuting between the workplace and home. Through the lens of the social practices theory, the Institutional Mobility Plan (PMI) can be seen as an intervention aimed at transforming existing transportation practices within companies.

The first step of the institutional mobility plan involves planning and key considerations for successful implementation, including gaining the support of top management, forming a coordination team, and assembling a dedicated work team, the plan seeks to recraft and substitute traditional commuting practices with more environmentally friendly alternatives. The second step of the Institutional Mobility Plan is the diagnosis phase, which serves as the foundation for developing the plan and evaluating its outcomes. The diagnosis involves analyzing the environment to assess accessibility and existing transportation infrastructure; this step enables the identification of interlocking practices and the potential for change. Additionally, it focuses on evaluating the organization's current mobility options, such as parking subsidies and corporate transportation, along with their associated costs, aiming to redirect subsidies from cars to alternative modes of transportation. The third step is the creation of the mobility plan, it is a document that outlines the design, incentives, and implementation timeline for both mobility and administrative strategies. It considers existing mobility options promoted by the company, assesses infrastructure availability, and aims to shift subsidies from cars to other sustainable transportation modes. The plan defines specific objectives, evaluates the feasibility of implementation, and calculates the potential for modal change, considering factors such as location, infrastructure, and individual transportation patterns; this step involves reshaping social norms and habits by providing incentives and infrastructure that support sustainable modes of transportation, ultimately aiming to shift the dominant practice of car reliance towards more sustainable alternatives. Step four includes the implementation of the selected strategies in the previous step and includes the creation of a budget for it. Finally, monitoring and evaluating the strategies and its sustainable impact, this allows for continuous learning and improvement in promoting sustainable behaviors and reducing the environmental impact of commuting practices.

5 Discussion

Key Discoveries

The study uncovered several key discoveries regarding transportation practices in Polanco. Firstly, the dominance of car usage as the primary mode of transport highlighted the influence of convenience, personal habits, and social norms on transportation choices; this can be due to a

higher environmental awareness, or to the fact that they live close to their jobs. The findings indicate that factors such as ease of access, familiarity, and established norms heavily influence individuals' preference for private cars.

Interestingly, the presence of individuals who already walked or cycled to work prior to the pandemic suggests a willingness to adopt more sustainable transportation options. This finding indicates the potential for behavior change and the receptiveness of individuals towards embracing alternative modes of transportation. It also signifies the importance of providing accessible and convenient sustainable options to encourage a shift away from car dependency.

The study also revealed that different age groups exhibit varying levels of flexibility for remote work. The younger age group, particularly individuals aged 20-30, demonstrated higher flexibility in working remotely. This can be attributed to their technological familiarity and the nature of their job responsibilities. On the other hand, individuals aged 30-40 showed less flexibility, possibly due to the nature of their work or other constraints. Understanding these differences among age groups can help tailor interventions and policies to promote sustainable transportation practices more effectively.

To add up, the study shows a high tendency on people's motivations for using sustainable transportation related to environmental concerns and reducing the use of the automobile.

Critical Analysis of Literature

The findings of this study align with the Social Practices Theory, which emphasizes the influence of convenience, personal habits, and social norms on transportation choices, emphasizing changing patterns to seek alternative ways of mobility (Strengers & Maller, 2015).

Convenience plays an important role in shaping transportation practices and making sustainable options accessible and user-friendly to encourage their adoption. Personal habits influence transportation choices, it means breaking old habits and forming new ones aligned with sustainability. Promoting walking, cycling, and public transportation as routine options helps establish sustainable habits. Social norms influence behavior and fosters a culture that values sustainable mobility through awareness campaigns, community engagement, and role models that adopt sustainable practices encourages people around them.

The dominance of private cars in Polanco reflects deeply ingrained social norms associated with automobile ownership and the perceived convenience it offers. To promote sustainable commuting practices, it is crucial to assess people's competencies in utilizing alternative modes of transport, such as biking or public transportation, and to address the reasons behind the perceived convenience of private car usage.

The study also highlights the need for integrated strategies that consider the interplay between individual preferences, social norms, and practical aspects of daily commuting. It is important to create a supportive and sustainable mobility ecosystem that encourages positive behavioral

changes and facilitates a shift towards more sustainable transportation options. Interventions for recrafting transportation practices can include the implementation of CMaaS through partnerships with mobility service providers can offer integrated transportation solutions to employees (Jittrapirom et al. 2017). Providing incentives for employees who choose sustainable transportation or subsidies for public transportation fares can promote alternative modes of transport can make sustainable options more attractive and accessible to workers. Substituting practices can include the change of private car to biking to work; for this, companies can offer workshops for people who do not have the competences for this new transportation mode, as well as incentivize it with bicycle cards which people can use as well in their free time. Finally, interlocking practices can include flexible work arrangements, such as remote work or flexible office hours, this can reduce the need for daily commuting, conducting awareness campaigns and education programs, and collaborating with local authorities to improve transportation infrastructure and services are essential interlocking practices. These efforts can collectively encourage individuals to adopt and sustain greener commuting practices in Polanco.

Implications and Next Steps

The findings of this study have several implications for promoting sustainable transportation practices in Polanco. Firstly, effective communication is crucial to raise awareness among companies and individuals about the benefits of sustainable transportation. Highlighting the advantages, such as cost savings and improved reputation, can create a compelling business case for adopting sustainable transportation practices.

Furthermore, incorporating the insights from the Social Practices Theory can help companies better understand the complex factors influencing transportation decisions. By aligning their efforts with these factors, companies can create a supportive environment that encourages the adoption of sustainable transportation options.

To encourage the adoption and usage of sustainable transportation options among workers in Polanco, it is crucial to address the factors that influence individual behavior. This includes challenging prevailing norms and habits associated with car usage, promoting the benefits of alternative modes of transport, and improving the convenience and accessibility of sustainable options.

Government initiatives and policies play a crucial role in promoting sustainable transportation. It is essential to prioritize the development of infrastructure for public transit, cycling, and carpooling to provide attractive alternatives to private cars. Implement supportive policies for businesses to include a sustainable mobility plan to their core activities, this could include considerations for behavior change and gender perspectives, along with ongoing monitoring and evaluation (IDEAMOS et al., 2023). Providing diagnostic tools, guidelines, communication materials, and an online platform can facilitate the process. Parking regulations to discourage the usage of car is another intervention that the government could support to reduce car usage. Additionally, addressing environmental concerns associated with car usage, such as quantifying

CO2 emissions and promoting the environmental benefits of alternative modes of transport, can encourage individuals to make more sustainable transportation choices.

Companies can adopt sustainable mobility strategies such as giving incentives to the employees, promote internal awareness campaigns on the benefits of sustainable transportation, this can include workshops, provide showers and changing rooms for people who cycle, walk, or run to the office; and for longer distances subsidize or reimbursement of public transportation or shared mobility services. This can be facilitated with the Institutional Mobility Plan generated by IDTP in which companies can follow the five-step plan to include it in their activities. Commuters play an important role in adopting sustainable transportation; they need to choose alternative transportations; the decision-making can be facilitated by the companies who provide the incentives necessary to encourage commuters to change their current practices. Commuters can as well request both companies and the government for better infrastructure and compensation for sustainable transportation creating understanding to other commuters, and people around. By taking these concrete steps, government, companies, and commuters can collectively contribute to promoting and facilitating the adoption of sustainable transportation practices in Polanco.

Balancing efficiency, social factors, and equity is crucial in designing effective policies (Carrales, 2023). Integration of urban planning, mobility strategies, and social consciousness is important for sustainable cities. To further advance sustainable transportation policies, future research should investigate the role of policy and governance for developing effective strategies. Analyzing the existing policies, regulations, and institutional frameworks can identify opportunities for improvement and integration of sustainable transportation

Lastly, exploring the socioeconomic factors influencing sustainable transportation practices is also crucial to ensure equitable access and benefits. Some studies suggest that individuals with higher average incomes are more interested in MaaS and sustainable transportation (Kriswardhana & Esztergár-Kiss, 2023). Therefore, understanding the relationship between income levels can help address potential disparities and promote inclusive and socially just transportation policies.

6. Conclusion

The survey on commuting patterns revealed several interesting findings in the context of the social practice theory and the Mobility-as-a-Service (MaaS) theory. The results indicated that private cars were the most preferred mode of transportation, reflecting the material aspect of commuting practices. This aligns with the social practice theory, where the material element represents the type of transportation mode preferred by the user. Additionally, the survey highlighted the skills aspect of commuting practices, as individuals demonstrated their ability to utilize different modes of transportation such as public transport and walking. Furthermore, the meaning aspect of commuting practices was evident as the main purpose was to get to work efficiently. These findings contribute to the understanding of commuting practices within the social practice theory framework. Moreover, considering the MaaS theory, the survey results can

inform the development of integrated mobility solutions that provide convenient and sustainable alternatives to private car usage. By utilizing the insights from the survey, transportation planners and policymakers can work towards implementing MaaS strategies that optimize the commuting experience, reduce congestion, and promote sustainable transportation options for the surveyed population and beyond.

The findings demonstrate a strong interest among the sample population in utilizing shared mobility for their daily commute within the corporate context. This aligns with the concept of Corporate Mobility as a Service (CMaaS) and its aim to provide seamless and sustainable transportation options to employees. The motivations behind this interest reflect the principles of social practices theory and the potential benefits of MaaS. Respondents expressed motivations related to pollution reduction, convenient integration with other daily activities, a desire to reduce private car usage, and the substitution of unsustainable practices. These findings emphasize the potential of shared mobility to transform commuting practices, enhance sustainability, and align with the goals of MaaS and social practices theory. By embracing shared mobility options within CMaaS frameworks, companies can play a pivotal role in facilitating meaningful shifts towards more sustainable commuting practices and fostering a greener and more interconnected mobility ecosystem.

Overall, the survey results and interviews shed light on the efforts made by companies to promote sustainable mobility. The findings emphasize the importance of flexible work arrangements, particularly in terms of remote work, to reduce the environmental impact of daily commuting. With a significant portion of employees lacking the flexibility to work from home, there is a continued reliance on traditional commuting methods, which contribute to increased traffic congestion, air pollution, and energy consumption in the city. The interviews with HR positions revealed varying perspectives on remote work. While one interviewee expressed the benefits and win-win nature of flexibility, another interviewee highlighted the challenges of transitioning back to office work and the potential negative impact on sustainability. This indicates that companies have different approaches and considerations when it comes to implementing remote work policies.

Furthermore, the findings indicated that most employees do not receive any compensation for their travel to work. However, a small percentage of respondents reported receiving compensation in the form of gasoline bonuses, monthly allowances, or company-provided transportation services like Uber. These findings suggest that there is room for companies to explore and implement alternative compensation strategies or transportation initiatives to alleviate the financial burden and encourage sustainable commuting practices.

The findings align with social practices theory, indicating that workers' transportation choices are influenced by factors such as availability, security, environmental impact, comfort, time efficiency, and cost. Companies need to understand and address these factors to promote sustainable transportation options. Incorporating social practices theory can help companies design effective strategies that align with employees' priorities. An example program, MOVIN Paseo de la Reforma, faced challenges in coordinating regulations between companies but

emphasized the importance of collaboration. The pandemic also influenced mobility patterns. In CMaaS, focusing on lifestyle and community-based messages, involving influential figures, and utilizing effective internal communication channels are key to successful implementation and promoting sustainable commuting practices among employees.

Despite the limitations of time and the researcher not being physically present in the research area, this study has provided valuable insights into commuting patterns and sustainable transportation practices in Polanco. While the inability to observe traffic congestion and engage in face-to-face interactions with surveyed individuals presented challenges, the study made the best use of available resources to collect relevant data and conduct insightful interviews. Building upon these findings, several recommendations can be proposed to promote sustainable commuting practices in the region. Companies should actively encourage the adoption of alternative transportation modes by offering incentives for public transport, cycling, and carpooling. Flexible work arrangements, such as remote work options, can also be implemented to reduce the need for daily commuting. By embracing Corporate Mobility as a Service (CMaaS) initiatives, companies can provide integrated and sustainable mobility solutions for their employees, ultimately fostering a shift away from private car usage. Effective communication campaigns should be conducted to raise awareness about the benefits of sustainable transportation, and collaboration with government and local authorities is crucial for improving transportation infrastructure and services. Despite the limitations, this study serves as a foundation for further research and encourages continuous efforts to drive positive changes in commuting behaviors and contribute to a greener and more sustainable future for Polanco and its inhabitants.

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Appendices

Appendix 1: Survey

Dear participant,

We are conducting a survey to understand how people commute to work and their attitudes towards sustainable mobility in Mexico City. Sustainable mobility means moving around in a way that minimizes environmental impact, reduces traffic congestion, and promotes healthy living. By filling out this survey, you will help us better understand transportation needs in the city and develop solutions that promote sustainable transportation.

The survey includes questions about your socio-demographic characteristics, travel patterns, and competencies regarding sustainable mobility. We will also ask about your company's travel policies and your preferences for shared mobility options. Lastly, we want to know what factors are most important to you when choosing your mode of transportation and your likelihood of using shared mobility options.

Your participation is voluntary, and all information collected will be kept confidential. The results of the survey will be used for research purposes only. Thank you for your time and contribution to this study.

I accept that my data is used only for the research purposes of the project.

Socio-demographic characteristics

1. What is your age? (18-20, 20-25, 25-30, 35-40, ,40-45, more than 45)
2. What is your gender? (M,F)

Materials/ Built environment

3. How do you usually commute to work? (Options: private car, public transport(bus, metro,metrobus), bike, walk, street taxi, apps such as Uber or Cabify)
4. Do you use more than one transportation mode to arrive to work? (eg. Car and walk, bus and bike, etc.) (Yes/No) IF YES, Specify:

5. Do you use public transport? (Yes/No)

If yes: why?

If no: why?

Travel Characteristics

5. How long does your commute take each way? (Options: less than 30 min, 30-60 min, 1-2 hours, more than 2 hours)

6. What time arrive to work? (Options: 7am-9am, 9am-11am, Other: Specify)

7. Approximately how many kilometers do you travel to work? (Options: 0-10km, 10-20km, 20-30km, 30-40 km, more than 40km)

8. How many times do you go to work per week? (Options: 5 days a week, 4 days a week, 3 days a week, less than 3)

Competences

9. Have you ever used shared mobility options such as carpooling, e-bikes, or e-scooters for your commute to work? (yes/no)

IF NO: Why? (Options: Lack of skills on how to use other transportation modes(eg.bike), lack of knowledge on how to use apps, lack of transportation options in your area)

IF YES: What made you shift to this practice? (Convenience, Affordability, Easy to use, Good for the environment, Comfort, Other:)

10. Which of the following options fits you best when thinking about using shared mobility for work? (Options: I would like to reduce the use of my private car, I would like to find a substitute for my current transportation mode, I would like to use it if it facilitates my other daily activities as well (such as doing groceries, going to the gym, etc.)

CMaaS

11. Does your company allow working from home? (yes/no)

12. Is there travel compensation that your company provide you for your daily commute? (Yes/No) If yes, please specify.

13. Would you be interested in having shared mobility options available for your use within your company (such as a corporate bus shuttle, corporate bikes, taxis, etc)? (Yes/No)

13.5 Do you think companies should support their employees in providing sustainable mobility options (eg. Paying for e-bikes, public transportation; offering CMaaS services, accept work from home, etc.) (Yes, No)

Psychological characteristics/ Meanings

14. Scale from 1-5 (1 being the least important and 6 the most important) what is important to you when choosing your mode of transportation? (Options: Availability, affordability, environmental impact, safety, comfort, time efficient)

15. I would be likely to use shared mobility options if they were: (listed options: more environmentally friendly, available, more affordable, safe, more comfortable, time efficient) than my current mode of transportation?

Appendix 2: Interview

1. What is the companies view on sustainability, specifically on sustainable mobility?
2. Do you know how most of the employees commute to work?
3. Have you heard any struggles from employees regarding the efforts to commute to work?
4. Are there any hybrid options for working or flexible schedules?
5. Have there been any strategies or programs to encourage employees to use sustainable transportation options (car-sharing, bikes, public transport, e-scooters, etc.)? If so, can you describe them?
6. Are there any incentives that the company could offer to employees who use sustainable transportation options? If not, would you be interested in doing so?
7. Are there any new or upcoming initiatives to facilitate commuting to employees in a more sustainable manner?
8. Is it the employer's responsibility to support their employee's commute to work in a financial way or to encourage (by organizing carpooling etc) more sustainable transportation?