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STEP INTO THE DRIVER'S SEAT

Master Thesis

A PARTICIPATORY VALUE EVALUATION OF THE PUBLIC TRANSPORT POLICY PREFERENCES OF THE TEL AVIV METROPOLITAN AREA & ISRAELI FACE VALIDITY ANALYSIS

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Complex Systems Engineering & Management

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A Participatory Value Evaluation of the Public Transport Policy Preferences of the Tel Aviv Metropolitan Area & Israeli Face Validity Analysis

by

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TU Delft

Preface

As I stand on the threshold of presenting this master thesis, the culmination of my journey through the MSc in Complex Systems Engineering & Management (COSEM) program at TU Delft, I find myself filled with a profound sense of gratitude and accomplishment. This work reflects not only my academic endeavors but also the collective efforts, encouragement, and inspiration of numerous individuals who have played pivotal roles in shaping my path.

I extend my heartfelt appreciation to my first supervisor, Dr. Niek Mouter. Your faith in my capabilities and the immeasurable guidance you have granted have afforded me the opportunity to delve into a topic that resonates deeply within me — a PVE study aimed at enhancing public transport in Israel. Having moved to the Netherlands five years ago, the country's vibrant mobility culture, characterized by the ubiquitous presence of bicycles and efficient public transport, left an indelible impression on me (though, it also imparted upon me a profound void when, as fate would have it, my cherished Delft bicycle was stolen not once, but twice). This thesis allowed me to bridge the worlds of my upbringing in the Tel Aviv metropolitan region and my studies in transport and logistics during my COSEM journey. Through this work, I have come to appreciate the power of public opinion in shaping impactful, sustainable, and efficient public policy. I am immensely grateful for your introduction to the creative and inspiring minds at Populytics — a collaboration that has resulted in a multi-lingual online platform, erasing language barriers and enabling diverse voices to contribute to public policy recommendations.

I am immensely grateful to my committee members, Dr. Wijnand Veeneman and Prof. Dr. Oded Cats, for their invaluable guidance and support. Your thoughtful insights and constructive feedback during our interactions have enriched the scientific caliber of my research. Your perspectives, informed by both Israeli-Dutch relations and the transport domain, have provided a holistic view for my work, improving its depth and relevance.

This thesis also marks the culmination of a five-year academic journey, which would not have been possible without the unwavering support of my family. Employing the metaphor of seafarer's professions, I extend my appreciation. My mother, a captain (both metaphorically and in actuality), has been the guiding force in my life, teaching me resilience, strength, kindness and the importance of aspiring for greatness. My father, a chief officer, has provided unwavering love and support, steady in his encouragement and wise counsel. My older sister, a chief engineer, who assumes the roles of confidante, best friend, and unwavering advocate, encompassing all these facets in a singular presence I get to call my big sister.

To my dear friends, thank you for being pillars of support and companions on this academic voyage. With an estimated 180 coffee breaks shared in just six months, we've not only fueled ourselves but also the profits of Coffee-star TU Delft.

In conclusion, I extend my sincere appreciation to all those who have contributed to the realization of this master thesis. As I embark on the next chapter of my journey, I carry with me the knowledge, experiences, and relationships cultivated during my time at TU Delft, propelling me toward continued exploration and contribution within the realm of Complex Systems Engineering and Management.

Emily Golan
Delft, August 2023

Summary

Introduction

The transportation system in Israel is currently in crisis due to its heavy reliance on private vehicles. To promote more sustainable modes of transport and shift away from an automobile-oriented lifestyle, it is crucial to improve the quality of the public transport system, particularly in the Tel Aviv metropolitan area (OECD, 2019, 2020). Understanding the preferences of Israeli citizens for transport projects is essential for gaining support and promoting behavioral changes towards sustainable mobility. Therefore, this research aims to investigate the preferences of Tel Aviv Metropolitan citizens regarding transport projects that aim to enhance public transport quality and encourage alternative mobility methods through a preference elicitation experiment. The first research question posed is: *What are the preferences of citizens in the Tel Aviv Metropolitan area for different transport policy options and their impacts?*

For this research, the Participatory Value Evaluation (PVE) method is used, a appraisal approach wherein individuals curate their favored portfolio of projects within the confines of a limited public resource (Mouter, Koster, & Dekker, 2021a). Citizens assume the role of ”decision-makers” during the PVE process, exercising their agency to determine the inclusion or exclusion of projects they wish to witness implemented, under the assumption of having direct control over a designated public resource. While PVE has shown promise as an new preference elicitation method, there is limited research outside the Netherlands, especially regarding its face validity. Most empirical studies on face validity of PVE have focused on Dutch respondents, indicating the need for conducting more PVE experiments in new countries (Itten & Mouter, 2022; Mouter et al., 2022; Mouter, Shortall, et al., 2021; Mulderij et al., 2021). Therefore, the second aim of this research is to gather new empirical information on the face validity of PVE in a *new* country - Israel. Israeli respondents offer a compelling perspective to assess the face validity of PVE due to their distinct perception of governance effectiveness, which encompasses various dimensions such as the quality of public services, policy autonomy, and government credibility (The World Bank, 2023). Notably, Israel's governance score has been declining and remains lower than the stable and high score observed in the Netherlands over the past decade. This prompts an intriguing inquiry into whether face validity evaluation changes when conducted by a public with a more pessimistic view of their government's credibility and policy effectiveness. Furthermore, from a societal standpoint, the application of PVE in a country with limited public participation contributes to the amplification of awareness concerning the prospective insights that public engagement can furnish to local policymakers (Israeli Goverment Transport Policy Expert, 2023). The corresponding second research question is: *What is the validity of Participatory Value Evaluation in the context of Tel Aviv?*

Methods

This research adopts a case study approach, incorporating various methods and sources of data, as summarized in table 1, and is divided into five main stages.

Table 1: Overview of applied methods per research stage

	Literature Review	Expert Interviews	PVE	Descriptive Statistics	Content Analysis	Latent Class Cluster Analysis	Mann–Whitney U test
1. Sociotechnical system analysis	x	x					
2. PVE experiment design	x	x					
3. Policy & impact analysis			x	x	x		
4. Preference profile cluster analysis						x	
5. Face validity analysis	x			x			x

PVE Experiment Design

In the second stage of this research, the PVE experiment was designed, and policies were identified to improve Israeli (public and alternative) transport. Here, the policy problem was first framed in an understandable way for the public. The main question and policy problem the respondents will be faced with in this PVE is as follows: Given a specific budget that cannot be exceeded, how would you

improve the quality of public transport and alternative mobility options in the Metropolitan to encourage more usage?

Next, by conducting literature reviews, document analysis and expert interviews, a list of the 11 most crucial problems with Tel Aviv transport were identified, and for each problem, project/policy solutions were identified to help solve them. The policy list included in the PVE was minimized from 16 to 10, by conducting a structured selection process. The following policies were included: 1. Better connected public transport dedicated road network 2. Increase of Saturday shuttle service 3. Improvement of accessibility of buses and stations to the physically disadvantaged community 4. Promoting technological infrastructure for smart transportation 5. Addition of direct bus lines to employment centers 6. Improve bus connectivity from residential neighborhoods to train stations 7. Acceleration of the bike lane project 8. Improving the pedestrian experience within cities 9. Acceleration of the metro project 10. Acceleration of the light rail project.

After that, the budget for each policy was estimated by using an open data base of the Israeli government expenses. For each policy, the impact on travel time and on available public car parking and roads were quantified by conducting a group interview with three Israeli transport policy experts. Qualitative information on other societal impacts were also provided to respondents such as impact on local economy, noise and environmental impacts, health and safety impacts etc. The resulting choice task is shown in figure 1. Furthermore, in addition to the regular choice task, respondents were also asked on their position regarding willingness to give up car infrastructure in favor of public and alternative transport improvements. Respondents were also asked to evaluate the face validity of the PVE using 7 widely used statements, and asked to provide some background information on their socio-demographic characteristics. The PVE was then sent to a closed panel of 269 respondents from the Tel Aviv metropolitan area.

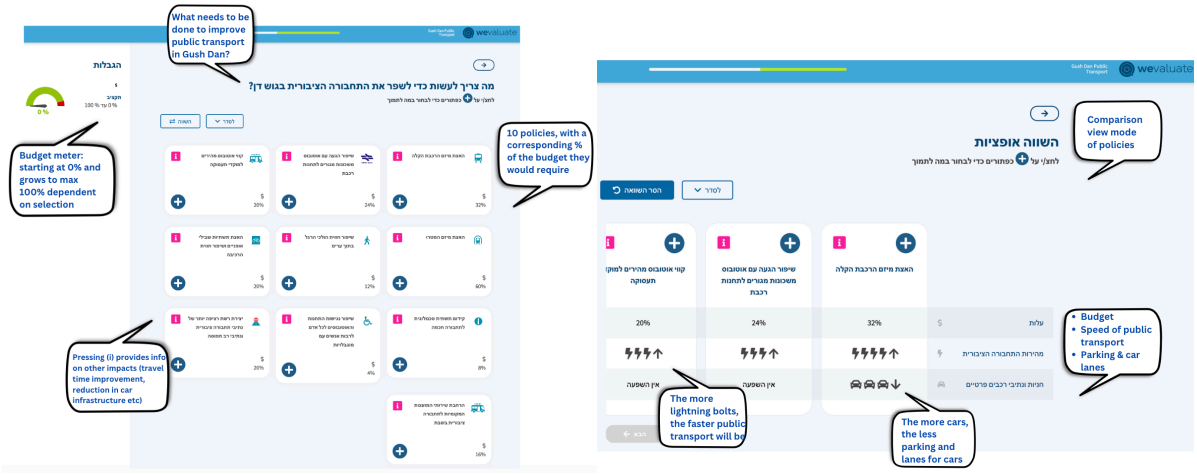

Figure 1: Israeli transport PVE consultation choice task

Tel Aviv Transport Project & Impact Preferences

In the third stage, transport projects and impact preferences of the respondents were analyzed, by implementing both descriptive statistics for the quantitative data, and a content analysis for the qualitative data. The choice task revealed that most respondents preferred selecting fewer but more expensive projects, allocating (almost) the entire budget. The overwhelmingly popular project, chosen by over 60% of respondents, was the acceleration of the light rail project, followed by the improvement of bus services from residential neighborhoods to train stations (41%), addition of direct bus lines to employment centers (39%), and acceleration of the metro project (36%). The main motivation behind selecting these projects was their significant improvement in travel time, attracting more car users to shift to public transport. Other reasons included enhancing public transport network connectivity, capacity, and accessibility to large industrial areas. In contrast, the least popular projects were related to alternative mobility options, such as improving the pedestrian experience in cities and accelerating the bike lane network project. However, respondents still acknowledged the potential of these projects to attract more car users to public transport, considering their positive impacts on public health, environment,

and safety. Travel time was identified as the most influential factor in respondents' decisions during the choice task, while the impact of cost was relatively low, and impact of car infrastructure reduction was less definitive.

Further analysis delved into public attitudes towards reducing car infrastructure in favor of public transport improvement. Approximately 50% of respondents expressed support for this trade-off, believing that better public transport would ultimately reduce congestion, enhance overall safety, and improve air quality. Those who hesitated about supporting the trade-off (24%) expressed doubts about the level of improvement in public transport and the potential to reduce car dependence. They also suggested that public transport enhancement could be pursued with minimal impact on car infrastructure, for instance, through the metro project. On the other hand, resistance to the trade-off (26%) primarily stemmed from concerns about exacerbating the parking crisis in the country and potential discrimination against individuals who have no choice but to rely on private cars, such as the elderly and disabled.

Preference Profile Cluster Analysis

A latent class cluster analysis (LCCA) was conducted to investigate whether respondents with similar characteristics showed similar preferences for groups of projects. The indicators used were the ten projects from the PVE choice task, while the covariates included the respondent characteristics: public transport profile, gender, having children, education level, whether work and residence are in the same city, financial status, and preferred mode of transport on Saturday (as an indirect way of asking for religious status). The analysis revealed that the only covariate significantly predicting class membership and transport project preference was whether respondents live and work in the same city. Four clusters were identified in this analysis, and two were of most interest. One cluster, predominantly for respondents who do *not* live and work in the same city, overwhelmingly supported both the light rail and the metro project, which are the two most expensive projects in the portfolio. Another cluster, likely for those living and working in the same city, comprised many cheaper projects, focusing on improving existing public transport services, and was the only cluster supporting policies promoting walking and cycling, as well as the addition of free public transport services on Saturday.

Israeli Face Validity Analysis & Comparison to Dutch Benchmark

In this research, the following seven statements of face-validity were looked into: (Readability & Clarity) I understood the task I was asked to complete, (Completeness) I received sufficient information for me to make choices, (Acceptance) I was convinced of my choices, I think this is a good method to include citizens in decision-making processes, (Relevance) I think improving public transport is an important topic to give my opinion on, (Transparency & Legitimacy) I trust that this research is honest, The research was objective and did not steer my choices in a certain direction. All statements were ranked overwhelmingly high , where the lowest ranking categories was completeness, ranking still high at an average of $4.12/5$. The face validity results in the Tel Aviv PVE were compared to a Dutch Benchmark, the 2017 Amsterdam transport PVE conducted by Mouter, Koster, and Dekker (2021b) via a Mann-Whitney U test, and to other (non transport-related) PVEs in the Netherlands.

Two findings were particularly important. The first inquiry sought to assess the respondents' perception of PVE as a viable approach to involve citizens in decision-making processes. The obtained response yielded a notable score of 4.19, surpassing the scores reported in similar Dutch cases. This outcome suggests a promising potential for the implementation of PVE as a means of facilitating citizen participation in Israel's decision-making practices. Therefore, it can be deemed justifiable to conduct further experimental investigations concerning the application of the PVE method in this particular setting. Additionally, a second statement was presented to the respondents to gauge their views on the significance of expressing their opinions concerning the enhancement of public transport services. The outcome of this inquiry revealed an overwhelmingly high score of 4.6. The substantially positive response highlights the importance and apparent necessity of integrating public participation in Israel's policy-making process, particularly when addressing matters related to public transport. This finding contributes to existing literature and affirms the practical relevance of incorporating public engagement in shaping effective policy decisions in Israel.

Discussion

This study aimed to explore Israeli citizens' preferences regarding transport projects with a focus on

enhancing public transport quality and promoting sustainable mobility options. Through the first-ever Participatory Value Evaluation (PVE) experiment in Israel, citizens were given a say in regional transport budget decisions, which had been traditionally excluded from their input. The research provides valuable insights into transport project preferences in Israeli society and explores strategies to transition from car dependency to more sustainable travel behavior. Based on the obtained results, the following major recommendations for practice and policy were formulated (figure 2).

The first two recommendations stress expediting the establishment of new public transportation modes currently absent, such as light rail and metro systems. Their implementation encourages commuters between distinct urban centers to opt for public transportation due to valued time savings and increased capacity. Encouraging cycling and walking is advised for same-city commuters, a demographic keen on alternative mobility. The third and fourth recommendations reveal a gap between apprehensions of Israeli transportation experts and politicians and nuanced PVE perspectives. Respondents mostly support reducing car infrastructure for sustainable alternatives, provided effective transportation strategies are promptly provided. Addressing opposition involves equitable access and early communication. The fifth recommendation emphasizes prompt execution of public transportation projects for Israeli commuter support. The study underscores that not solely the attributes of a transportation project, but also the expeditiousness of its implementation and the resultant disruptions, play pivotal roles in shaping public preferences and support. Implementation speed and associated disruptions shape public preferences. A long-delayed light rail project garnered public frustration and anticipation, highlighting the importance of swift implementation to secure backing, as seen in the Tel Aviv metro's impending construction.

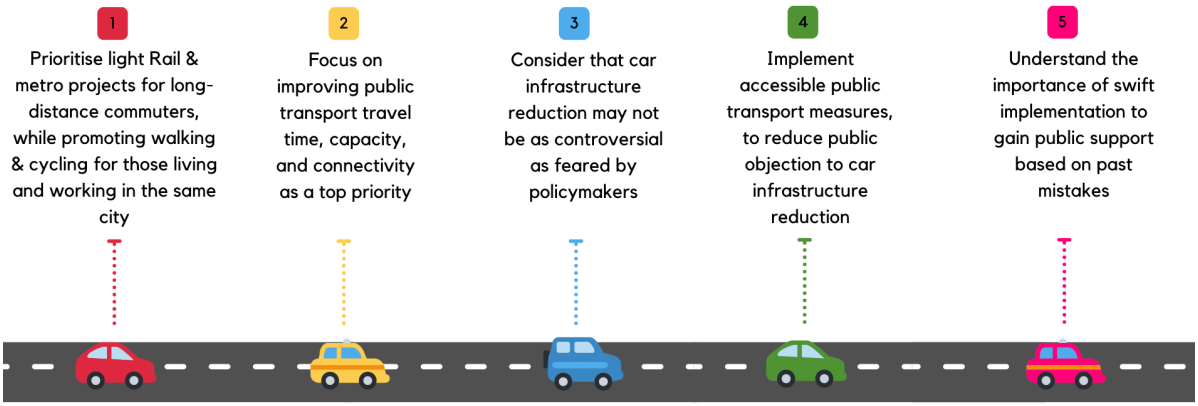

Figure 2: Main recommendations for policy & practice based on the findings of this PVE

This thesis presents valuable contributions to existing knowledge and methods in the field of sustainable transport policies. Firstly, it demonstrates policy relevance. The study enhances the understanding of policies that balance budget-efficiency and policy acceptance, crucial for designing sustainable transport policy packages. The findings also show promising potential for broader application of PVE in Tel Aviv and Israel. Moreover, the research sheds light on the limited knowledge regarding sustainable transport policies in the Middle East, where urbanization, traffic congestion, air pollution, and climate change challenges are growing concerns. Tel Aviv citizens exhibited a preference for large-scale projects introducing new transport modes, differing from past similar Western studies. These findings underscore the importance of contextual nuances when developing and implementing sustainable transport policies due to the variability in preferences across different societies and regions.

The research findings also highlight several avenues for future research. Firstly, the potential for applying PVE on a larger scale in Tel Aviv and Israel in general is promising, given the high interest and value expressed by Israeli experts and the public's positive response. Conducting a choice experiment alongside a PVE is recommended to further understand the differences in eliciting preferences using these two methods. Additionally, exploring framing strategies in PVEs, such as presenting the trade-off between giving up car infrastructure and improving public transport, could yield further insights into respondent preferences. Comparing the impact of framing on projects, particularly surrounding bike and pedestrian initiatives, could be valuable. Would bike and pedestrian projects for example have performed better in this PVE if safety impacts were shown quantitatively like travel time improvement

and reduction of car infrastructure, or if safety/environmental goals had their own meter on the side? Lastly, addressing the limited number of PVE case studies with face validity categories, especially in the transport context, is essential for generating more robust benchmarks. Future consultations should include face validity categories to examine how different cultures and content/styles influence PVE outcomes. The research also highlights the need to address comprehensiveness as a potential weak spot in PVEs to better accommodate varying preferences among participants.

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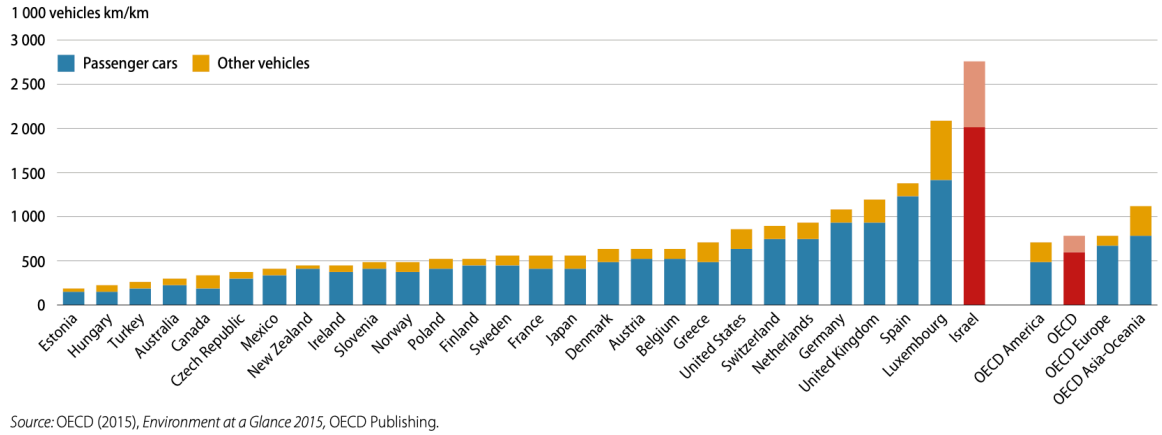
Introduction

This chapter introduces the central problem addressed in the research and establishes its societal and scientific relevance. Subsequently, the identification of the academic knowledge gap leads to the formulation of research questions and objectives for this thesis. The research approach employed in the study is also elucidated. Lastly, the chapter outlines the structure of the remaining sections of the thesis.

1.1. Tel Aviv Metropolitan: Automobile Oriented Transport

Traffic congestion is a major disturbance to daily-life in Israel, and has recently become a major socioeconomic issue on the agenda of Israeli media and politics. In fact, Israel is the OECD country with the worst congestion (OECD, 2020) (Figure 1.1). Congestion however, is only a symptom ”felt” by the public, which stems from deeper problems. This issue arose mainly due to Israel's sizeable infrastructure deficit, stemming from its short history and public under-investment since the early 2000s (OECD, 2018). The biggest deficit and reason for the growing congestion in Israel, concerns public transport and alternative mobility options. The OECD has conducted multiple studies (OECD, 2015, 2018, 2019, 2020) that indicated a massive disparity between Israel and other developed countries with regards to the quality of public transportation and the service provided to the population. This disparity is apparent in the existing infrastructure, the distribution of commutes between public transportation and private cars and the travel time and speed using public transportation. In this section, the negative effects of Israel's lagging public transport infrastructure are discussed. Then, the reasons that led to the current lagging state of public transport in Israel will be identified and explained.



Source: OECD (2015), *Environment at a Glance 2015*, OECD Publishing.

Figure 1.1: Road traffic density per network length, figure taken from OECD (2015)

1.1.1. Negative Impacts of Automobile Culture

Israel's and Tel Aviv metropolitans' massive public transport infrastructure deficit has many negative effects on residents' quality of life and the domestic economy. Many studies have showed that congestion leads to decreased air quality in a city. In fact, a recent study conducted in Israel by Potchter et al. (2014) showed the level of CO in Tel Aviv to be higher than in European cities, due to the respective density of private cars. This is detrimental both for the environment as well as for citizens overall health.

Moreover, the lagging public transport not only results and contributes to terrible road congestion and air pollution, but also contributes to economic and social imbalances in the country. Insufficient public transport worsens the (already significant) housing shortage by decreasing the attractiveness of more affordable neighbourhoods and reduces accessibility and job opportunities for disadvantaged individuals from peripheral areas (OECD, 2020). Well-functioning infrastructure is vital for inclusiveness, growth and overall well-being, as it increases trade, competition and innovation. These benefits are essential for Israel due to its relative remoteness from other markets and its high and rapidly rising population density, which increases the social returns on infrastructure investment in domains such as transport (Chu, 1997; Deole, 2014). In addition, the lagging public transport which encourages public reliance on private vehicles, is very costly. Costs of congestion in Israel are estimated at around 2% of GDP, higher than in other high-income economies where for example 1% is usually cited for the average cost of congestion in Europe and around 0.7% to 0.9% in the USA (OECD, 2019).

1.1.2. Automobile Culture Encouraged by Transport Policy

After establishing the negative effects and severity of the lagging Israeli public transport system, one must investigate how did Israel get to its current state of lagging public transport and the overall automobile oriented lifestyle? Has Israel's public policy on transportation aimed to cope with this issue?

Transportation in Israel is in a state of crisis because the transportation system is mainly based on the use of private vehicles. Firstly, one of the major reasons for this, is the historical neglect of public transportation in Israel, compared to the considerable development of private vehicle infrastructure (15 Minutes Public Transportation Alliance, 2023). In other words, for years the government has invested in roads, highways and junctions, but hardly invested in public transportation routes, mass transit systems, public transportation terminals and improving public transport drivers' working conditions. This neglect caused overuse of the private vehicle, and a cycle which discouraged public transport usage even further (figure 1.2). Weak investment in public transport and increased investment in private cars encourages the usage of private cars from the public, which then leads to congestion. Congestion makes improving public transport even more difficult (as this would require giving up infrastructure for cars in the highly dense Tel Aviv region and cause opposition from the public). This then discourages the government from investing in public transport even further and opt to invest in private car infrastructure - and the cycle continues again (15 Minutes Public Transportation Alliance, 2023). Moreover, another factor which contributes to the congestion cycle and to the government's neglect of public transport in favor of car infrastructure, is suburbanization. Suburbs are even more disconnected from public transport, and therefore make residents dependent on private cars. This also increases car ownership and a car-oriented lifestyle (Civitas, 2017), and therefore a need for supporting car infrastructure. Furthermore, another major contributor is the socioeconomic mindset and the rise in the overall standard of living. Private vehicles can be identified as a product that affords mobility, availability and an easier lifestyle, contributing to one's standard of living (Civitas, 2017; Kinan et al., 2018).

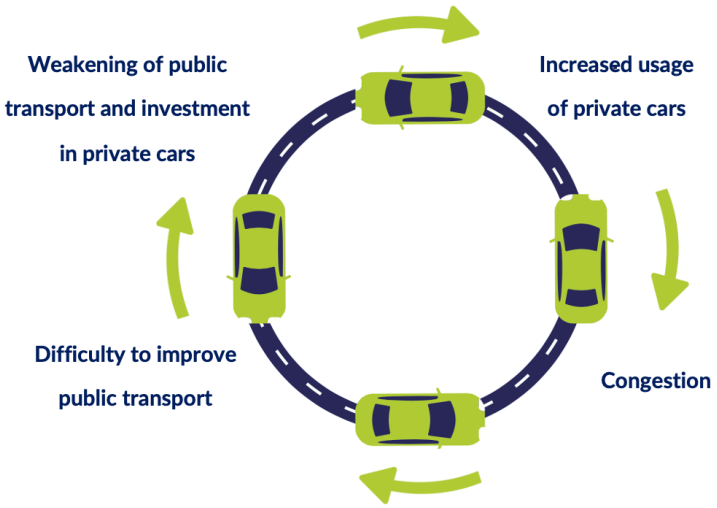


Figure 1.2: Cycle of increased usage of automobiles and private cars. Information adapted from 15 Minutes Public Transportation Alliance (2023)

1.1.3. Israeli Citizen's Transport Project Preferences

Support for sustainable transportation and shifting from private vehicle use to public transportation is important for economic, environmental, and public health reasons (Litman, 2016). Nevertheless, convincing citizens to adopt environmentally friendlier travel behaviors can be challenging. The Israeli Government is aware of the public transport and infrastructure problem in the country and in the Tel Aviv Metropolitan area in particular, and has begun addressing it in recent years by increasing the availability of public transport and investing more money yearly in public transport infrastructure. These improvements and changes made to the public transport system must match the needs and desires of the public that it is intended for. This is (also) because support for changes in the public transport system is crucial for promoting mobility behavior changes. However, there is limited current information on Israeli citizens' preferences for transport projects, both in literature and in practice (elaborated on in section 3.2.2 in detail).

1.1.4. Knowledge Gap & Research Question 1

Academic knowledge Gap & Corresponding Research Objective (1)

Academic Knowledge Gap: Improving the currently lagging quality of public transport system in Israel and specifically the Tel Aviv metropolitan is essential to create a shift from an automobile oriented lifestyle to usage of more sustainable modes of transport. Support for any changes made in the transport system is vital for promoting these mobility behavior changes. However, there is limited current information on Israeli citizens' preferences for transport projects. Hence, the corresponding research question is: **What are the preferences of citizens of the Tel Aviv Metropolitan area for (the impacts of) transport policy options?**
Research Objective: This research aims to study Tel Aviv Metropolitan citizens' preferences towards transport projects aimed at improving public transport quality and encouraging alternative mobility methods, by means of a preference elicitation experiment.
Contribution: For literature, this will contribute to the limited knowledge on the current transport preferences of Israeli society. For practice, better understanding of citizens' current preferences and needs is vital to design a future transport system, that successfully promotes a mobility behavior shift from car-dependency to other more sustainable modes of transport.

The main methodological reference of this research is Participatory Value Evaluation (PVE), a novel appraisal and preference elicitation method which can be seen as a hybrid of public budgeting and citizen choice experiments. The motivation behind selecting PVE as the preference elicitation method used in this case study is described in section 2.2.1.

1.2. Participatory Value Evaluation

Project appraisal is the process of determining, in a structured way, a project or policy's viability (Mouter, Koster, & Dekker, 2021a). During this process, policy makers often wish to know the positive and negative impacts of policies before making their decision. Appraisal and selection are critical actions for infrastructure governance as these actions serve as gatekeepers, ensuring (in principle) that socially and economically viable projects are chosen to be implemented (Schwartz et al., 2020).

However, different appraisal methods can lead to different recommendations, as their characteristics and foundations vary from one another (Berechman, 2009). Examples of common appraisal methods include Cost-Benefit Analysis (CBA), Multi-criteria Decision Making (MCDM), Deliberative appraisal methods (DAM), and Environmental Impact Assessment (EIA). CBA is a widely used economic appraisal tool to support the planning and decision-making process, especially for transport and infrastructure related projects (Asplund & Eliasson, 2016). In a CBA, projects are evaluated by converting their positive and negative social impacts into monetary values via willingness to pay (WTP) principle. The key characteristic of WTP is that the value individuals attach to a government project's impact is inferred from the amount they are willing to pay in the context of a private decision (Mouter, Koster, & Dekker, 2021a). When benefits exceed the costs of a project in a CBA, that project should be implemented. Past literature has widely criticized CBA for using the WTP principle, based on the argument that individuals might value an impact differently in a private sphere versus a public sphere (Aldred, 2006; Anderson, 1993; Clark et al., 2000; Sunstein, 1983).

1.2.1. PVE: A Novel Preference Elicitation Method

PVE was designed to be an alternative for and address some critique on the well-known CBA method (Mouter, Koster, & Dekker, 2021a), which is widely used in the transport infrastructure decision-making process (in many western countries, as well as in Israel) (Mackie et al., 2014). To help governments decide what projects to spend public money on, and to give citizens a direct outlet to voice their opinions, Mouter et al. (2019) designed the PVE.

PVE is an appraisal method, where individuals select their preferred portfolio of projects given a constrained public resource (Mouter, Koster, & Dekker, 2021a). Citizens are the 'decision-makers' while filling out a PVE, and choose which (if any) projects they would like seen implemented, given they had control over a specific public resource. PVE recognizes citizens' belief that government funds should be spent on different purposes than private money (Mouter, Koster, & Dekker, 2021a). The method attempts to solve this issue by investigating individuals' preferences by the direct utility they

derive from the policy options. When respondents select their preferred portfolio, they make trade-offs that indicate which policies and impacts they prefer or would sacrifice in order to implement their desired portfolio (and corresponding desired impacts). However, if respondents believe none of the projects should be executed they can choose not to select any of them and shift the budget to another time period or other causes (Mouter, Koster, & Dekker, 2021b). In addition, PVE, allows citizens to include normative ideas regarding their preferred future urban mobility system. This is why for example, safety and cycling projects performed well in a PVE conducted in the Netherlands, as it allowed the expression of the normative belief of citizens that a mobility system should be cycling friendly rather than car friendly (Mouter, Koster, & Dekker, 2021a). In addition, PVE experiments allow participants to include local knowledge that decision-makers might not be aware of when assessing the impacts of a project. This is unlike CBA, which values impacts based on standardized price tags (Mouter, Koster, & Dekker, 2021a).

The purpose of such public participation is to design more effective policies, as they are designed while taking-into-account citizen preferences directly (Mouter et al., 2018). In other words, public participation helps safeguard that decision-making is not solely a top-down process but also a bottom-up process. Public participation is routed in the ideology that citizens should be able to have influence on decisions that affect them (Burton, 2009). By letting citizens allocate scarce public resources, PVE helps derive the social desirability and welfare impacts of projects/policies (Mouter, Hernandez, et al., 2021). A PVE framework has five main goals: 1) Elicit citizens preferences for public policies/projects, 2) Inform decision-makers what these preferences are, 3) Facilitate public participation in the decision-making process, 4) Increase awareness amongst citizens regarding a dilemma that policymakers face when making decisions, 5) Strengthen empathy and understanding between the public and decision-makers.

However, PVE has also been criticised for how it elicits preferences. More specifically, some question whether PVE experiments measure preferences accurately and also, if respondents perceive the PVE design appropriate to express their preferences accurately. This relates to PVE's *validity* as a research and preference elicitation method.

1.2.2. PVE Validity

For any research tool, including PVE, researchers want to make sure it indeed measures the intended research concept/construct (i.e. is it valid?) (Kember & Leung, 2008). Validity describes how well the information collected by a tool covers the specific topic of investigation (Ghauri et al., 2020). In other words, the concept of Validity means *'measure what is intended to be measured'* (Francis & Field, 2011). The literature differentiates between several types of validity: face validity, content validity, construct validity, criterion validity. Their corresponding definitions are shown in figure 1.3. Establishing PVE validity is crucial, because a perceived lack of validity has vast potential consequences for the credibility, attractiveness and acceptance of PVE as a method (de Ruijter, 2022).

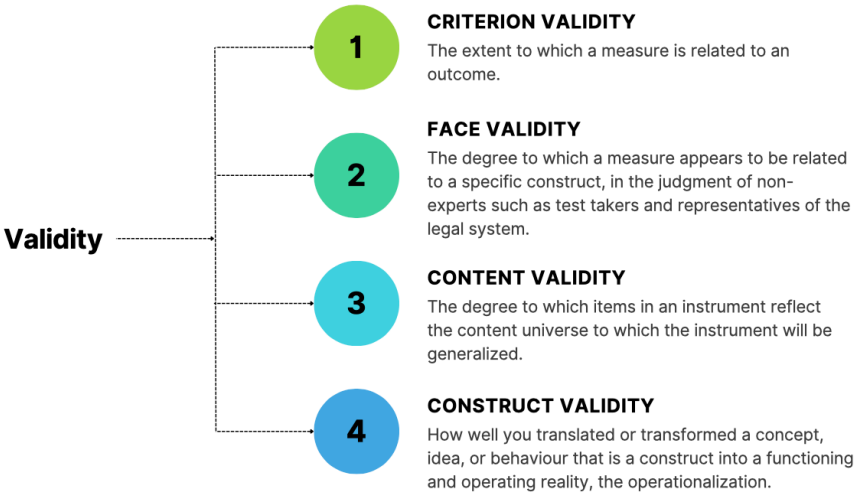


Figure 1.3: Types of Validity identified in the literature and their definitions

Due to the novelty of the method, there is still much to understand on PVEs *face validity*. Establishing a PVEs face validity is especially crucial for three main reasons. Firstly, one of the doubts regarding PVE is whether laypeople can comprehend the highly complex socio-technical issues PVEs usually tackle. Establishing *face-validity* is crucial, as this helps indicate the measurement instrument (in this case, PVE) items *'linguistically and analytically look like what is supposed to be measured'* in the eyes of the respondents (Taherdoost, 2016). Secondly, establishing a high face validity is important for a PVE, as it induces cooperation and positive motivation among respondents during the questionnaire (Nevo, 1985). This is important to avoid incomplete PVE responses (due to respondents quitting mid-way). Thirdly, convincing policymakers, employers, and administrators to implement the PVE is more likely with a high face validity (Nevo, 1985).

Initial research has been conducted on the face validity of PVE, and empirical data has been gathered in past PVEs. For example, some PVEs investigated whether the tasks were clear to respondents and whether they received sufficient information to answer the PVE (Mouter et al., 2020; Mouter, Beek, et al., 2021), while other PVEs asked respondents if the experiment was realistic (Mouter et al., 2018). However, most PVEs so far have been conducted in the Netherlands (figure 1.4), and therefore most empirical research so far regarding the face validity of PVE has been conducted with Dutch respondents. People with similar backgrounds tend to rate a tests' face validity similarly, and rate different tests - differently. Hence, even if PVEs in the Netherlands so far have received high (or low) face validity, that does not guarantee respondents from another country would evaluate a PVE in the same manner.

1.2.3. PVE Experiments Worldwide

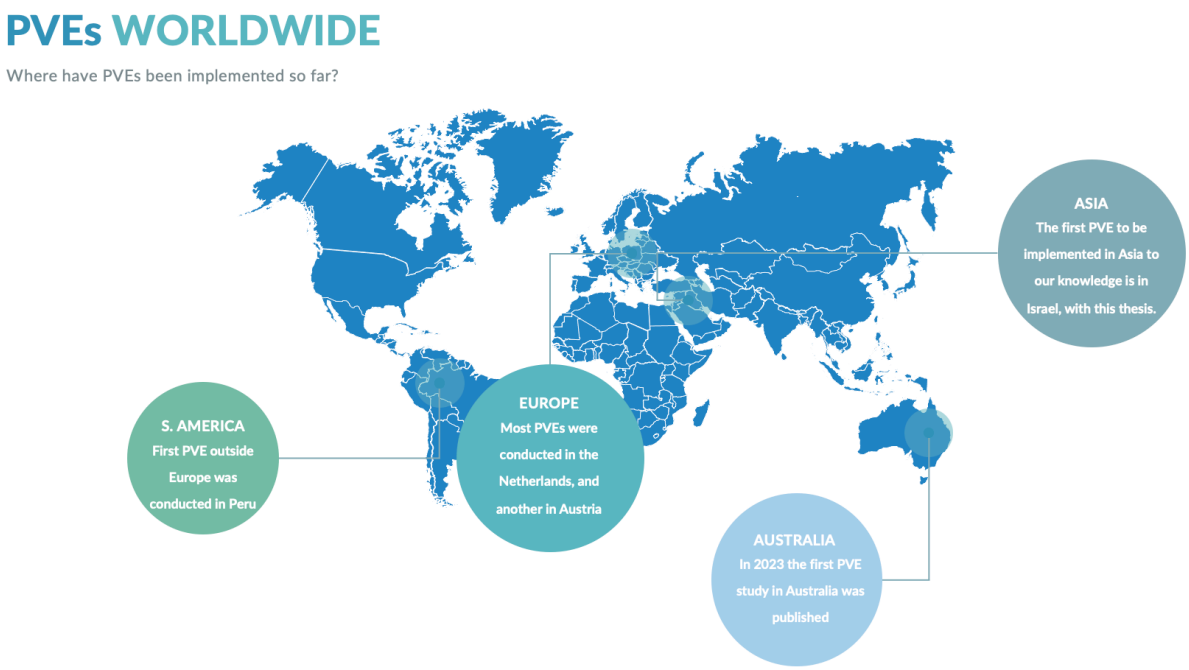


Figure 1.4: Implementation of PVE around the globe and research surrounding face-validity so far

PVEs experiments have been conducted in the Netherlands, in diverse domains. First, PVEs were conducted in the Health Care industry. For example, Mouter, Hernandez, et al. (2021) investigated the use of PVE for the evaluation of Dutch COVID-19 policies, while Rotteveel et al. (2022) conducted a PVE to investigate public opinion on funding projects promoting a healthy body weight among low income citizens. Secondly, the Transport & Urban Mobility sector (Hössinger et al., 2022; Mouter, 2021; Mouter, Koster, & Dekker, 2021b). For example, Mouter, Koster, and Dekker (2021b) compares PVE and cost-benefit analysis by applying both methods for the same transport project and comparing their resulting recommendations. Furthermore, Climate & Energy Transition (Itten & Mouter, 2022; Mouter, Shortall, et al., 2021) and Flood Risk Mitigation (Mouter et al., 2019, 2021c) were also found to be

fields where PVEs were conducted in. Past research on PVE has expressed the need to conduct PVE experiments in other countries other than the Netherlands, in order to be able to generate more general insights on the applicability and effectiveness of this public participation tool and appraisal method (Itten & Mouter, 2022; Mouter et al., 2022; Mouter, Shortall, et al., 2021; Mulderij et al., 2021).

Recently, a PVE was conducted in Austria by Hössinger et al. (2023), who analysed the preferences of citizens for climate policies specifically in the transport sector. Another PVE experiment was conducted by Boshuijzen-van Burken et al. (2023) in Australia, utilizing Value Sensitive Design to craft an ethical framework addressing autonomous systems within the Australian Defense sector. Finally, a PVE experiment was also recently conducted in Peru, where citizens' preferences for education policies were analyzed. To conclude, there is limited knowledge regarding the added value of PVE outside the Netherlands, and more specifically in terms of its' *face validity*.

1.2.4. Why Asses PVE Face Validity in Tel Aviv Israel?

This research proposes to evaluate the face validity of a PVE experiment in Tel Aviv Metropolitan, Israel. Evaluating Tel Aviv residents preferences for transport policy projects would be an interesting country and context to apply a PVE experiment in for several reasons. First, some cities in the metropolitan already have initiatives for local public participation (Herscovici et al., 2022), while others do not. However, those are usually in a smaller scale in comparison to PVE experiments (elaborated on in section 3.2.2). Analyzing the face validity of PVE from respondents with less experience with public participation would be an interesting perspective to evaluate, especially since PVE is at times criticized for being complex to comprehend for laypeople. Secondly, according to The World Bank (2023), the Netherlands is on the upper scale of political stability, while Israel is ranked much lower. As PVE is a tool to help policy-makers shape policies to match the public's preferences, it would be interesting to see whether the face validity of PVE changes when applying it to a politically unstable setting, especially in terms of respondents' willingness to participate and opinion on PVE itself. Thirdly, another factor making Israeli respondents an interesting perspective to asses face validity of PVE is the difference in perception of governance effectiveness. Specifically, the perception of governance refers to how citizens view the quality of the public service and its independence from political pressures, the quality of policy formulation and implementation and the government's credibility to commit to its policies. According to The World Bank (2023), Israel's score isolates more every year and is lower than the Dutch score, which stayed relatively stable and high the last 10+ years. For similar reasons, it would be interesting to check whether face validity evaluation changes when a public that is more pessimistic about its' government's credibility and effectiveness is evaluating PVE.

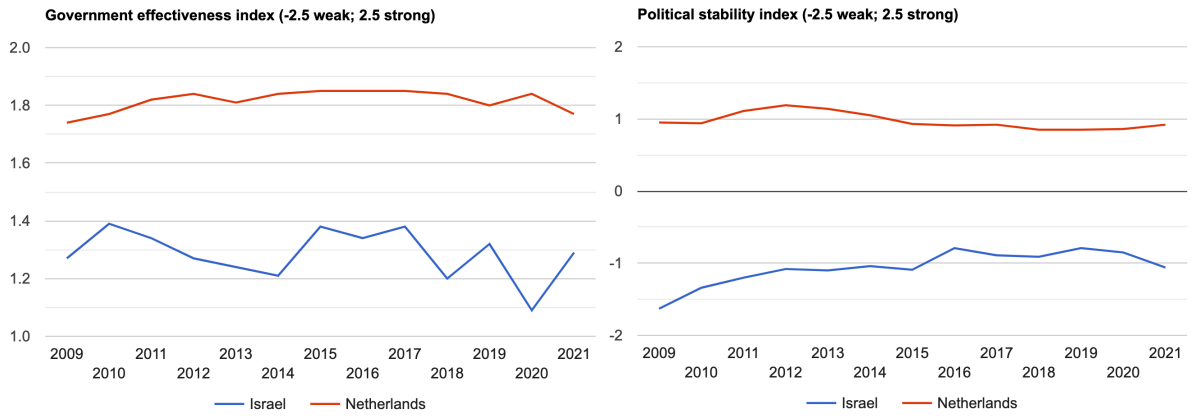


Figure 1.5: Israel vs. Netherlands Indexes: Governance Effectiveness Public Perception (Left) & Political Stability (Right), from The World Bank (2023)

1.2.5. Knowledge Gap & Research Question 2

Academic knowledge Gap & Corresponding Research Objective (2)

Academic Knowledge Gap: Very little research has been conducted on the added value of PVE outside the Netherlands, specifically in terms of its *face validity*. Most empirical research so far regarding the face validity of PVE has been conducted with Dutch respondents. Consequently, the PVE literature emphasized a need to conduct more PVE experiments in new countries (Itten & Mouter, 2022; Mouter et al., 2022; Mouter, Shortall, et al., 2021; Mulderij et al., 2021).
Research Objective: This research aims to gather new empirical information on the face validity of PVE as an appraisal and preference elicitation method, by conducting a PVE experiment and assessing its' face validity in a *new* country - Israel. Hence, the corresponding research question is: What is the validity of Participatory Value Evaluation in the context of Tel Aviv?
Contribution: This will contribute to the research on the applicability and effectiveness of this preference elicitation and appraisal tool, and whether or not (non-dutch) respondents perceive PVE appropriate to express their preferences accurately.

1.3. Research Approach & Sub-Questions

1.3.1. Case Study Approach

This thesis aims to test the applicability of a novel method in a new culture, country and continent it has yet been tested in. Mouter (2017) describes how every application of a PVE can be seen as an experiment, with elements of survey in them since one of they key aspects of every PVE is having respondents fill in a unique survey. Though there exists various definitions of 'case study' in the literature, a popular one by Yin (2009) defines the case study method as the following: *'An empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident'*. Case studies have both advantages and disadvantages.

In terms of advantages, firstly, Flyvbjerg (2004) state the most obvious advantage of case studies as a research approach is that it allows a highly detailed analysis in the individual case. This detailed information will not be taken out of context, making these studies very valuable. Secondly, Yin (2009) states that regardless of the field of study, the need for case studies stems from the need to understand complex social phenomena. Case studies allow understanding said phenomena while considering multiple variables of potential importance, and allow gaining a holistic view of real-life events (Yin, 2009). Thirdly, Golby (2001) describe how case study research allows investigating casual processes "in the real world" rather than in artificially created settings.

However, the main disadvantages of case studies must be acknowledged. One of the most common critiques against case studies, is its lack of scientific generalizability: *'It is widely believed that case studies are useful in the study of human affairs because they are down-to-earth and attention-holding but that they are not a suitable basis for generalization'* (Stake, 2009). This research aims to implement a PVE in a new cultural setting. While no concrete generalizations can be made based on solely this case, in order to start making generalization regarding the applicability of PVE around the world and increase information on the strengths and weaknesses of a PVE when applied to different contexts, cases must be conducted. In other words, you have to start somewhere. Moreover, a way to mitigate the impact of the singular case study and its inability to generalize, combining multiple kinds of data collection methods. This will provide a more balanced picture of reality (Verschuren et al., 2010), and will be done in this research: documents, interviews, online experiment.

1.3.2. Research Sub-Questions

The following research sub questions were phrased to help answer the main research question, and the corresponding purpose of each question for answering the main research questions is detailed in figure 1.6:

Q1 **What are the preferences of citizens of Tel Aviv Metropolitan area for (the impacts of) transport policy options?**

Q1.1 What are the strengths and weaknesses of utilising public participation for decision-making specifically in the Tel Aviv transport context?

Q1.2 Which potential policies could improve the quality of public-transport in Tel Aviv and encourage usage of other mobility options?

Q1.3 How do Tel Aviv residents evaluate the options and impacts of the policy options?

Q1.4 Which preference profile clusters arise within the Tel Aviv metropolitan residents when conducting the PVE?

Q2 **What is the validity of Participatory Value Evaluation in the context of Tel Aviv?**

Q2.1 How do Tel Aviv Israeli citizens evaluate the validity of PVE?

Q2.2 What is the difference in face validity evaluation results when comparing the Tel Aviv PVE to past Dutch PVEs?

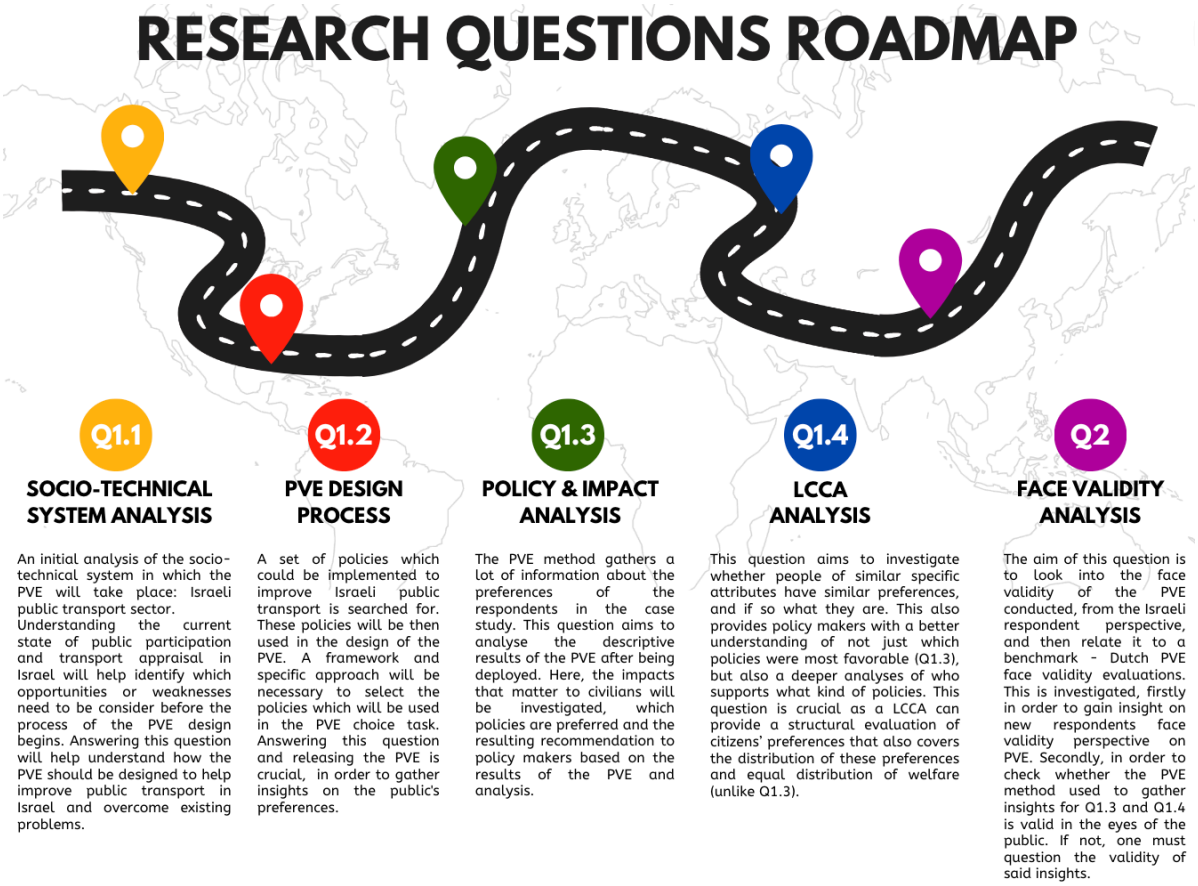


Figure 1.6: Research strategy & purpose of each sub-question for answering the main research questions

1.4. Societal & Scientific Importance

From a scientific perspective, this research aims to firstly, provide new insights into the applicability of the PVE method in a new culture and country - Israel. PVE literature has expressed multiple times the need to conduct similar PVE experiments in other countries in order to be able to generate more general insights on the applicability and effectiveness of this preference elicitation method (Itten & Mouter, 2022; Mouter et al., 2022; Mouter, Shortall, et al., 2021; Mulderij et al., 2021). Secondly, the research looks into the validity of PVE and how Israeli citizens evaluate this method. As research on the validity of PVE has mainly been executed in context of the Netherlands, conclusions and results so far are mainly based on the Dutch-citizen perspective (and a single Peruvian PVE previously aforementioned). Looking into the perspective of people from a different country will strengthen and contribute

to the research on the validity of PVE as an preference elicitation method. Finally, in this case study, the PVE investigates transport-related policy preferences in a region (Tel Aviv area) where transport infrastructure is substantially under-developed for OECD standards (OECD, 2020). Applying PVE in a transport context is especially interesting, since in many western countries, including in Israel, transport is a domain in which Cost Benefit Analysis (CBA) has the strongest tradition in terms of guidelines and information available to transfer impacts of government policies into monetary aspects (Mackie et al., 2014). As PVE addresses some critique on the well-known CBA method (Mouter, Koster, & Dekker, 2021a), implementing another PVE in this domain could help further the research on the difference between the two methods. Finally, from a applied perspective, increasing the knowledge on the current transport policy preferences of Tel Aviv residents will provide Israeli policy-makers with insight into how to best encourage a shift from automobile use to alternative more sustainable transport modes (public transport, walking, cycling etc).

From a societal perspective, applying a PVE in a country where public participation is less apparent helps increase awareness of the potential insights public participation has to offer local policy makers (Israeli Goverment Transport Policy Expert, 2023). Furthermore, including the public's perspective where possible should be cherished by implementing and perfecting methods such as PVE. Recently, the number of people around the world with democratic rights has plummeted from 3.9 billion to 2.3 billion people between 2017-2021 (Herre, 2022). The societal relevance of implementing public participation tools specifically in Israel has become even more apparent, due to recent controversial plans of the thirty-seventh Israeli government regarding the current judicial system (aiming to eliminate judicial review of legislation) (Rubin & Berger, 2023). Critics of these changes claim the executive branch seeks to consolidate power and undermine democracy and public opinion (Figure 1.7). According to Prof. Aeyal Gross, a professor of constitutional and international law at Tel Aviv University: *'Effectively, these changes will mean there is no legal boundary to government. A government with no limits totally undermines any idea of democracy'* (Gross, 2023).

Figure 1.7: Israeli's in Tel Aviv protest plans to change Israel's judicial system. Figure from Rubin and Berger (2023)

1.5. Relevance to CoSEM MSc

The objective and theme of this thesis is linked to Complex Systems Engineering & Management (Figure 1.8). Firstly, it has a clear design component - the PVE questionnaire itself that must include scenarios and policies relevant to a real-world problem. Secondly, a systems engineering approach is used to obtain solutions and conduct research taking into account diverse stakeholder perspectives (SWOT analysis, stakeholder analysis, public preferences, expert interviews). Thirdly, conducting a PVE means solving the complex design issue of identifying a complex policy issue needing solving, in this case; encouraging a behavioral shift from automobile usage to other sustainable alternative modes by improving the quality of these other modes. Then, designing policies and scenarios to potentially solve said complex problem (by conducting literature reviews and expert interviews), implementing a PVE experiment, and analyzing the results using COSEM - taught methods from the T&L track. The PVE that will be designed in this research tackles a complex problem and aims to solve it by adding a new perspective to the design of transport infrastructure in Israel.

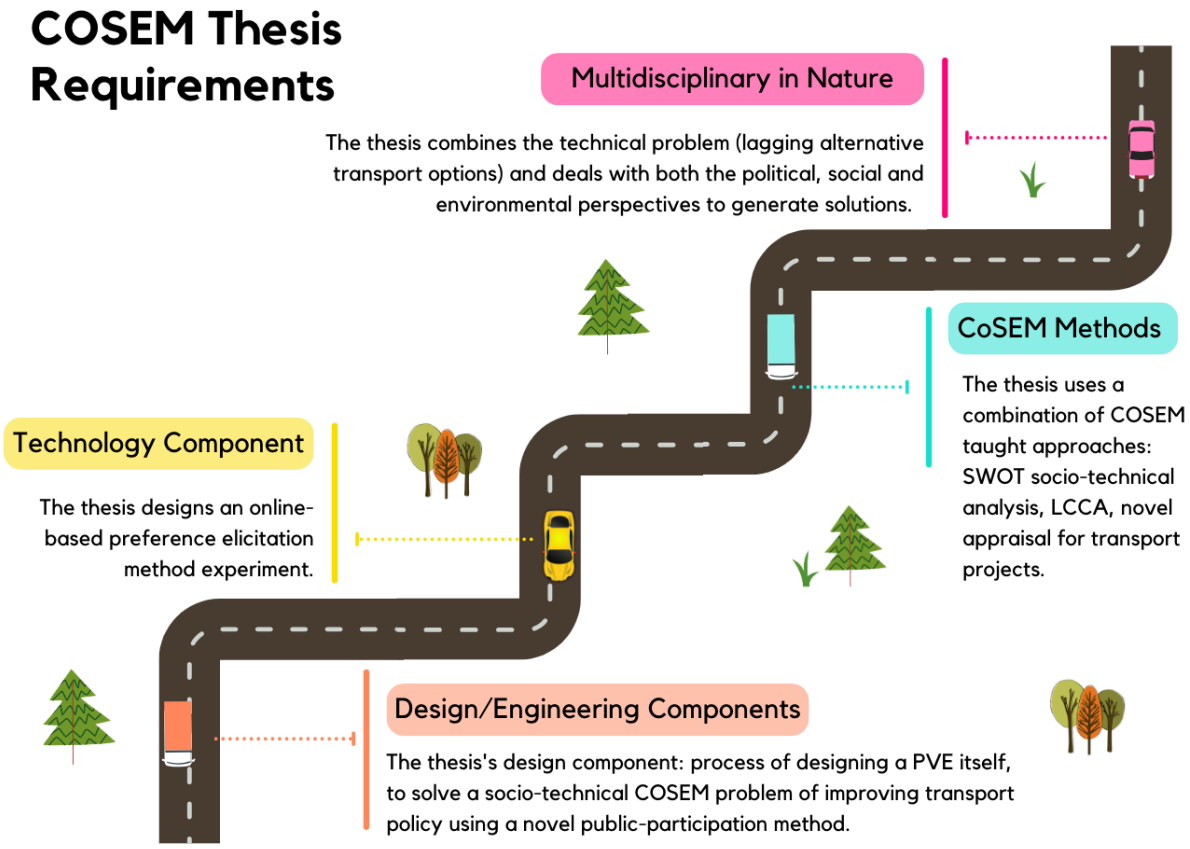


Figure 1.8: Relevance of this thesis topic to the COSEM curriculum, based on the COSEM thesis requirements

1.6. Thesis Structure

The rest of the thesis is structured as follows. Chapter 2 describes and motivates the methods used in this thesis to answer the above research questions. In chapter 3, a SWOT analysis is conducted to understand the strengths and weaknesses of utilising PVE and public participation for decision-making specifically in the Israeli public transport context (Q1.1). In chapter 4, the process of finding potential policies which could improve the quality of public-transport and alternative mobility options in Tel Aviv and designing the PVE is detailed (Q1.2). In chapter 5, the results of the PVE are interpreted, and the preferences for policies and impacts are evaluated (Q1.3). In chapter 6, a LCCA is conducted in order to identify whether preference profile clusters arise within the PVE respondents (Q1.4). In chapter 7, the analysis of face-validity from the Israeli respondent perspective is provided (Q2). The thesis is finalized with a discussions section reflecting on the results of this case study in comparison to the literature on preferences and face validity, including the limitations of this research. Finally, the conclusions chapter summarize and synthesize the answers to each sub-question, thus answering the main research question.

2

Methodology

This chapter outlines the research methods employed in this study. Given that this thesis centers on a case study of a PVE in Tel Aviv, the PVE method will be elaborated on first and justified as the appropriate preference elicitation approach for this research. Subsequently, the specific research methods used to design the PVE (i.e., literature review and expert interviews) and analyze the PVE results (including descriptive statistics, LCCA, and content analysis etc.) will be described and justified as suitable techniques aligned with the research sub-questions.

2.1. Motivation for Using Each Method

The following section will summarize the planned methods that will be used to answer each research (sub)question, the motivation behind choosing each methodology and the resulting deliverable. The corresponding research flow diagram is shown in figure 2.1.

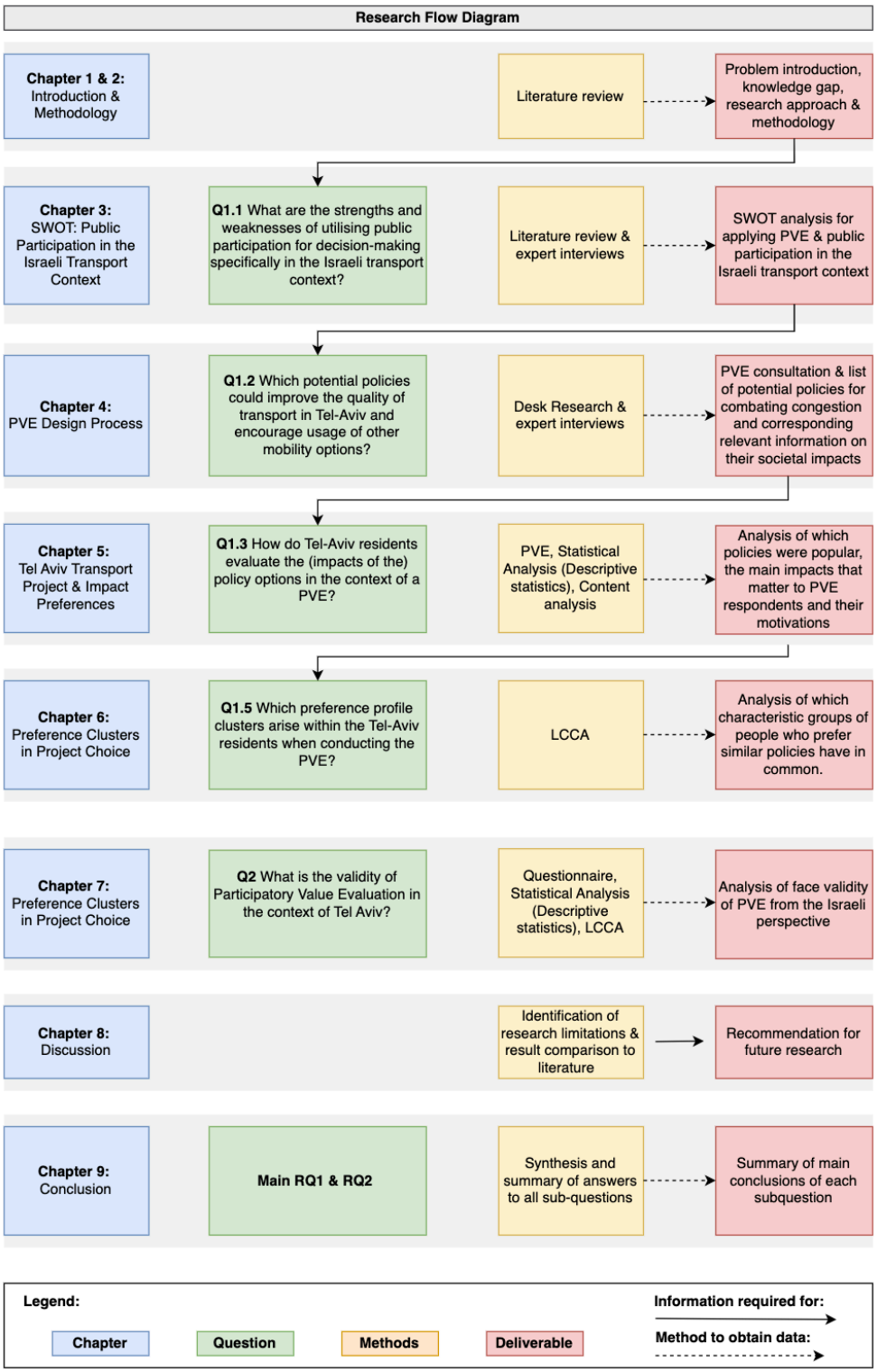


Figure 2.1: Research flow diagram

Q1.1 What are the obstacles and opportunities of utilising public participation for decision-making specifically in the Tel Aviv transport context?

- **Deliverable:** SWOT analysis of public participation in the Israeli public transport context.
- **Desk Research & Expert Interviews:** A literature review delves into scholarly works, research papers, and case studies worldwide, revealing strengths and weaknesses in shaping transport policy. Expert interviews provide contextual insights from policymakers, city planners, and engagement practitioners, offering valuable knowledge about local dynamics, challenges, and opportunities in transport decision-making. This method comprehensively examines the current state of public participation in Tel Aviv, identifies obstacles, explores opportunities, and ensures the study's credibility through cross-validation of data sources, ultimately providing a holistic understanding of the topic (figure 2.2).

Figure 2.2: Analysis Framework for Q1.1 is divided into three main analyses that are done using both expert interviews and three literature reviews

Q1.2 Which potential policies could improve the quality of transport in Tel-Aviv and encourage usage of other mobility options?

- **Deliverable:** The PVE consultation itself: list of potential policies for combating congestion, and corresponding relevant information on their societal impacts and costs.
- **Desk Research & Expert Interviews:** A literature review allows access to a wealth of existing knowledge and scholarly works related to transport policies and their impacts. It provides insights into best practices and successful policies implemented in similar urban contexts around the world. Also, it helps identify any gaps in the existing policies and areas where further research or innovative approaches are needed. Expert interviews with local policymakers, urban planners, and transport authorities provide context-specific insights into the unique dynamics and challenges faced in the Tel Aviv metropolitan area. Experts can offer valuable information on the feasibility and suitability of specific policies in the local context. Interviews bring practical knowledge to the evaluation process. These firsthand accounts can reveal the challenges, opportunities, and unintended consequences of policy implementation, which might not be fully captured in the literature. Incorporating expert insights through interviews fosters stakeholder engagement in the evaluation process. This participatory approach ensures that local perspectives and priorities are taken into account when designing and assessing the policies.

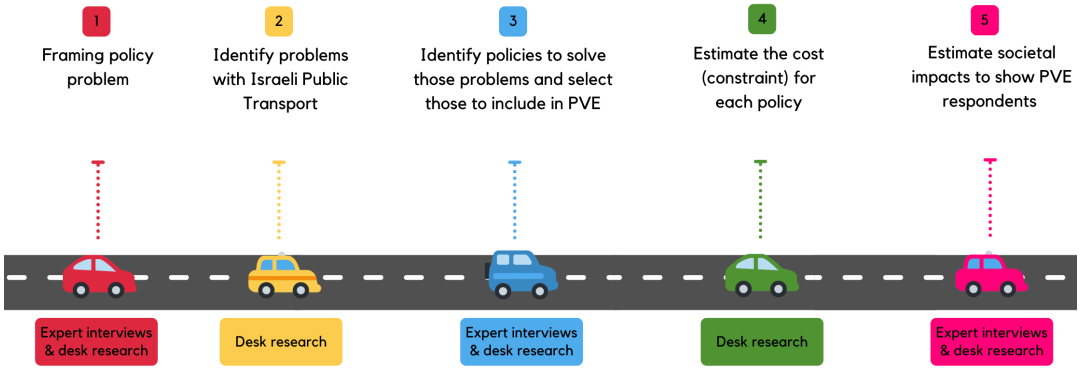


Figure 2.3: Analysis Framework for Q1.2 is divided into five main stages, elaborated on in chapter 4

Q1.3 How do Tel-Aviv residents evaluate the (impacts of the) policy options?

- **Deliverable:** Analysis of which policies were popular, the main impacts that matter to PVE respondents and their motivations.
- **Descriptive statistics & Content analysis**: Content analysis offers in-depth insights into the underlying reasons behind residents' evaluations. It uncovers the specific themes, sentiments, and arguments expressed in their responses, providing a deeper understanding of their perspectives. Descriptive statistics, on the other hand, provides a high-level overview of the distribution of preferences, allowing researchers to identify dominant viewpoints and preferences among the residents. This method combination allows for a well-rounded assessment of the policy options and equips policymakers with a comprehensive understanding of residents' evaluations, enabling them to make informed decisions and tailor policies that better align with the preferences of the Tel-Aviv community. Moreover, content analysis is particularly useful in discovering unexpected or novel perspectives that might not have been considered in the initial policy options. This can help policymakers and stakeholders gain insights into previously overlooked aspects or potential modifications to the policy proposals.

Q1.4 Which preference profile clusters arise within the Tel-Aviv residents when conducting the PVE?

- **Deliverable:** Analysis of which shared socio-demographic and other characteristic people who prefer similar policies have in common.
- **Latent Class Cluster Analysis:** LCCA is specifically designed to identify subgroups or clusters within a population that share similar preferences. It offers a quantitative framework for clustering individuals based on their preferences and is particularly well-suited for handling large data-sets, making it applicable to studies involving a substantial number of respondents, such as a PVE with numerous Tel Aviv residents. Moreover, LCCA is an unsupervised learning technique, which means it does not rely on predefined categories or labels. This enables the data to reveal natural groupings based on similarities in preferences, rather than imposing preconceived classifications. Additionally, LCCA has the capability to handle both categorical and continuous variables simultaneously, allowing for a comprehensive analysis of transport preferences that may involve diverse types of data.

Q2.1 How do Israeli citizens evaluate the face-validity of a PVE?

- **Deliverable:** Analysis of face validity of PVE from the Israeli perspective.
- **Questionnaire** Though there are many methods of evaluating the face validity of an experiment, in order to analyze how Israeli citizens evaluate the face validity of this PVE and answer Q1.4, a questionnaire method is used. Nevo (1985) recommends the use of a questionnaire, where respondents can rate an instrument based on a 5-point Likert scale in a questionnaire. This method was chosen as this is how face validity has been assessed

using previous consultations, and therefore the results found in this research can be better compared to PVEs conducted in other countries in future research. A key advantage of questionnaires for assessing face validity is that they allow asking specific questions and one can asses different aspects of face validity. However, respondents do not explain their answers in real depth (Marshall, 2005).

Q2.2 What is the difference in face validity evaluation results when comparing the Tel Aviv PVE to past Dutch PVEs?

- **Deliverable:** An initial indication on the validity and applicability of PVE as a method in other cultural and political settings, in this case Tel Aviv, Israel.
- **Statistical analysis, Mann-Whitney U test:** The Mann-Whitney U test is a suitable method to study the difference in face validity evaluation results for several reasons. First, the test is appropriate for comparing two independent groups, which is precisely the scenario when comparing the responses of Tel Aviv respondents and past Dutch responses. Each group of respondents provides separate and unrelated data, and the Mann-Whitney U test can assess whether there are significant differences between these two groups' face validity evaluations. Second, in face validity evaluations, respondents typically provide rankings on an ordinal scale. The Mann-Whitney U test effectively handles ordinal data and assesses whether there are differences in the central tendencies of the two groups without requiring assumptions about normality. Thirdly, the test is robust to outliers, making it suitable for situations where extreme scores might occur in the data without affecting the test's accuracy. Finally, it allows for hypothesis testing to determine whether there is a statistically significant difference in the face validity evaluation results between the Tel Aviv and past Dutch responses. This is valuable for drawing meaningful conclusions from the data.

2.2. Participatory Value Evaluation

Participants in a PVE are asked online, to build a portfolio of their preferred policies that satisfy the given constraint(s), which in this experiment will be a budget, but could be other scarce resource such as emissions or healthcare capacity. They also receive information on each policy and their impacts and consequences. This process takes respondents a maximum of about 20 minutes. The choice model in this method estimates the individual utility for the policies and their impacts, aggregates this over all participants, converts it into portfolios and ranks them from most to least desirable (Mouter et al., 2019). In addition, participants can write motivations for their preferences, which can also be analysed to see which arguments and values are critical in the public's eye. Normally, in practice, both the portfolio and value results are communicated to policymakers (de Ruijter, 2022).

2.2.1. Rationale Behind PVE as the Chosen Preference Elicitation Method

Choosing a preference elicitation method depends on the policy question that should be answered. PVE was chosen as the method for preference elicitation in this research. So far, most of the literature studying citizens' preferences for transport policies have looked into isolated policies (i.e., (Huber & Wicki, 2021a)). However, past research has shown that combining multiple projects leads to an improved behavioral response (Axsen et al., 2020). Due to this and to the need to apply multiple changes to the Tel Aviv transport system, only preference elicitation methods that allow an evaluation of policy combinations were considered, which could (potentially) be easily communicated to the entire metropolitan.

Given these requirements, PVE and choice experiments were both candidates. On one hand, choice experiments hold great promise as an elicitation technique for policymakers seeking to gather information about people's preferences regarding the impacts of policy options and the options themselves. On the other hand, PVE is especially beneficial when policy-makers want to understand preferences regarding the extent to which public resources should be allocated towards a potential set of options (Mouter, Hernandez, et al., 2021). The Israeli government has a special budget reserved to spend on improve the transport system in the country between 2023-2027, and must now implement changes in line with this budget, and with the preferences of the public (Israeli Government, 2023). PVE was found to be the suitable preference elicitation in this research, as it concerns the allocation

of a scarce public resource (government budget) towards a set of policy options. In addition PVE was also preferred due to the following considerations:

New Policy Ideas & Contextual Relevance: One of the benefits of PVE is that it also provides citizens with the opportunity to suggest new ideas and solutions that researchers and policymakers might not have considered before. The participatory character of PVE gives room for respondents to be honest and creative and encourages the expression of local knowledge and innovative suggestions. This allows the insights and recommendations to be more tailored to the specific needs of Tel Aviv Metropolitan citizens. Transport preferences can be highly context-specific and can vary depending on the challenges and opportunities faced by the Tel Aviv Metropolitan residents. By allowing respondents to express any preference in an open-ended way, PVE can provide valuable insights into the specific needs/concerns of the local population. This contextual relevance is more challenging to achieve via choice experiments on the other hand, as they rely more on predefined scenarios/attributes.

Nuanced Preference Understanding: PVE allows researchers to get insight into not only ”what” the preferences are, but also the ”why” behind them (again, especially via the qualitative insights). This kind of nuanced understanding is better for helping policymakers be able to design policies aligned with citizens' values, expectations and priorities. A richer nuanced understanding such as this is especially beneficial when studying such a complex multifaceted transport problem. Choice experiments primarily focus on quantitative data, that is less successful in comprehensively capturing the intricacies of citizens' preferences.

Policy Exploration Flexibility: PVE allows respondents to combine policy bundles themselves, unlike choice experiments that present respondents with pre-defined policy packages. PVE therefore provides respondents with the freedom to mix different policies according to their preferences using easily-comprehensible information. By doing so, PVE puts participants in the role of task solvers not choice makers, better reflecting their preferences specifically in a public decision-making context. Also, in a PVE it is easier to incorporate a wider range of policies in comparison to choice experiments. Meaning, in a PVE, participants have more freedom and flexibility in bundles they can recommend, since they can build their own portfolio and have more diverse options to choose from.

Preference Elicitation & Public Empowerment: Implementing a PVE means not only conducting a preference elicitation experiment, but also actively involving citizens in the transport policy decision-making process. By doing so, citizens feel heard and valued and therefore increasing support for the final transport policies potentially implemented based on a PVE. This is due to a sense of ownership and acceptance generated by such public participation. As choice experiments provide fixed bundles and less freedom to respondents, sense of ownership may be at a disadvantage.

2.2.2. Design Stages of a PVE

According to Bouwmeester (2021), setting up a PVE can be seen as a five stage process, summarized in figure 2.4. First, the policy problem is established. This is usually a collective problem the policy-maker is in charge of solving. Secondly, policies are found and defined, that aim to solve the policy problem at hand. The effects of each policy is also researched and established (so that respondents understand and see the consequences of applying each policy). In addition, in this stage the constraints of the PVE and problem are also established. Constraints refer to the characteristics that the PVE respondents cannot exceed (e.g., the public budget). Thirdly, after the policies and constraints have been well defined, the PVE itself is designed, meaning the questionnaire is written to reflect what information the policy-makers wish to obtain. Next, in step four of conducting a PVE the questionnaire is sent and citizens participate by filling out the online PVE. In the fifth and final step, the results of the PVE are analyzed and presented to the policy-makers who can generate various insights from said results. For example, a PVE can provide insight on which policy options were most favorable, by who (citizens with which characteristics) and why (the motivation of respondents to choose specific policy options and how different respondents rate the properties of different policies) (Dartée, 2018). Chapter 4 covers in more detail the design process of the PVE (stages 1,2,3 as described here) and chapter 5 covers stage 5 and shows the results of the PVE conducted in this case study. Furthermore, while figure 2.4 summarized the general process of designing any PVE, figure 2.5 outlines the main stages taken to design the Tel Aviv transport PVE in particular.

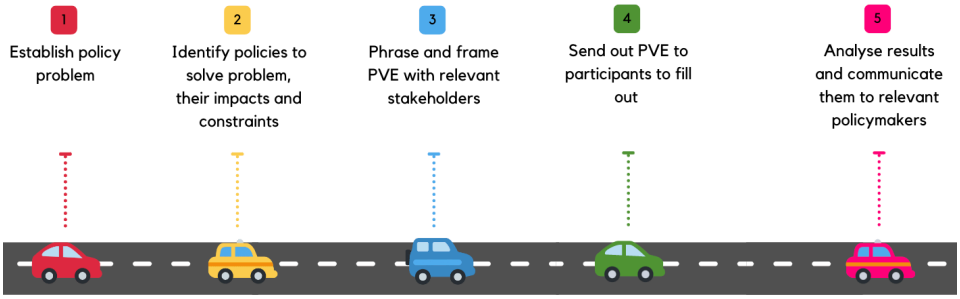


Figure 2.4: General stages of a PVE

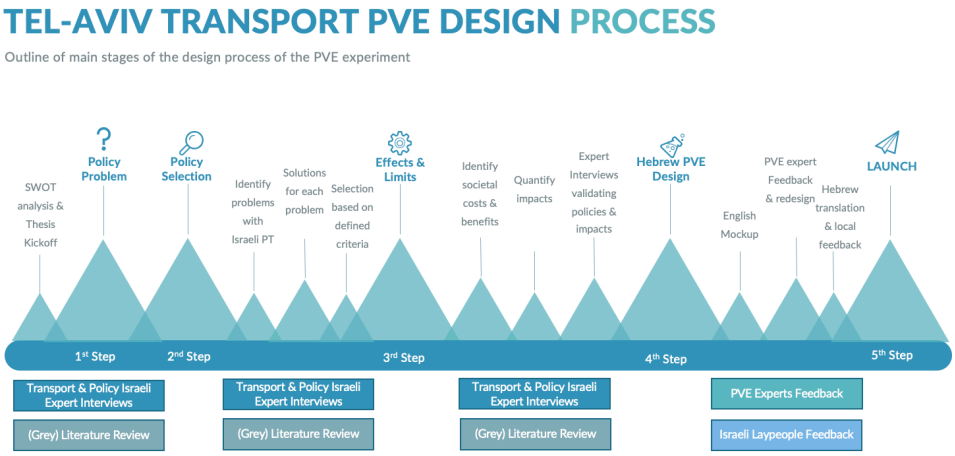


Figure 2.5: Specific stages of designing the first Tel Aviv transport PVE

2.2.3. Data Collection & Target Audience

In terms of the target respondents for this PVE, the study will target residence of Gush Dan (sometimes also referred to as the “Tel-Aviv Metropolitan area” in this study). Though its “influence area” (Figure 2.6) also has a substantial effect on the public transportation habits in the area, it was excluded from the experiment in order to provide a policy preference analysis that corresponds to the needs and opinions of the Gush Dan residents. And mainly, to provide a manageable scope for the PVE design in terms of socio-demographic characteristics required, and especially in terms of focusing the list of relevant policies in the PVE to a specific region. A survey company (Dynata) was used in order to get a data panel of 269 respondents which are a representative sample on the basis of age and gender. The respondents were required to be eighteen years or older and live in the Gush Dan region.

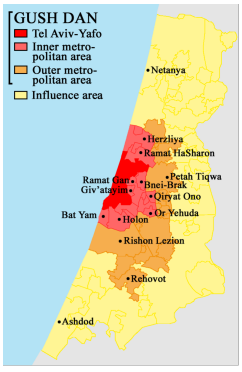


Figure 2.6: PVE Target Respondents: Gush Dan area is included, and influence area is excluded. Figure taken from Wikipedia (2023)

2.3. Desk Research & Literature Review

Literature reviews (i.e. desk research) are conducted to answer research questions Q1.1 and Q1.2. The databases Google Scholar and Scopus were used as the tools to search for literature. It is important to emphasize that all reviews in this thesis also included a substantial amount of grey literature such as OECD reports, Tel Aviv municipality and government reports etc. Firstly, Q1.1 will establish the potential challenges and opportunities of public participation in the Israeli transport context. This is done before starting to design the PVE, in order to understand where PVE might be of most help. Which obstacles can it help mitigate in current issues with public transport? How is public participation being conducted in the country today and where can PVE be most appropriate? Secondly, research question Q1.2 is in essence the design process of the PVE itself, which requires also a literature review in order to identify potential policies to improve public transport, identify their estimated costs and estimated societal impacts.

2.4. Expert Interviews

As shown in section 2.1, Q1.1 and Q1.2 incorporate not only desk research, but also expert interviews. According to Pfadenhauer (2009), expert interviews are suitable to complement a literature study. Experts were consulted for four main aims. The first aim, was to understand the Israeli public transport context (Q1.1). Experts were asked to provide input on the stakeholders in the Israeli public transport context, how and whether they implement public participation, which transport appraisal methods are popular in Israel and their insight into the political and institutional barriers that prevented public transport from progressing in the country. The second aim, was to help shape the content in the PVE to match the Israeli public and validate information on policies and impacts (Q1.2). Experts were asked which policies and problems are most crucial to solve to improve the state of public transport. Experts were also used to estimate the impacts shown in the PVE and validate the costs estimated. The third aim, was to understand how to design the PVE in a user-friendly way while still capturing the complexity of the policy problem. PVE design experts provided their opinion on how information could be best presented to the public for convenient participation. Finally, the results of the PVE were summarized in a non-scientific friendly manner and communicated back to the experts below, who provided feedback on how they evaluated the results and insights of the PVE. The list of experts and their background is shown in table 2.1.

Table 2.1: Experts consulted throughout this thesis

Expert	Function/Expertise
Public transport politics expert	Former consultant to the Israeli ministry of transport on matters regarding public transportation. This expert also founded a company aimed at improving public transport in Israel and has experience with public participation for decision-making throughout the entire country, and has vast experience and political knowledge in the Israeli public transport context.
Public transport policy & implementation expert 1	Community and activism manager at an Israeli public transport NGO. This expert is experienced in connecting the urban planning world to the community and in the involvement of Israeli residents in making decisions in the field of policies that affect them in their day-to-day lives. Experienced in implementing visual tools as a tool for activism and policy change.
Public transport policy & implementation expert 2	Director of government relations and policy at an Israeli public transport NGO. This expert specializes in public policy in the local governance level and government level and worked in multiple local municipalities on diverse and strategic issues: economic development, urban planning, infrastructure development and public participation.
Public transport policy & implementation expert 3	Architect at an Israeli public transport NGO. This expert has experience in urban planning and data processing. Has experience working as a landscape architect on a variety of projects in the country: from planning neighborhoods, parks and fast bus systems, to planning urban and interurban bicycle paths.
PVE design experts	Group of PVE designers at a company that conducts PVE consultations. These experts have designed many PVEs for various contexts, and this PVE was presented to the company in order to improve it to the final version presented in this thesis. These experts know how to design PVEs in such a way that captures complexity of a policy problem, while still showing it in a user-friendly comprehensible way to respondents.

2.5. Descriptive Statistics

To answer Q1.3 descriptive statistics are performed. They aim to provide global understanding on the quantitative data of the PVE consultation. Mainly, in three areas: which policies were preferred, which impacts were perceived as important to respondents and how each face validity statement scored. It also provides insight in the distribution of the sample (socio-demographic characteristics like gender) and insight whether respondents were willing to give up car infrastructure for public transport improvement of not.

2.6. Content Analysis

In order to analyze in an efficient way the motivations of respondents throughout the PVE, contributing to answering Q1.3, a content analysis is conducted. According to Columbia University (2023), content analysis is a method helpful to determine the presence of words/themes/concepts in qualitative data and allows a researcher to identify patterns within the qualitative data. Conducting a content analysis on text requires the text to be coded, or broken down, into manageable categories for analysis (Aacharya, 2022). Some main advantages of content analysis are that it allows for both qualitative and quantitative analysis, and qualitative data can also be analyzed further in a quantitative manner. In addition, over time, it can provide valuable historical and cultural insights. Nevertheless, some of the main disadvantages include that it can be highly time consuming and is subject to increased error (Columbia University, 2023). However, content analysis is considered a powerful tool when combined also with other research methods such as interviews, and quantitative analysis - and therefore this research combines multiple methods alongside content analysis of respondents written motivations.

2.7. Latent Class Cluster Analysis (LCCA)

A LCCA focuses on whether certain groups of respondents can be identified who share similar characteristics and who collectively choose similar policies (Q1.4). This analysis is crucial to conduct in addition to the descriptive results of a PVE. The analysis of PVE provides a portfolio of infrastructure, which should maximize social welfare increase (Mouter, Koster, & Dekker, 2021b). The PVE portfolio only provides the projects that are highest ranked on average, without considering the distribution of preferences and equal distribution of welfare (Kaplow, 2008). Consequently, there is a risk of misinterpretation of respondents preferences. Consequently, in order to better facilitate a democratic decision - making about public budget (which PVE assumes all citizens to be co-owner) decision-makers should be able to understand the distribution of citizens' preferences as well (Mouter, Koster, & Dekker, 2021b; Nyborg, 2012), in a none time-consuming way. Hence, a LCCA can provide a structural evaluation of citizens' preferences for infrastructure projects that also covers the distribution of these preferences. The LCCA maximizes homogeneity within clusters and the heterogeneity between clusters. The indicators in this analysis will be the public transport projects (it is assumed that the indicators in a LCCA are independent of each other), where each project choice was added as a binary variable. The covariates will be the socio-demographic characteristics and case-specific characteristics from the PVE (figure 2.7).

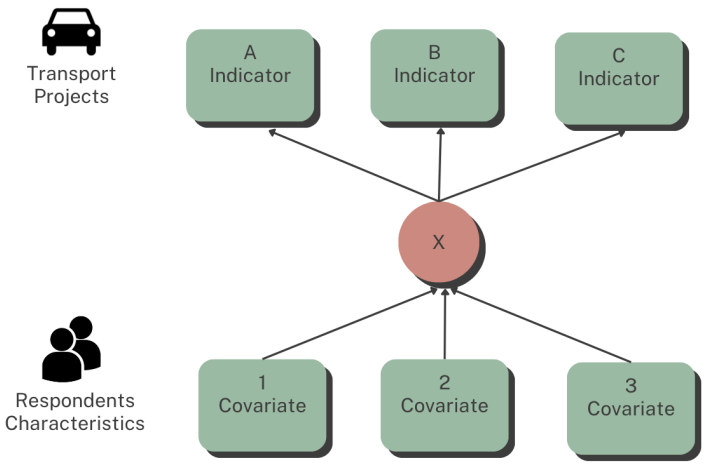


Figure 2.7: LCCA Model including three indicators, latent class cluster variable X and covariates

3

(Q1.1) SWOT: Public Participation in the Israeli Transport Context

In this chapter, the potential of implementing public participation in the Israeli public transport context will be discussed to address research question Q1.1. To answer RQ1.1, three key topics will be examined:

1. **Literature Review and Expert Interviews on Current State of Public Participation and Project Appraisal in Tel Aviv Public Transport:** This review provides valuable insights into the prevailing status of public participation and project appraisal in the country and region.
2. **Review of Advantages and Disadvantages of Public Participation in Transport Decision-Making:** This examination focuses on past literature to identify the advantages and disadvantages associated with incorporating public participation, particularly in urban and transport decision-making contexts. The review aims to shed light on the potential benefits that could be relevant for the current state of Israeli transport decision-making.
3. **Review of Political and Institutional Barriers in Israeli Public Transport Development:** This review aims to investigate the underlying reasons for the prolonged or absent progress in Israeli public transport developments. Additionally, then, one can determine whether any of the advantages of including public opinion in transport decision-making (identified in the previous review) can potentially mitigate these barriers.

Finally, based on the aforementioned information, a SWOT analysis will be synthesized to summarize the potential implications of public participation for enhancing Israeli public transport.

3.1. Public Participation Advantages & Weaknesses in Transport Policy Making

In traditional transport planning approaches, urban and transport decision-makers and planners are experts in the field who decided plans amongst themselves (Hall, 1983). It was not common in classical planning that citizens would provide a voice in the policy-making design process (Lane, 2005). Experts in the field of transport and urban planning, as well as government official and policy-design experts, would work to develop solutions based on a planning rational and specific goals and perspectives (Kamacı, 2014). The public interest was then incorporated in the design by for instance capturing the *'greatest good for the greatest number'* (where 'good' depends on the specific transport evaluation conducted, for example factors like environment, safety etc.) (Creighton, 2005).

Nowadays, public participation is more commonly accepted in the policy design process (of both transport and other fields), especially in democratic countries (Buchy & Race, 2001; Nylen, 2002; OECD, 2001; Trenam, 2000). With a system planning approach, participation in the form of consultation became another method to gather relevant information from (and to) the public (Kamacı, 2014). Arnstein (1969), defines citizen participation as the following: *'Participation is about redistribution of power in which the have-nots of our society who are presently excluded from the political and economic processes are given power to have control and influence over matters that affect their lives'*. More recent perspectives and definitions of citizen participation in decision-making, shift the definition so that such participation is provided to those who are (potentially) affected by said decisions and those who wish to participate, not only the *'have-nots that are excluded from political and economic processes'*, as described by (Arnstein, 1969). Moreover, another perspective by Nalbandian (2016), emphasizes the value citizens can bring to the design process: *'[public participation encompasses] the ways in which community members' interests, needs, values, and concerns are integrated into public decision and actions'*. There is vast literature on the positive and negative aspects of incorporating public participation methods in policy-making processes. A literature review was conducted to provide an overview of the potential strengths (table 3.1) and weaknesses (table 3.2) of implementing public participation methods. This is done to be aware and take advantage of potential benefits that can be reaped from conducting a PVE in transport decision-making in Israel, as well as being aware of potential weaknesses before implementing the case study.

Table 3.1: Potential Strengths of Public Participation In Transport Planning

Potential strengths of Public Participation In Transport Urban Planning	**Source(s)**
Can strengthen a project's legitimacy and public acceptance, as community input can generate less opposition via community input.	Koch and Steiner (2016); Roberts (2004); Nared (2020); Irazabal (2009); Berry et al. (1993); Potapchuk and Crocker (2017); Roberts (2004); Stein (2017); Irvin and Stansbury (2004); Konisky and Beierle (2001); Reed (2008); Junker Koehler et al. (2007)
Can serve an education tool for citizens on certain decision-making contexts, as allowing the public to participate can increase the public's understanding of the policy issue at hand	Irazabal (2009); Berry et al. (1993); Roberts (2004); Blackstock et al. (2007); Junker Koehler et al. (2007); Pahl-Wostl (2002);
Can increase mutual understanding between policymakers and the public and therefore strengthens trust	Roberts (2004); Quick and Bryson (2016); Richards et al. (2007); Beierle (1998); King et al. (1998)
Can help identify alternative solutions to complex problems by integrating various interests and opinions	Koch and Steiner (2016); Roberts (2004); Feldman et al. (2009); Quick and Bryson (2016), Griffin (2007);
Can help increase design outcomes by incorporating local needs, desires, insight, and knowledge	Koch and Steiner (2016); Irazabal (2009); Stein (2017); Nared (2020); Quick and Bryson (2016); Innes and Booher (2010); Thomas and Bertolini (2020); Irvin and Stansbury (2004); Habron (2003);
Can increase democratic values within urban and transport development	Irazabal (2009); Roberts (2004); Feldman et al. (2009)
Can help increase both transparency and inclusion within the design process	Irazabal (2009); Roberts (2004); Stein (2017); Feldman Quick, 2009

Table 3.2: Potential weaknesses of Public Participation In Transport Planning

Potential Weaknesses of Public Participation in Transport	**Source(s)**
The average citizen may not have the ability to comprehend complex problems, and therefore Uninformed public opinion may distract from the main issue	Roberts (2004) ; Stein (2017)
Can be highly costly in terms of resources (in terms of money, staffing, time) and cumbersome (slow)	Roberts (2004); Feldman et al. (2009); Irazabal (2009); Nared (2020); Lawrence and Deagen (2001); Vroom (2012); Korfmacher (2001);
Potentially provides room for opportunistic/self-serving public opinions that may not serve the “greater good” as well as short-sighted perspectives	Roberts (2004); King et al. (1998)
Issues with ensuring inclusiveness: are all the right people able to be involved?	Feldman et al. (2009); Irazabal (2009); Koch and Steiner (2016)
Issues with ensuring representativeness: usually, the higher the socio-economic status, the more likely that public possesses resources to participate	Feldman et al. (2009); Reed (2008); Junker Koehler et al. (2007); Korfmacher (2001)

Nowadays however, the literature debate regarding participation is no longer ‘representative government vs. citizen participation’, but rather, what type of citizen participation process is best for which type of decisions (for example: Konisky and Beierle (2001)). An overview of different types of citizen participation methods is described in appendix C.

3.2. Israeli Transport Appraisal & Public Participation

3.2.1. Transport Appraisal in Israel

In terms of which appraisal methods are usually used to evaluate transport infrastructure plans in Israel, the national framework for transport projects in Israel is usually based on cost benefit analysis (CBA). In addition, the national guidance documents require presenting decision-makers also with the major impacts separately via a Multi Criteria Analysis (MCA). These impacts are often times accessibility, safety, environmental impacts, and diverse equity concerns. For example, when designing the Tel Aviv metropolitan strategic public transport plan 2040, in addition to a CBA, a MCA was conducted to compare the plan alternatives according to goals, weights and also criteria, which were set by policy makers in the Mass Transit Committee (MTC). The MTC included four main criteria and corresponding weights. First, transportation (40%): refers to accessibility, transit usage and speed, performance and social equity. Second, economic (30%): refers to benefit-cost ratio, overall cost per transit user, percentage of operating costs covered by revenue, and agglomeration benefits. Thirdly, quality of life and environmental impacts (20%): refers to population coverage, number of transfers, reliability, land-use coherence, safety, and environment. Fourth and finally, feasibility (10%): which refers to both planning and implementation (Shiftan et al., 2022).

3.2.2. Public Participation in Tel Aviv Transport

Next, a literature review and expert interviews were conducted to understand the current state of public participation and project appraisal in the country and region. The full and detailed stakeholder analysis is elaborated on in appendix I. The main insights of this review are summarized below.

Public participation in Israel has a unique context and history, but it faces challenges similar to many other countries (Sadan & Churchman, 2012). The concept emerged in the late 1970s, hindered by a centralized and hierarchical government structure, economic instability, and the belief in experts’ superiority (Sadan & Churchman, 2012). Comparing Israel’s public participation with OECD requirements provides insight into its current state. The public is often involved late in decision-making, especially regarding environmental implications, lacking well-established processes (Israeli Public Transport Experts, 2023; Sadan & Churchman, 2012). In recent years, sustainable development has gained traction in government and planning circles, elevating the importance of public participation (15 Minutes Public Transportation Alliance, 2023).

In the transport policy sector, four main groups engage in public participation: public transport operators, the Ministry of Transport, local municipalities, and NGOs advocating for public transport (15 Minutes Public Transportation Alliance, 2023). **Public transport operators** involve the public in their design process through physical interactions but lack inclusive digital consultation tools (Israeli Goverment Transport Policy Expert, 2023). **The Ministry of Transport** cooperates with platforms like Insights

for online consultations, but the focus is mainly on gathering opinions rather than shaping decisions (Israeli Goverment Transport Policy Expert, 2023). **Local municipalities** vary in their approach to public participation, some being more open, conducting town meetings and using online tools (15 Minutes Public Transportation Alliance, 2023; Insights, 2023). Direct public involvement in decision-making is still rare and limited to a more local scale (Israeli Goverment Transport Policy Expert, 2023). Moreover, **NGOs** like Transport Today & Tomorrow and the 15 Minutes Public Transportation Alliance actively advocate for public transport improvement and use public participation to drive policy changes (15 Minutes Public Transportation Alliance, 2023). They empower transport users to voice their needs and conduct various activities to promote user-friendly transport networks (15 Minutes Public Transportation Alliance, 2023).

Despite some interest in public participation, challenges persist due to the multitude of players and lack of coordination, making it difficult to implement meaningful public-participation (15 Minutes Public Transportation Alliance, 2023). Stakeholders find public participation time-consuming and often prioritize louder voices, hindering its effectiveness (15 Minutes Public Transportation Alliance, 2023).

3.3. Political Acceptance & Institutional Barriers for Improving Public Transport

In recent years, the Israeli transport ministry has attempted to improve public transport and solve the growing congestion phenomenon via three main ways: improving the current bus transport quality, improving alternative transport (walking/cycling) quality and acceleration of new large scale projects in Tel-Aviv (Kinan et al., 2018). A literature review was conducted in order to identify the main institutional barriers to improving the transport system in the aforementioned areas, shown fully in appendix G, and the main insights summarized below.

The literature review highlights that the main barriers to improving Israeli transport, particularly in the Tel Aviv metropolitan area, are rooted in political objections. These objections, especially within some municipalities, create resistance to giving up car infrastructure in favor of prioritizing other modes of transport improvement. As a result, both large cross-municipal projects, such as light rail and metro, and local municipal transport projects can suffer delays and hindered progress.

Firstly, regarding bus transport quality improvement, the lack of effective control systems within the Ministry of Transportation and the absence of a comprehensive transportation policy contribute to institutional barriers. At the municipal level, many mayors do not prioritize promoting public transport usage, and there is a lack of engagement and clear statements on encouraging public transport. Secondly, regarding alternative transport quality improvement, political acceptability for allocating bicycle infrastructure at the expense of private vehicles varies at the local level. Some elected officials oppose changing street sections that affect private car users, making the implementation of cycling infrastructure challenging. The lack of synchronization between neighboring authorities also hinders the creation of a continuous cycling network between cities. Thirdly, the acceleration of new large transport projects, such as the metro and light rail, faces political opposition from some local municipalities. Concerns about losing power and resources may delay progress, posing significant barriers to implementing these projects.

In conclusion, these objections hinder the implementation of various transport improvement projects, impacting both large-scale cross-municipal initiatives and local municipal transport developments. Overcoming these political barriers and **engaging in a bottom-up approach** may strengthen public support and facilitate the progress of transport improvement projects.

3.4. Conclusion: Potential of Public Participation in Israeli Transport

The political and public acceptability of public transport policies was found to be especially low when they come directly at the expense of private car parking - for example public transport lanes, bike lanes, light rail lines. That being said, in the literature review it was found that some of the benefits of including public opinion in public transport decisions are for instance strengthening a project's legitimacy and reducing opposition (shown in table 3.1). In addition, some public participation methods were found to also be good information exchange tools between the public and decision makers, and could therefore also increase awareness to come of the benefits of public transport policies that impact car

infrastructure badly (table 3.1). A bottom-up process of reducing objections to these measures may be helpful by showing the public policy makers dilemma when implementing public transport projects, and mitigating NIMBY (not in my back yard) phenomenom. For example, a PVE could be used to show the public how though some policies indeed reduce the available infrastructure for cars, they also tend to increase other measures the public finds important like reliability of public transport, shortened travel time or overall increased road safety. In addition, it was found that there is a severe lack of cooperation on large-scale public transport projects by the local municipalities. Public participation via a PVE in specific cities or regions like Gush Dan could help place pressure on local municipalities to indeed be onboard with public transport improvement, and to cooperate more easily with larger transport projects (such as light rail and metro) in order to help these projects be finalized more quickly. The findings are summarized in a SWOT analysis (figure 3.1).

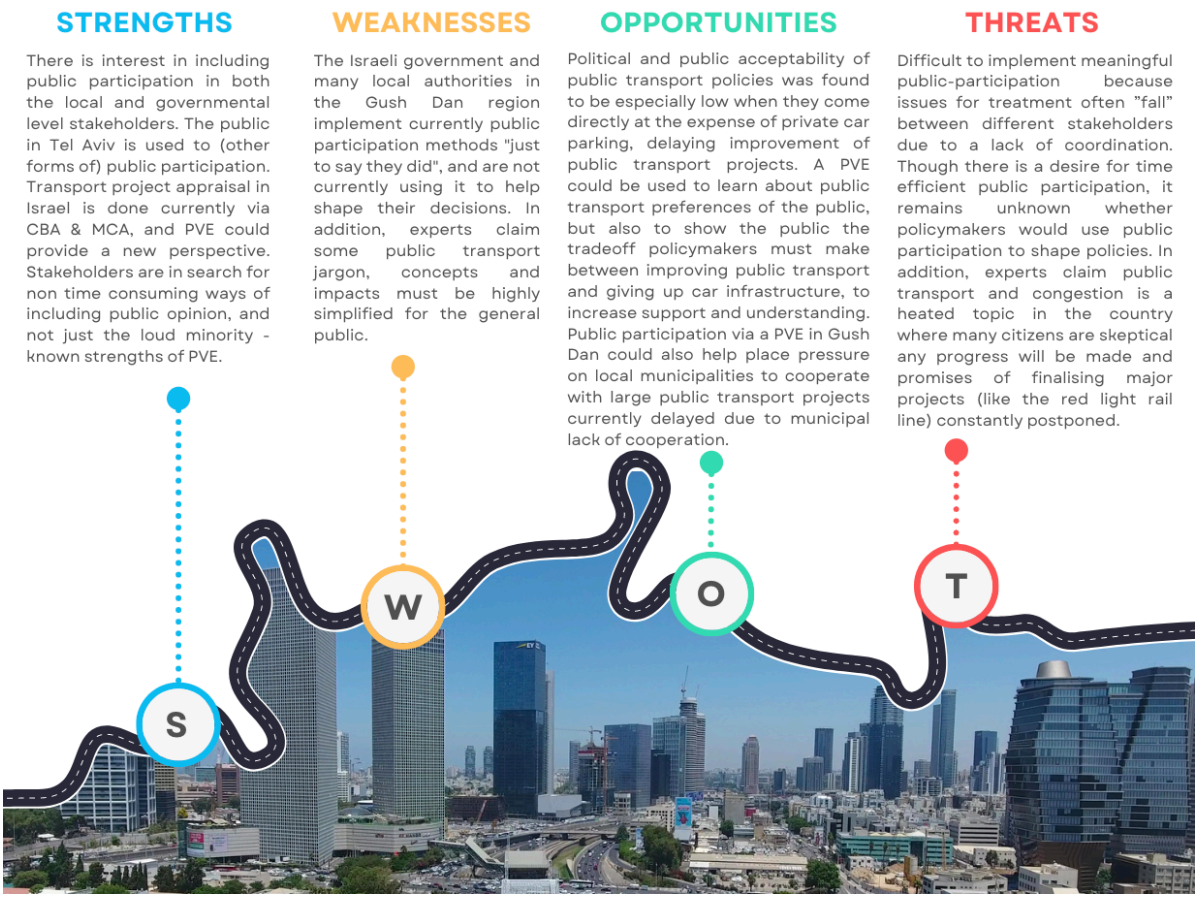


Figure 3.1: SWOT anaylisis: potential of public participation for improving Israeli public transport

4

(Q1.2) Tel-Aviv Transport PVE Design Process

In this chapter, we provide a detailed description of the main stages involved in designing the Israeli transport PVE, addressing research question Q1.2. The design process encompassed the following key stages:

- **Framing the Policy Problem:** The policy problem was carefully formulated for laypeople's comprehensibility.
- **Identifying Main Transport Problems in Tel Aviv:** The principal issues affecting the Tel Aviv transport system were identified.
- **Developing a List of Potential Policies:** A range of policies was generated for each problem, and a selection process streamlined the list for the PVE.
- **Estimating Policy Effects and Budget Constraints:** Preliminary desk research and a focus group with three transport policy experts assessed policy effects and determined the budget constraint for the PVE.
- **Identifying Relevant Socio-demographic Characteristics:** Background information on respondents was collected through relevant socio-demographic characteristics.
- **Face Validity Questions:** Lastly, the face validity questions from the PVE are presented.

4.1. Step 1: Framing the Policy Problem

The first stage of the PVE involves identifying and framing the collective policy problem the PVE aims to solve. In this stage, the exact problem is framed in an understandable way for the public. This was conducted in two sub-steps.

First, a review of recent studies on the automobile oriented lifestyle and congestion in the country was conducted, including both Israeli and international studies. It was found that many recommended a two sided approach in order to change the current automobile oriented lifestyle in the country. First, improving the quality of the various public transport options and increasing accessibility and attractiveness to use said options. Second, alongside improving the quality of public transport, it was found beneficial to introduce gradually measures to incentivize car users to use public transport, via different types of taxation reforms and subsidy changes. However, in order to narrow down the scope and focus of the PVE, this PVE will focus solely on the first part of the recommendation (improving the quality of public transport in the region) by conducting a Fixed budget PVE.

Second, consultations were conducted with experts in Israeli public transport policy (see Appendix A.1), in order to identify how to best shape the introduction so it relates to respondents and would be comprehensible in a short text. While the findings and main impacts of the congestion problem are describes in section 1.1, the most critical feedback received from the consultations, is that Israeli respondents must be informed in a prominent way that identifying public transport policies (shown in the PVE) can help with the congestion problem in the country. This is a problem the majority of the public wishes to solve, and many people in the country are not aware of the impact accessible and efficient public transport can have on reducing congestion (Israeli Public Transport Experts, 2023). This resulted in the following framing of the context of the PVE and policy problem:

Framed Policy Problem

The traffic jams in Israel are among the worst in the world.
The road system collapses under the load, especially during the hours of arrival and return from work. Hours are wasted in traffic jams, air pollution worsens and housing prices rise. The cost of the traffic jams is estimated at about 40 billion NIS per year. If we do not significantly improve public transportation in the area, the traffic jams will only get worse.
This survey addresses you, the user of public transportation, in order to help the decision makers understand the preferences of the public that will use public transportation on a daily basis. In this survey you can advise which projects you would promote in order to improve public transportation in Gush Dan.
What needs to be done to improve public transportation in Gush Dan?

Hence, the main question and policy problem the respondents will be faced with in this PVE is as follows: *Given a specific budget that cannot be exceeded, how would you improve the quality of public transport and alternative mobility options in Gush Dan to encourage more public transport usage?*

4.2. Step 2: Identifying Problems with Tel Aviv Transport

4.2.1. Problems with Tel Aviv Transport

In this stage of the PVE, a literature review was conducted in order to gather understanding on the main problems with Tel Aviv metropolitan transport, so that the PVE could include policies potentially solving these problems. This was done in an attempt to not only select the best policies for a PVE, but also to make sure the a wide variety of the pressing problems will be addressed via the PVE experiment explicitly. The majority of the problems were found from two main types of sources. First, problems included in this research were based on public transport reports (Israel State Comptroller, 2019) written by the State Comptroller of Israel (who inspects, reviews, and audits the policies and operations of the government of the State of Israel). These problems are sourced from a governmental authority whose sole task is to review policies and operations of the government, including transport. Said problems were reported directly to the Israeli government, meaning the policymakers are aware and consider these to be the main problems to address. Secondly, an international perspective of the public transport issues in the country was also desired. Therefore, multiple OECD and other international evaluations of Israeli transport were used to provide a reliable external perspective into the public transport issues

Israel has, especially when comparing it to other countries in the OECD. In total, 11 problems were identified with the current state of transport in the Tel Aviv Metropolitan, shown in table 4.1. However, a highly detailed explanation of each problem and corresponding references can be found in appendix H:

4.2.2. Problems Addressed in the PVE

After the aforementioned problems were identified and investigated, some problems were left out of the PVE design in this stage, either because they did not closely match with the scope of the framed policy problem closely (i.e. improving the quality of public transport in Gush Dan) or because the group expert consultation suggested these problems were more suitable for dedicated PVE's. The selection and problems that were excluded is shown in table 4.1, followed by a reasoning of why each of the three excluded problems were left out of the PVE design.

Table 4.1: Public transport problem selection overview. Three problems were already excluded in this stage of the PVE design

Problem	Included / Not Included
Insufficient frequency of regional and inter-city bus lines & overcrowding	✓
Longer travel time than expected & delays	✓
Lack of public transport on Saturdays	✓
Lagging accessibility to elderly & physically challenged individuals	✓
Accidents related to electric scooters & bikes	✓
Alternative travel modes (walking/cycling) marginalized	✓
Insufficient accessibility to train stations via bus from residential areas	✓
Substantial delays in major public transport projects	✓
Lack of female security in public transport	✗
Lack of incentive to move to public transport	✗
Lack of sufficient public transport in non-jewish cities/neighborhoods	✗

The first problem to be left out is the *Lack of female security in public transport*. Though this is an important problem to address in order to improve public transport usage in the country for half of the population, it might be more beneficial to solve this particular problem by conducting a dedicated "female only" PVE where different solutions are presented specifically for this problem, and Israeli female commuters could provide their perspective into the transport design process. Currently, even though public transport plays an important role in the lives of women, it remains male dominated, both in its design and in its employment (International Transport Workers' Federation, 2022).

The second problem to be left out is the *Lack of incentive to move to public transport*. This is a critical problem mentioned in multiple reports (Kinan & Tal, 2017; OECD, 2018, 2019, 2020) and creating such incentives could be a critical part in changing mobility behaviour and the automobile lifestyle in the country. However, the PVE aims to focus more on making the public transport offered more attractive and suitable to the transport needs of the public (pull policies, rather than push), so that if/when such push incentives would be integrated, there will be suitable public transport to accompany said policies.

The third problem to be excluded in this stage of the design process, is the *Lack of sufficient public transport in non-jewish cities/neighborhoods*. Previous reports (Israel State Comptroller, 2019; Kinan & Tal, 2017; OECD, 2018, 2020) emphasized that the gap is so substantial between the transport infrastructure in said neighborhoods, as well as the literature (Abu Qarn & Lichtman Sadot, 2021; Elias & Katoshevski-Cavari, 2014; Feitelson & Cohen-Blankshtain, 2018; Moran et al., 2010; Rokem & Vaughan, 2017). Therefore, including it in a regional-level public transport PVE might be challenging and unfair towards those communities, especially since the PVE in this master thesis is conducted in Hebrew. Ideally, the PVE would be designed in both Hebrew and Arabic, which unfortunately is outside the scope and capabilities of this single thesis.

Transport Problems To Solve in the Next Stage

1) Insufficient frequency of regional and inter-city bus lines & overcrowding, 2) Longer travel time than expected & delays Lack of public transport on Saturdays, 3) Lagging accessibility to elderly & physically challenged individuals, 4) Accidents related to electric scooters & bikes, 5) Alternative travel modes (walking/cycling) marginalized, 6) Insufficient accessibility to train stations via bus from residential areas, 7) Substantial delays in major public transport projects

4.3. Step 3: Policy Selection Process

In the third stage of the PVE design process, one must identify a list of relevant policies to include in the PVE. First, for each problem, policies that could help solve each problem were searched for (shown in detail in table 4.2). Each of the policies entails different actions and overall benefits. Appendix D explains each policy in table 4.2 in more detail, however not all policies can be included in a single PVE.

Table 4.2: Optional policies to help mitigate each problem

Main Problem	Policy	Source
Insufficient frequency of regional and inter-city bus lines and overcrowding	Increase salary and working conditions of drivers	OECD (2019) Israel State Comptroller (2019) Kinan et al. (2018)
	Support pilot projects of new technologies and operating concepts	OECD (2020) Israel State Comptroller (2019)
Longer travel time than expected and delays	Stricter enforcement of illegal use of public transport dedicated roads	Kinan and Tal (2017) Israel State Comptroller (2019)
	More continuous connection of public transportation routes and high-occupancy routes (with an emphasis on large employment centers)	Kinan et al. (2018) Israel State Comptroller (2019) OECD (2015)
Lack of public transport on Saturdays	Increase parking and fleet of car-sharing at the expense of regular parking in busy locations	Kinan et al. (2018)
	Increase of Saturday shuttle service from suburbs to TLV and within TLV	Wharton (2017) OECD (2019)
Lagging accessibility to elderly and physically challenged individuals	Improving the accessibility of stations and buses for everyone, including people with disabilities	Kinan et al. (2018) Israel State Comptroller (2019) Kinan and Tal (2017) Israel State Comptroller (2021)
	Promoting technological infrastructure for smart transportation	Kinan et al. (2018) Kinan and Tal (2017) Israel State Comptroller (2019)
Accidents related to electric scooters and bikes	Traffic education programs	Kinan et al. (2018) Kinan and Tal (2017)
	Stricter enforcement of (electric) scooter and bike laws	Kinan and Tal (2017) Israel State Comptroller (2019)
Alternative travel modes (walking/cycling) marginalized	Acceleration of the bike lane project (with an emphasis on reaching employment centers and train/light rail/metro stations)	Kinan et al. (2018) Israel State Comptroller (2019) OECD (2018, 2019, 2020)
	Improving the pedestrian experience within cities	Kinan et al. (2018) Kinan and Tal (2017)
	Improve bike parking capacity in main stations, working and leasure zones	(Kinan & Tal, 2017)
Insufficient accessibility to train stations via bus from residential areas	Increasing frequency and expanding bus service from residential neighborhoods to train stations and synchronization with the train schedule	Kinan et al. (2018) Kinan and Tal (2017) Israel State Comptroller (2019)
Substantial delays in major public transport projects	Accelerate light rail project	OECD (2018, 2019, 2020) Israel State Comptroller (2019)
	Accelerate metro project	OECD (2018, 2019, 2020) Israel State Comptroller (2019)

After a list of potential policies was established, a selection process was conducted in order to minimize the amount of policies to a manageable amount for a PVE experiment. The recommended amount of policies in one PVE is usually between 8 to a maximum of about 12. In order to minimize the amount of policies to be within this range, the following six selection criteria were chosen to evaluate each policy, and the selection process of all the policies is summarized in table 4.3.

- **Criteria 1 - Which policies do experts think are *most* needed to improve the current transport system?** As a first criteria, we want to know if policymakers are even interested in receiving input for a specific policy. Some policies are potentially more influential than others to improve the state of public transport in Israel. Therefore, this criteria was used in order to prioritise the

policies that are especially beneficial and relevant to improve the state of public transport, according to Israeli transport experts interviewed and official government recommendations (e.g. (Israeli Goverment Transport Policy Expert, 2023; Israeli Public Transport Experts, 2023; Kinan et al., 2018)).

- **Criteria 2 - Where is public opinion *most* apparent and needed?** According this criteria, each policy was evaluated by whether there is a need from the public to find input, or for which policies or types of policies public opinion is substantial and should therefore still be considered, even if it is not necessarily directly needed. Some policies do not require direct input from the public, while other policies require input from the public more than others. As this PVE is intended to provide input for policymakers regarding the public's preferences for policies that would encourage more satisfaction with the public transport offered, it is crucial to include policies that require input from the public, or policies which the public would like to share their opinions on.
- **Criteria 3 - Diversity of mobility options:** The PVE should include policies that target the improvement of different types of public transport and alternative mobility options. This provides respondents with a diverse set of options within the PVE choice task. As discussed in section 2.2.1, one of the strengths of PVE in comparison to other preference elicitation methods (such as DCE) is that it allows incorporating a wider range of policies in one experiment. This therefore also will allow to
- **Criteria 4 - Diversity in transport problems addressed:** Although not all problems can be addressed in one PVE, the PVE should aim to include policies that contribute to multiple different problems identified in this study, rather than including policies that solve a few specific problems.
- **Criteria 5 - Diversity in Cost:** The PVE should include both policies that cost a lot, and also policies that cost relatively less, in order to provide diversity in options for respondents to choose from (and see whether cost is a important factor influencing choice).
- **Criteria 6 - Inclusion of policies that tend to have a disadvantage in traditional appraisal methods** In Israel, many transport and infrastructure projects are evaluated using Cost Benefit Analysis (CBA) and Multi Criteria Analysis (MCA). The PVE will include policies have a disadvantage when evaluated via traditional appraisal methods, for example projects that encourage cycling or walking.

Table 4.3: Policy selection process overview

Policy	C1	C2	C3	C4	C5	C6
Increase salary and working conditions of drivers			Bus			
Support pilot projects of new technologies and operating concepts			Innovation			
Stricter enforcement of illegal use of public transport dedicated roads			Bus, Shuttles (moniot sheirut)			
Better connected public transport dedicated road network within and between cities			Bus, Shuttles (moniot sheirut)	✓	✓	
Increase parking and fleet of car-sharing at the expense of regular parking in busy locations			Car Sharing			
Increase of Saturday shuttle service from suburbs to TLV and within TLV			Satturday Shuttle System	✓		
Improvement of accessibility of the street, bus stations to the physically disadvantaged community			Bus, Shuttles (moniot sheirut)	✓		
Promoting technological infrastructure for smart transportation			Information infrastructure	✓		
Traffic education programs			Safety education			
Stricter enforcement of (electric) scooter and bike laws (e.g. Helmet use, riding on sidewalk laws)			Safety			
Accelerate existing bike network regional plan and improvement of rider experience on bike lanes			Bike/Scooter	✓		✓
Improvement of walking experience within cities. Widen sidewalks at the expense of car parking adapted for convinient walking (benches, shade etc.)			Walking	✓		✓
Improve bike parking capacity in main PT stations, working and leasure zones			Bike/Scooter			
Better accessibility (via inter-city bus lines) to major train stations from residential areas			Bus/Train		✓	
Accelerate light rail project			Light Rail	✓	✓	
Accelerate metro project			Metro	✓	✓	

Finally, the policy selection rendered ten main policies which will be subsequently included in the transport PVE, where the policies can be divided into three main groups: policies to improve the existing public transport quality, policies to improve alternative transport quality and policies to accelerate new large scale projects.

Final list of 10 policies included in PVE

- **Policies to improve the existing public transport quality:**
  1. Better connected public transport dedicated road network within and between cities
  2. Increase of Saturday shuttle service from suburbs to TLV and within TLV
  3. Improvement of accessibility of buses and stations to the physically disadvantaged community
  4. Promoting technological infrastructure for smart transportation
  5. Addition of direct bus lines to employment centers
  6. Improve bus service from residential neighborhoods to train stations and synchronization with the train schedule
- **Policies to improve alternative transport quality:**
  1. Acceleration of the bike lane project (with an emphasis on reaching employment centers and train/light rail/metro stations)
  2. Improving the pedestrian experience within cities
- **Policies to accelerate new large scale projects:**
  1. Acceleration of the metro project
  2. Acceleration of the light rail project

4.3.1. Policy Explanations

In this section, the main aspects and characteristics of each of the ten policies included in the PVE will be described.

1. **Better connected public transport dedicated road network within and between cities**
   - **What is being recommended?** Creating a more connected network of public transportation routes and existing high-occupancy routes, with an emphasis on reaching large employment centers.
   - **How is this done?** By adding more lanes in the intercity and urban space, based on existing road infrastructure.
   - **What are the advantages?** Reliability and speed: a significant improvement in the speed and reliability of bus travel, shortening arrival times to destinations, and a reliable and regular frequency of trips. Increasing frequency without increasing the budget: the same vehicle fleet and the same drivers can manage to make more trips. Expediency: Creating expediency in the use of public transportation by improving travel times compared to the private vehicle.
2. **Increase of Saturday shuttle service from suburbs to TLV and within TLV**
   - **What is being recommended?** Expansion of (free) bus services on Saturday throughout Gush Dan.
   - **How is this done?** Adding new lines from new councils that wish to participate but find it difficult to commit to the yearly budget the service requires on Shabbat and increasing frequency of existing lines, taking into consideration areas where Shabbat observers reside.

- **What are the advantages?** Decrease in dependence on private vehicles: will reduce the use of private vehicles by residents and increase the use of public transportation even on weekdays. Increasing freedom of movement: will allow more citizens who do not own a car to get around on Shabbat.

3. **Improvement of accessibility of buses and stations to the physically disadvantaged community**

   - **What is being recommended?** Improving and promoting the existence of all the measures necessary according to the law to ensure accessibility to the public transportation infrastructure, without the passenger being required to pay extra.
   - **How is this done?** The accessibility of bus stops and buses can be improved, for example by: creating a ”baylet/island bay” instead of a bus entrance bay, increasing the space of the stations, enforcing accessibility measures such as stopping as close as possible to the curb, using ramps, starting a ride only after anchoring a wheel-chair and making sure the operating announcement systems is fully functional. Ensuring quick response times of the public transport operators regarding complaints regarding accessibility for people with disabilities and ensuring the availability and response of an accessibility coordinator on behalf of the operator.
   - **What are the advantages?** Equality: making public transportation accessible will allow disadvantaged populations to move around independently and be an equal part of society.

4. **Promoting technological infrastructure for smart transportation**

   - **What is being recommended?** Promote technological infrastructures for smart transportation.
   - **How is this done?** Technologies incorporated in this policy are for example: traffic lights that give priority to public transportation, and advanced tools for sharing information in real time.
   - **What are the advantages?** Travel time and reliability: technology to manage traffic lights will give priority to public transport and thus significantly improve the travel time of public transport. Accurate information in real time for passengers: these efforts will also improve the information for passengers in real time regarding departure and arrival times, travel duration, crowding, delays, etc.

5. **Addition of direct bus lines to employment centers**

   - **What is being recommended?** Creating direct bus lines that will transport workers from municipalities throughout Gush Dan directly to large employment centers
   - **How is this done?** About 80% of the congestion on the roads is due to drivers trying to get to the same work areas and exactly at the same hours. In addition, employees waste a lot of time and energy looking for parking. This project promotes fast and direct lines from residential areas throughout Gush Dan direct to large employment centers, in order to provide workers with a direct and convenient way to get to work by public transportation and not by car.
   - **What are the advantages?** Improving the economy: will strengthen and upgrade the local economy, increase the attractiveness of the employment areas, and increase labor productivity. Improving road safety: reducing traffic hazards and improving road safety. Convenience: direct and convenient access to employment centers. The quality of the environment: improving the quality of the environment in light of the transition from the use of private vehicles for commuting to work to the use of direct lines to employment centers.

6. **Increasing frequency and expanding bus service from residential neighborhoods to train stations and synchronization with the train schedule**

   - **What is being recommended?** Improving the ability to get by bus from residential neighborhoods to train stations.

- **How is this done?** There are residential neighborhoods in the Gush Dan area without connection and easy access via public transportation (buses) to Israel Railways stations, which forces them to rely on private cars. This policy includes adding new bus lines from isolated neighborhoods/towns to train stations, and increasing the frequency of the already existing bus lines.
- **What are the advantages?** Improving road safety: reducing traffic hazards and improving road safety. Accessibility and equality: connecting residential areas that are disconnected from the rest of the public transportation system and increasing the general satisfaction of the residents and the ability to use and rely on the public transportation system. The quality of the environment: improvement of the quality of the environment due to a transition from using private vehicles to traveling by train to using buses.

7. **Acceleration of the bike lane project**

   - **What is being recommended?** Creating a network of more continuous, wide, separated from other traffic and green bicycle paths, connecting between (and within) Gush Dan cities and improving the cycling experience.
   - **How is this done?** The bicycle path network project in Gush Dan will connect between (and within) the cities of Gush Dan, with an emphasis on the connectivity of the bicycle network to employment centers, main public institutions, leisure and recreation centers and transportation centers. There will be safer separation between pedestrian riders and vehicles. The experience of riding on bicycle paths will be improved by adding places to sit and refresh, planting trees or adding shade to the paths.
   - **What are the advantages?** Road safety: there will be a safer separation between cyclists, pedestrians and vehicles, and thus the safety of cyclists and pedestrians will increase significantly. A cheap and healthy mobility alternative: cycling is a cheap, fast and healthy way to get around. Less noise and air pollution: cycling is a quiet and environmentally friendly way to get around.

8. **Improving the pedestrian experience within cities**

   - **What is being recommended?** Upgrading sidewalks and improving the pedestrian experience within cities.
   - **How is this done?** Widening sidewalks while reducing parking spaces, adding shade by planting trees, adding pleasant seating.
   - **What are the advantages?** Improving access to public transportation: because walking is a complementary means of public transportation, and the experience of getting to the station is part of it. Therefore, upgrading the sidewalks can also improve the overall travel time by public transportation. Safety and health in the public space: wide and guarded sidewalks provide a pleasant space for walking even during rush hours, and prevent injuries resulting from unmaintained sidewalks. Economy and society: on streets where many people walk, urban commerce, social interaction and community activities improve, which improve the public space and the urban economy.

9. **Acceleration of the metro project**

   - **What is being recommended?** Speed up the metro project (high-speed subway), and shorten the schedule for completing the project.
   - **How is this done?** The metro network in metropolitan Tel Aviv is a network of subways, which is designed to expand the service deployment of the mass transit network to Kfar Saba and Ra'anana in the north, Petah Tikva in the east, and Lod and Rehovot in the south.
   - **What are the advantages?** Significant improvement in accessibility and speed: the metro will serve 60% of the population of Gush Dan and the surrounding area, and will allow reaching Tel Aviv-Jaffa in a maximum of 45 minutes. Reduction in air pollution and noise: the metro is completely underground, so it will reduce air pollution and noise. More efficient use of the urban space: better utilization of the land and savings on parking will be possible

Accessibility to the suburbs: the metro connects the suburbs to the centers of activity and Tel Aviv-Yafo. A significant reduction in traffic jams: the Gush Dan Metro will increase the capacity of the transportation system, significantly improve accessibility and transportation mobility, and significantly ease traffic congestion.

10. **Acceleration of the light rail project**

    - **What is being recommended?** Speed up the completion of the light rail project (three lines) expected to operate in Gush Dan.
    - **How is this done?** The light rail network is expected to connect the cities of Ramat Gan, Givatayim, Herzliya, Petah Tikva, Givat Shmuel, Kiryat Ono, Yehud-Monson, Or Yehuda, Bnei Brak, Bat Yam, Holon and Rishon Lezion to Tel Aviv - Jaffa. Multiple delays have pushed the expected year for the completion of the three lines (currently expected to end at 2028) and effort can be taken to avoid further delays.
    - **What are the advantages?** Speed improvement: high travel speed and accuracy in times. Large capacity: about 450 passengers will be able to travel on each train. High frequency: a maximum frequency of 3 minutes in the underground parts during rush hours. The quality of the environment: improving the quality of the environment in light of the transition to electric transportation. Less noise: The light rail is a significantly quieter means of transportation compared to buses, as it is almost always powered by electricity, while buses are usually powered by an internal combustion engine. Vehicle safety: light rail integrates into a public pedestrian walkway, and is therefore more comfortable for pedestrians and puts them at less risk.

4.4. Step 4: Estimating Budget Constraint

In order to simulate the choice the Israeli Transport Ministry has to face, participants were given a constraint for selecting projects: a budget. Therefore, for this PVE, costs were estimated for each policy, and converted into percentages based on a fictive budget to help minimize the amount of policies participants can choose (table 4.4).

Table 4.4: Budget calculations for each policy

Policy	Cost [million ILS]	Percentage of Budget [%]	Source
Better connected public transport dedicated road network within and between cities	50	20%	Budget Key (2023b)
Increase of Saturday shuttle service from suburbs to TLV and within TLV	40	16%	Liberman (2021)
Improvement of accessibility of the street and bus stations to the physically disadvantaged community	10	4%	Budget Key (2023e)
Promoting technological infrastructure for smart transportation	20	8%	Budget Key (2023f)
Acceleration of the bike lane project	50	20%	Budget Key (2023d)
Improving the pedestrian experience within cities	30	12%	Kinan et al. (2018)
Acceleration of the metro project	150	60%	Budget Key (2023c)
Acceleration of the light rail project	80	32%	Budget Key (2023a)
Addition of direct bus lines to employment centers	50	20%	Kinan et al. (2018)
Increasing frequency and expanding bus service from residential neighborhoods to train stations and synchronization with the train schedule	60	24%	Kinan et al. (2018)
Total Cost	***540***		
Fictive Budget to constraint respondents	***250***		

In current Israeli transport project funding, the municipalities have the power to make decisions regarding where and how to implement policies in the region, but the government determines the funding for different types of transport policies and infrastructure projects. Hence, costs were estimated from a governmental funding perspective. Of course, such projects also have financial contributions from

other parties, however those were not considered in this PVE. The majority of the costs were estimated by using a open-data database where all past government expenditures and fundings are recorded [1]. Using this information from recent-year funding, the approximate governmental funding for most policies could be inferred. For the few policies that had no record of government funding (or due to the fact that they were never approved by the government), costs were estimated using other local-Israeli reports. The estimated costs were then converted to percentages of a fictive budget. The PVE design choice to show costs as percentages was made, since the costs are not exact and are estimated based on past various expenditures. The focus here is on the relative costs of different policies, since the budget used in this study is fictive and aims to challenge individuals to choose not all policies they would want to implement, but only those they most would prefer.

An important clarification to be made here, is that for the policies that aim to accelerate new large scale projects (light rail, metro, bike lane network), the total cost of implementing said projects was not taken into account (as it is also funded by multiple sources), but rather the budgets/costs the government has been investing (or intends to invest) in order to speed up the process of pushing forward said projects. This was decided since all three major projects are already in progress, but the progress is very slow, and requires speeding up. Therefore, we would like to know whether the public wishes to speed up those projects further and would have them completed sooner rather than later, and avoid delays currently being faced (as seen in the light rail project, which has been delayed multiple times).

4.5. Step 5: Estimating Effects

In the analysis of the potential for public participation in the Israeli transport context (chapter 3), one of the main conclusions was that the public acceptability of public transport policies to improve the state of public transport is especially low when they come directly at the expense of private car parking/lanes. A bottom-up process of reducing objections (and increasing understanding) to such ”negatively perceived” impacts on available car infrastructure may be helpful. Therefore, in order to (potentially) increase public support for policies that negatively impact available car-infrastructure, a PVE could also be used as an educative tool to show participants that often times policies that improve substantially public transport, must come at the expense of car infrastructure. The idea here, is that respondents are shown the (often times) trade-off policy-makers in Israel must make between improving *substantially* the average travel time and reliability of public transport in the region, and reducing car infrastructure citizens currently rely on. Therefore, in the PVE it was decided to compare the policies by including three main impacts:

- Reduction in available public car parking and roads
- Travel time improvement (reduction)
- Public transport reliability improvement

Furthermore, since exact information regarding the above three impacts could not be directly found publicly or provided by policy-makers as in other PVE case studies, it was considered to be best given the circumstances, to provide *categorical* information on the effects of each policies, in order to avoid misleading the public and to simply compare the *relative* impacts of each policies to the rest. The categorical impacts were estimated by conducting a group interview with three Israeli transport policy experts (Israeli Public Transport Experts, 2023), who debated and agreed upon the categorical impacts [2], shown in table 4.5.

[1] ”Key to the budget” מפתח התקציב https://next.obudget.org/

[2] It is important to emphasize that the experts claimed these are based on their knowledge of predictions on the *current* plans and expectations of each policy and project. In addition, it is important to emphasize that ideally, more experts would have been consulted in order to validate even further these estimations, however due to the time constraint of conducting a thesis, a single group interview was found sufficient for the purposes of this thesis.

Table 4.5: Categorical impacts of each policy. Effects are evaluated on a categorical scale of between 0 (no impact) and 5 (highest impact)

Policy	Reduction in available public car parking & roads	Travel time improvement	Reliability improvement
Better connected public transport dedicated road network within and between cities	5	4	4
Increase of Saturday shuttle service from suburbs to TLV and within TLV	0	0	1
Improvement of accessibility of the street and bus stations to the physically disadvantaged community	2	1	1
Promoting technological infrastructure for smart transportation	0	3	2
Acceleration of the bike lane project	3	2	4
Improving the pedestrian experience within cities	2	1	0
Acceleration of the metro project	0	5	5
Acceleration of the light rail project	4	4	5
Addition of direct bus lines to employment centers	0	3	2
Increasing frequency and expanding bus service from residential neighborhoods to train stations and synchronization with the train schedule	0	3	2

After estimating the impacts and including a version with all three impacts shown explicitly in the PVE, it was concluded that public transport reliability and travel time improvement are much too correlated for most policies (as shown by the similar quantitative impacts). Therefore it was decided there is need to only show it as travel time improvement in the final version of the PVE. With this stage, the choice task (which is the main part of the PVE consultation) was finalized, and is shown in figure 4.1. The core impacts (see table 4.5) are shown as icons to participants in order to increase the user-friendliness of the consultation and avoiding confusing respondents with numbers (figure 4.2). Other crucial advantages and impacts of each policy that could not be quantified or were not applicable for all policies were explained via text in the policy descriptions, shown in section 4.3.1.

Figure 4.1: Final design of Hebrew PVE choice task, with English explanations

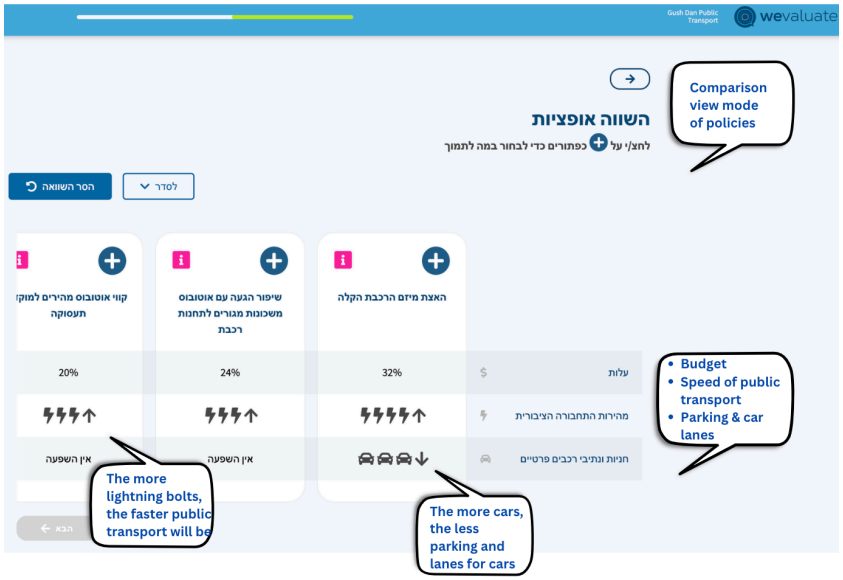


Figure 4.2: Final design of Hebrew PVE choice task, comparative view

4.6. Face-Validity Statements

As this research also aims to investigate how Israeli citizens evaluate the face validity of a PVE, questions on face validity must be added after the choice task. In order to be able to reflect on the face validity results of this thesis in comparison to other PVEs conducted in the Netherlands, the face-validity questions from a similar transport-related Dutch PVE would be best. The closest related dutch transport PVE was conducted in Amsterdam, but was found to be slightly outdated in terms of the face-validity statements it asked respondents. Therefore, based on a consultation with a face-validity PVE researcher, a set of more up-to-date face validity statements were also included based on recent PVEs. Though ideally more face validity statements would be included, this would overwhelm participants. First, it was statements were included that analyze respondents' *ability* to participate: readability, clarity and completeness. Second, statements were included to investigate respondents' *willingness* to participate: relevance, transparency, legitimacy and acceptance.

The face validity statements included in this PVE are shown below.

Face Validity Statements included in PVE

The following face validity statements were included in the PVE, where individuals had to rank each statement with a 5-point Likert scale (strongly agree, agree, neutral, disagree, strongly disagree):

- (Readability & Clarity) I understood the task I was asked to complete.
- *(Completeness)* I received sufficient information for me to make choices.
- *(Relevance)* I think improving public transport is an important topic to give my opinion on.
- *(Transparency & legitimacy)* I trust that this research is honest.
- *(Transparency & legitimacy)* The research was objective and did not steer my choices in a certain direction.
- *(Acceptance)*: I think this is a good method to include citizens in decision-making processes.
- *(Acceptance)* I was convinced of my choices.

4.7. Socio-Demographic Characteristics

As with every PVE consultation, it is beneficial to collect socio-demographic characteristics on the participants. This is helpful to analyze the representatives of the sample as well as useful when conducting analyses on the potential relationships between socio-demographic characteristics and transport preferences. The following characteristics were deemed important to identify:

1. **What is your public transportation profile?** *Adult (no special profile), Soldier, Student, Elderly, Disabled, Other, I don't know/Rather not say.*
2. **What is your gender?** *Male, Female, Other, Rather not say*.
3. **Do you have children?** *Yes, No, Rather not say*.
4. **What is your level of education?** *High school diploma, Higher Education, None, Other, Rather not say.*
5. **Place of work/study is the same as my place of residence** *Yes, No, I don't know/Rather not say*
6. **What is your current financial status?** *I have more than enough money every month, I have enough money every month, I barely have enough money every month, I run out of money every month, Rather not say*.
7. **What is your main mode of transport on Saturday?** *Car, Bike/Scooter, Taxi, Saturday bus service, I do not travel on Saturday for religious/other reasons, I have no way to travel on Saturday*

4.8. Public Opinion on Reduction of Car Infrastructure

As discussed throughout this research, the SWOT analysis conducted prior to designing this PVE (figure 3.1) concluded that some public transport projects are delayed partly due to fear of public outrage due to necessary reduction of private car infrastructure which many commuters rely on currently daily. Therefore, this PVE consultation also asked respondents whether or not they would support reducing private car infrastructure in order to improve public transportation in the region. In addition to a reply (yes/no/maybe), respondents were encouraged to motivate their reasoning (see appendix, figure B.7).

5

(Q1.3) Tel Aviv Transport Project & Impact Preferences

This chapter presents the results of the PVE consultation. Firstly, we describe the demographic characteristics of the panel, including age, education, etc. Secondly, we examine the policy and impact preferences of the respondents using descriptive statistics and a content analysis, encompassing both quantitative and qualitative responses. Lastly, we analyze public opinion regarding the willingness to give up car infrastructure in favor of public transport improvements.

5.1. Sample Characteristics & Representativeness

Information was gathered on the socio-demographic characteristics of the respondents in the PVE (tables 5.2, 5.1). A Chi-Square test is conducted for gender and education, in order to evaluate whether the sample is representative of the Tel-Aviv Metropolitan population. As shown in table 5.1, the sample was found representative of age, but a discrepancy was found for level of education. Specifically, educated individuals are over-representative in the sample. In order to improve the representativeness of this consultation, a re-weighting should be carried out. The answers of participants from the under-represented group are then assigned a higher weighting factor than the answers of participants from over-represented groups. In order to perform a re-weighting on the characteristics of level of education, the rule of thumb based on past consultations is that at least 30 respondents are needed for each composite category (e.g. "no formal education"). If there are fewer than 30 respondents for composite categories, the standard deviation of the re-weighting increases rapidly. Meaning, statements can be made with little certainty about the representativeness of the sample. However, in this consultation, not all categories had the minimum amount and therefore the results cannot be generalized as representative for education levels in the population.

Table 5.1: Chi-square tests for gender and education level, taking $\alpha = 0.05$ and $N = 269$. Some of the respondents answered "Rather not say" to these questions, therefore the percentages do not add up to 100%. Information on the Tel Aviv metropolitan for expected gender was taken from City Population (2019), and for expected education level from The Center for Economic and Social Research (2022)

Chi-Square Test (Gender)	**Sample**	**Expected (Tel Aviv Metropolitan)**	**P Value**
Men	48%	49%	0,886403006
Women	51%	51%	
Chi-Square Test (Education Level)	**Sample**	**Expected (Tel Aviv Metropolitan)**	**P Value**
High (1st/2nd degree and higher)	48%	39%	0,003842188
Bagrut/High-school diploma	37%	30%	
Other	12%	18%	
No formal education	3%	13%	

Table 5.2: Socio-demographic characteristics of the panel respondents, $N = 269$.

	# Respondents	**% Panel**
Public Transport Profile		
Adult (No special profile)	176	66%
Senior citizen	23	9%
Soldier	6	2%
Student	41	15%
Disabled	9	3%
Other	9	3%
Rather not say	5	2%
Have children		
Yes (Has children)	150	56%
No (No children)	113	42%
Rather not say	6	2%
Work and live in the same city		
Yes	118	44%
No	122	46%
Other	18	7%
Rather not say	11	4%

	# Respondents	**% Panel**
Mobility on Saturday		
Private Car	156	58%
Free Saturday shuttles	18	7%
Bike/Scooter	13	5%
Taxis	8	3%
Do not commute for religious reasons	58	22%
I do not have a way to commute on Saturday	10	4%
Rather not say	6	2%
Financial status		
More than enough money each month	21	8%
Enough money each month	117	44%
Barely have enough money each month	62	23%
Run out of money each month	33	12%
Rather not say	36	13%

5.2. Policy & Impact Preferences

In this section, Q1.3 will be answered: the policy preferences of respondents and impacts they found important will be discussed. In addition, the insights from the content analysis on the motivation behind choosing each policy is reported, in order to provide a deeper understanding not only which policies were preferred, but also *why*.

5.2.1. Policy Preferences & Qualitative Motivations

First, one can reflect on the amount of policies respondents chose in this consultation. There was no minimum amount of policies respondents had to select, however because the total cost of all policies

was over the allowed 100% budget (see constraint in table 4.4), it was not possible to choose all ten projects. Table 5.3 presents the number of projects selected by the respondents and shows that most respondents selected between 2-3 projects. Furthermore, when looking into how the budget was spent amongst respondents (Table 5.4), it is apparent that about half (49%) of respondents chose to spend almost the entire or the entire budget (over 92% of the budget), while 35% of respondents spent between 52%-88% of the budget. Finally, 16% of respondents chose to spend less than 48% of the budget. To conclude, we see that many respondents preferred fewer more expensive policies, rather than more but cheaper policies. In fact, the three most expensive policies were in the top four most selected policies (see table 5.5).

Table 5.3: Number of projects selected by respondents, $N = 269$.

Number of projects selected	Number of respondents
0	0 (0%)
1	31 (12%)
2	56 (21%)
3	76 (28%)
4	42 (16%)
5	47 (17%)
6	16 (6%)
7	1 (0%)

Table 5.4: Budget spent distribution. Note that some combinations did not allow respondents to spend exactly 100 percent of the budget.

Budget Spent	# Respondents	% Respondents
4% - 16%	11 (4%)	16%
20% - 32%	23 (9%)	
36% - 48%	10 (4%)	
52% - 60%	32 (12%)	35%
64% - 80%	32 (12%)	
84% - 88%	30 (11%)	
92% - 96%	59 (22%)	49%
100%	72 (27%)	

Next, to provides insight into which projects were more popular than others, descriptive results have been applied. Figure 5.1 shows the popularity of each policy, as the percentage of respondents that voted for each policy. All policies were chosen by at least 20% of respondents. A majority of respondents (61%) voted to accelerate the ongoing light rail project, while 41% wish to improve the bus connection from residential neighborhoods to train stations. The two least popular policies to improve public transport in the region were found to be improving the pedestrian experience in cities (21%) and the bike lane network project (20%).

Table 5.5: Projects according to popularity rank, and their corresponding characteristics. Quantitative impacts are shown as: *Small [0-1], Medium [2-3], Large [4-5]*

Project	Rank [based on # chosen]	Cost [% Budget]	Travel mode	Travel time improvement [Small/Medium/Large]	Car infrastructure reduction [Small/Medium/Large]
Accelerate the light rail project	1	32%	Light Rail	Large	Large
Improve bus service from residential neighborhoods to train stations	2	24%	System Connectivity	Medium	Small
Direct bus lines to employment centers	3	20%	Bus	Medium	Small
Accelerate metro project	4	60%	Metro	Large	Small
Promoting technological infrastructure for smart transportation	5	8%	Smart transport	Medium	Small
Increase of Saturday shuttle service from suburbs to TLV and within TLV	6	16%	Shabbat Transport	Small	Small
Improvement of accessibility of buses and stations to the physically disadvantaged community	7	4%	Bus	Small	Medium
Better connected public transport dedicated road network	8	20%	Bus	Large	Large
Improve pedestrian experience within cities	9	12%	Walking	Small	Medium
Acceleration of the bike lane network project	10	20%	Bike/Scooter	Medium	Medium

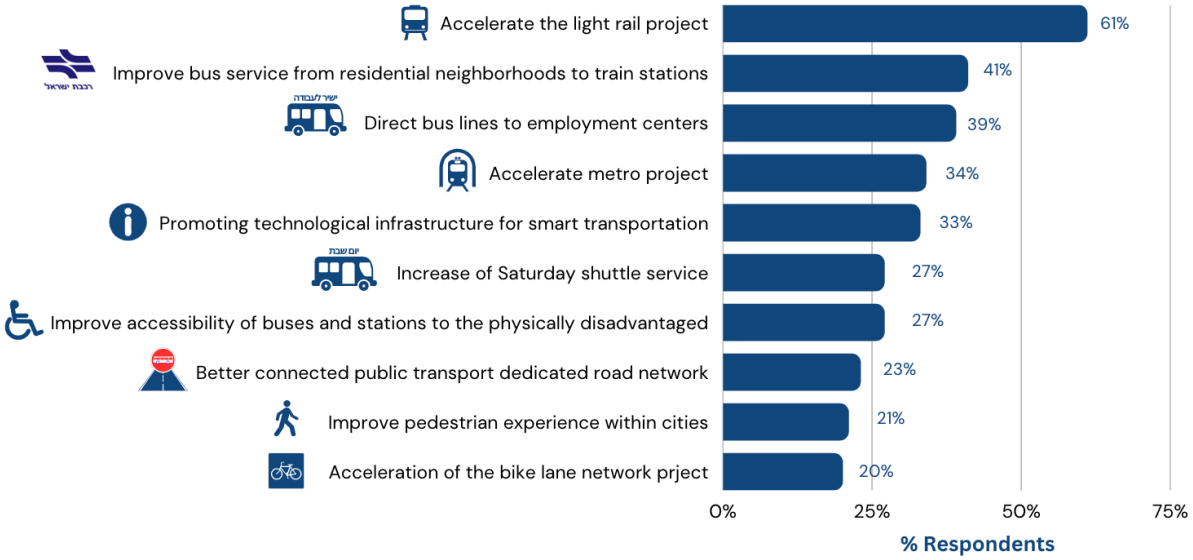


Figure 5.1: Percentage of respondents which selected the different public transport projects, in order of popularity (from most to least popular), $N = 269$.

To conclude, the public's top five preferences for public transport policies: Accelerate the light rail project (61%), Improve bus service from residential neighborhoods to train stations (41%), Direct bus lines to employment centers (39%), Accelerate metro project (34%) and Promoting technological infrastructure for smart transportation (33%). These projects are (expensive) projects with medium-large improvement impacts on travel time, and small reduction of car infrastructure - with the exception of the light rail project, which has a large impact on car infrastructure reduction. These popular policies seem to be surrounding travel modes that are not operational (yet) in the region: metro and light rail (mass transit), or buses, or improving the existing PT system connectivity (between buses and trains). After the popular policies and their main characteristics were identified, the qualitative motivations behind the selection was analyzed, in order to provide policy-makers with a deeper understanding of the public's needs and reasoning for choosing said projects.

5.2.2. Qualitative Motivations for Each Project

The qualitative motivations behind selecting each policies are analyzed in this section. While the impacts that were important to respondents during the choice task was asked directly (results shown in the next section), the motivations were analyzed in order to identify the reasoning behind the support for each policy, which also provides insight into the impacts that respondents valued per policy. All qualitative motivations (716 in total) for selecting policies were read and categorized into similar reasoning, where 23 different popular categories were identified overall for all ten policies. The full overview of qualitative motivations for each policy is shown in appendix table E.1. In this section, only the motivations per policy that were given by at least 10% of the responses are shown (most popular motivations per policy, with 16 popular categories corresponding to this restriction).

The motivations behind choosing the most popular projects is first looked into: accelerating the light rail project, the metro project, improving bus services from residential neighborhoods to train stations, direct bus lines to employment centers and promoting smart technological infrastructure. A common denominator for selecting these projects according to respondents was their substantial improvement of travel time, and their high potential to attract the most amount of current car users to rely on public transport instead. Other popular motivations for choosing the high ranked projects were their improvement of public transport network connectivity, capacity and connectivity to large industrial areas.

In contrast, when looking into the motivations behind the two least popular projects: improving the pedestrian experience in cities and the bike lane network project, different motivations were apparent. Similarly to the popular projects, respondents who chose biking and walking policies believe these policies would also have a high potential to attract the a large amount of current car users to rely on public transport instead. In contrast to any other policy in the list, respondents preferred these projects

due to their positive impacts on public health and the environment and safety.

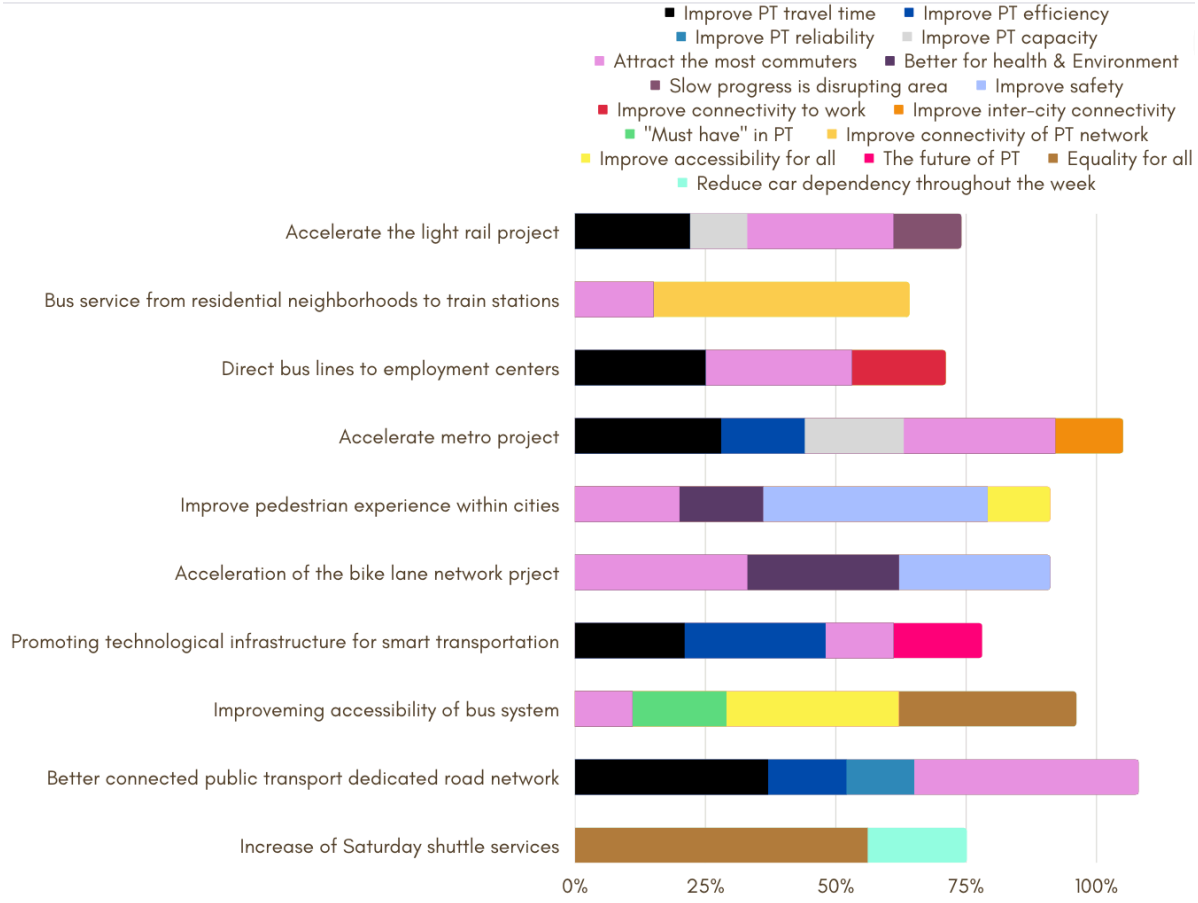


Figure 5.2: Overview of the most popular qualitative motivations for each policy (out of 716 motivations in total). Note the % do not necessarily add up to 100% as many respondents motivated their chose with multiple categories.

To conclude, based on the qualitative motivations it can be inferred that public health, safety and sustainability are values which are currently less urgent for the public when improving the public transport system. Rather, the public would like to see a stronger focus on improving travel time, capacity and connectivity of the public transport network.

5.2.3. Impact Preferences

Besides the qualitative motivations, after the choice task respondents were asked which factors (shown in the choice task) were important when making their decision and how much, summarized in table 5.6 and figure 5.3. The first apparent observation is the impact of travel time improvement exhibits a left-skewed distribution, meaning most respondents indicated travel time improvement had a large (43%) or very large (29%) impact on their decisions. Secondly, the impact of car infrastructure reduction exhibits an almost symmetrical normal distribution, where most respondents indicated this factor had a medium (29%) or large (22%) impact on their choices. Moreover, when evaluating the impact of cost, it seems to exhibit a (non-symmetric) bimodal distribution, where most respondents either indicated cost had a medium impact (31%) or no impact (25%) on their decisions. Additional bar charts of the remaining impacts can be found in appendix E.1. Furthermore, we see that the quantitative results in this analysis are in line with the quantitative results shown in the previous section. For the top five selected policies, a popular qualitative motivation for choosing those projects was indeed always - improving travel time. In contrast, impacts such as environment benefits were found popular qualitative motivations for the least popular selected projects (bike lane network, improving walking experience - both which have smaller impacts on travel time).

Table 5.6: Answers of respondents to how much each impact in the choice task impacted their decision, $N = 269$.

	No Impact	Small Impact	Medium Impact	Large Impact	Very Large Impact
Cost	66 (25%)	50 (19%)	84 (31%)	47 (17%)	22 (8%)
Travel Time Improvement	7 (3%)	15 (6%)	52 (19%)	117 (43%)	78 (29%)
Car Infrastructure reduction	40 (15%)	52 (19%)	77 (29%)	60 (22%)	40 (15%)
Improvement of Air quality	53 (20%)	39 (14%)	63 (23%)	63 (23%)	51 (19%)
Noise Reduction	64 (24%)	59 (22%)	49 (18%)	59 (22%)	38 (14%)

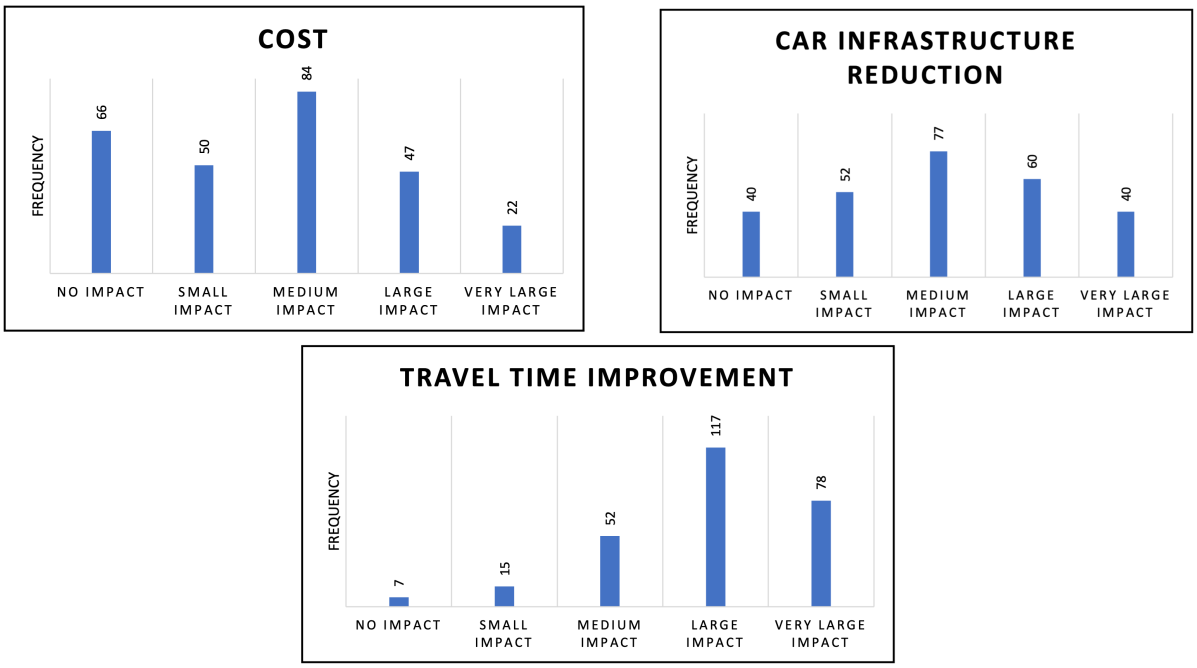


Figure 5.3: Bar charts of impacts, $N = 269$.

To conclude, it is highly apparent both from the qualitative motivations analyzed in the previous section and the impacts directly ranked by respondents here, that improving the travel time with public transport is crucial for almost all respondents, while cost was not found to be the make-or-break factor when selecting policies. The impact of car infrastructure reduction was found to vary highly amongst respondents. Therefore a deeper dive was conducted in the next section to better understand what exactly the public thinks of reducing car infrastructure in favor of public transport improvement. This was done since as established earlier in chapter 3 of this research, fear of public backlash is a major reason for delays and ill-cooperation with public transport infrastructure developments.

5.3. Reduction of Car Infrastructure in Favor of Public Transport

Furthermore, respondents were also asked whether or not they would support reduction of car infrastructure to substantially improve public transport in the region. This was asked, as the findings in the SWOT analysis (summarized in figure 3.1) conducted in this research revealed how many municipalities are unwilling to cooperate with larger public transport improvement plans in the region especially when said plans are at the expense of existing car lanes and parking in their city. When consulting the panel (see figure 5.4), it was found that half of the respondents would support such actions and answered ”Yes” (50%), 24% might support them and answered ”Maybe”, and the remaining 26% answered ”No” and would not support such decisions. Respondents were also asked to motivated their response if they wish. A total of 102 responses were analyzed via a content analysis which categorized the responses into popular groups. Among respondents that support reducing car infrastructure in favor of public transport improvement, the most popular motivation (60% of ’Yes’ respondents alone) was the belief that better public transport would reduce congestion in the long run as well (win-win situation). In addition, other motivations included the belief that public transport is the future of mobility and will increase overall safety and air quality. Among responses that were against such decisions (’no’

respondents) the two popular arguments were firstly, fear that such actions could potentially worsen the already existing parking crisis in the country. Secondly, fear that such decisions discriminate against those dependent on private car-use regardless of public transport improvement (disabled, families with children and strollers, elderly etc.). Finally, among the respondents that replied 'maybe', the responses were more diverse. Many motivated their response by stating that private cars are more convenient and offer quality of life. Others were sceptical that public transport will improve enough to allow them to stop relying on their cars, hence the fear of reducing infrastructure. Some respondents also believed the two are not mutually exclusive, and that one can improve public transport with minimal impact on car infrastructure (such as: metro, underground car parking etc.). The full list of motivation categories identified per answer is shown in figure 5.4.

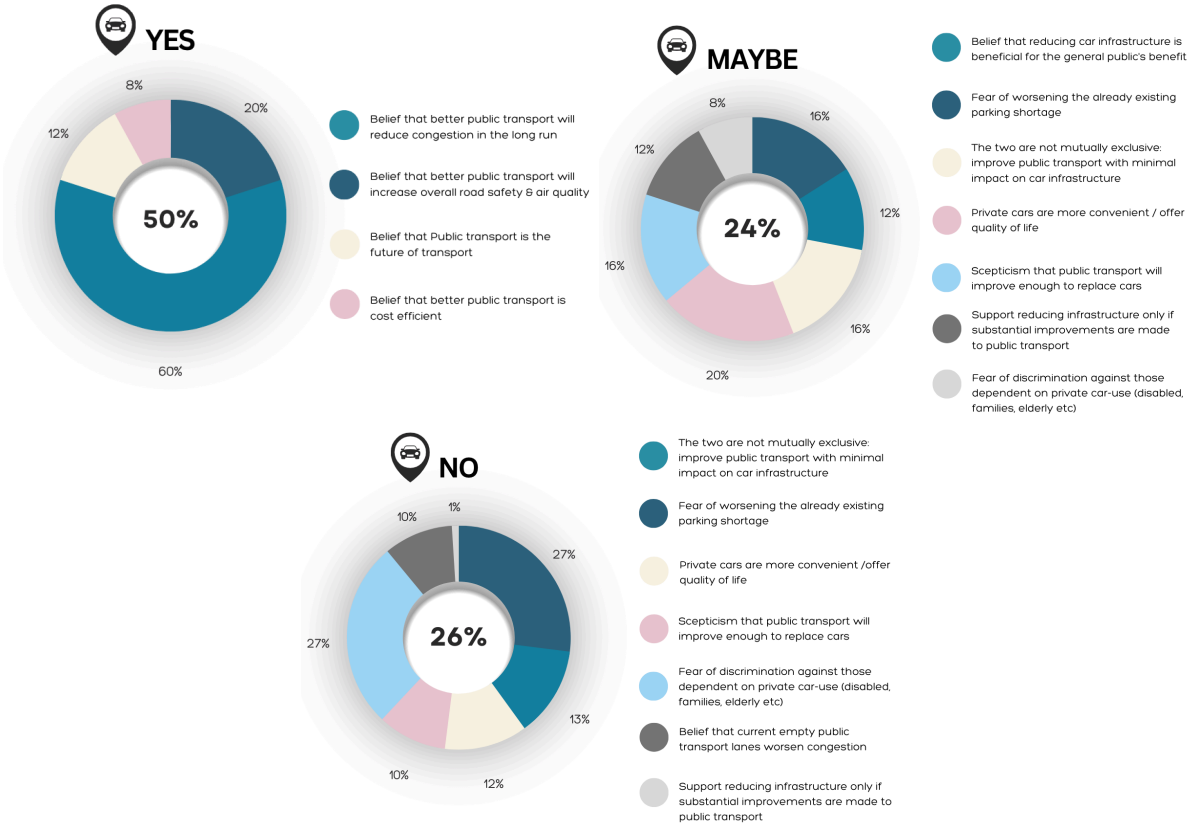


Figure 5.4: Content analysis of 102 motivations to the question: Would you support reduction of car infrastructure in favour of public transport improvement? Few smaller categories were left out.

6

(Q1.4) Preference Clusters in Project Choice

In this chapter, we present the LCCA results, addressing question Q1.4. The LCCA was conducted for the selected projects to investigate whether respondents with similar characteristics preferred similar groups of projects. A cluster model was estimated, consisting of 10 indicators corresponding to the 10 projects presented in the choice task. The socio-demographic characteristics obtained from the PVE were used as covariates in the LCCA.

6.1. Model Estimation

First, the optimal number of clusters is determined. To determine local model fit, the bivariate residuals (BVRs) must be below 3.84 and to determine global model fit, the Bayesian information criterion (BIC) will be used, which weighs both model fit and parsimony, and smallest value represents the optimal model. An estimation was conducted for 1-6 cluster models, and the corresponding results are shown in table 6.1. The table shows how according to the BIC criteria, a model with 3 clusters would be optimal, as its' BIC value is the smallest. However, when taking into consideration BVRs criteria, a 4-cluster model had less substantial BVRs. Since the 4-cluster model's BIC is not much larger than the 3-cluster model, 4 clusters was chosen as the optimal number of clusters.

Table 6.1: Model estimation, where BIC and BVR are criteria to determine the optimal number of clusters for the analysis

Number of Clusters	BIC (LL)	#BVRS>3.84	Max BVR
1	3275	23	44
2	3170	11	18
3	3127	6	11
4	3138	2	9
5	3171	1	3.96
6	3209	0	2.7

6.2. Identified Clusters & Significant Characteristics

After the correct number of clusters were found, the Wald test and corresponding p-values were checked to all be under 0.05, meaning all 10 indicators (projects) are significant, as shown in table 6.2. Consequently, the model covers for heterogeneity between clusters for all indicators. If all respondents of a cluster selected a project, the presented value in table 6.2 is 1, and if none of the respondents of a cluster selected a project, the the presented value is 0.

Table 6.2: Cluster profiles project choice (% divided by 100) and statistical Wald test and P-values. Cells >0.50 are marked green. Cells high compared to the loading's of other projects in the cluster are marked grey (> 0.4), and cells >0.9 are marked dark green.

	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Wald Test	P-Value
Cluster Size	0.4236	0.2745	0.1836	0.1183		
Project						
Accelerate the light rail project	0.9957	0.0037	0.9574	0.1449	24.96	1.6e-5
Improve bus service from residential neighborhoods to train stations	0.6238	0.2191	0.0022	0.6918	31.65	6.2e-7
Direct bus lines to employment centers	0.5092	0.3556	0.0023	0.6279	9.60	0.022
Accelerate metro project	0.0008	0.6112	0.9526	0.0030	14.21	0.0026
Improve pedestrian experience within cities	0.1740	0.2372	0.0011	0.5909	16.15	0.0011
Acceleration of the bike lane network project	0.1991	0.1432	0.0010	0.6563	21.52	8.2e-5
Promoting technological infrastructure for smart transportation	0.2664	0.3228	0.4688	0.3767	5.9	0.012
Improvement of accessibility of buses and stations to the physically disadvantaged community	0.3022	0.2523	0.1030	0.4436	10.34	0.016
Better connected public transport dedicated road network	0.2790	0.1437	0.0012	0.5896	16.06	0.0011
Increase of Saturday shuttle service from suburbs to TLV and within TLV	0.2831	0.2979	0.0015	0.5949	9.59	0.022

The covariates included in this LCCA were all the socio-demographic characteristics collected by respondents: public transport profile, gender, whether they have children, education level, whether their place of work and residence is the same, financial status, preferred mode of transport on Saturday (indirect way of asking for religious status). All covariates were included in the model to predict class membership, and one of the main advantages of an LCCA is that it can control for correlations among these covariates. Consequently, the model shows to what extent the covariates predict class membership and which covariate dominates. Table 6.3 presents the significance of each covariate. It was found that the only covariate which significantly predicts class membership is whether respondents live and work in the same city or not (only covariate with a p-value less than 0.05). Table 6.4 presents the profile distributions of this significant covariate, which will be used for cluster interpretations. Appendix table F.1 shows the profile distribution of the rest of the insignificant profiles. Since the rest of the covariates are not significant, they are related to other covariates and were not found to *directly* affect project preferences.

Table 6.3: Wald test of covariates significance

Covariates	Wald Test	P-value
Public transport profile	15.1964	0.65
Gender	2.1002	0.91
Have Children	3.8661	0.69
Education Level	8.1672	0.77
Work and live in the same city	20.3025	0.016
Financial Status	13.4767	0.34
Mobility on Saturday	12.7919	0.8

Table 6.4: Cluster profile distribution for the significant covariate (percentages divided by 100). Significant loading's (>0.5) are highlighted in green.

	Cluster 1	Cluster 2	Cluster 3	Cluster 4
Work and live in the same city				
No	0.3960	0.3977	0.7290	0.2797
Other	0.0709	0.0292	0.1226	0.0858
Rather not answer	0.0269	0.0410	0.0000	0.0863
Yes	0.5062	0.5321	0.1484	0.5482

6.3. Cluster Interpretations

Each of the four clusters can be interpreted in terms of the projects selected by this group of respondents (shown in table 6.2), and what kind of individuals have a high probability of belonging to the cluster (which can be derived from the distribution of the covariates, shown in table 6.4).

Cluster 1: We Need Light rail & Better Connectivity (42%)

In the first cluster identified (size: 42%), respondents preferred finalizing the ongoing light-rail project, and two more bus related projects: improving the connectivity via bus to the train stations and adding direct bus lines to employment centers. People are more likely to belong to this cluster if they live and work in the same city. Moreover, this cluster preferred several mid-expensive projects (costs shown in table 5.5).

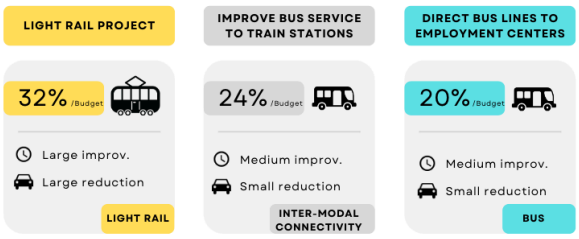


Figure 6.1: Cluster 1: Light rail & Buses, Work and live in the same city: Yes

Cluster 2: Metro is a Must (27%)

Individuals who belong to the second cluster identified (size: 27%) predominantly chose the metro project. This is the most expensive project in the choice task, which vastly improves travel time of the overall PT system, while not impacting car infrastructure. People in this cluster therefore preferred spending money on a single but very expensive project. Finally, people are more likely to belong to this cluster if they live and work in the same city. In addition to the metro project, this cluster is also likely to select additional cheaper projects like smart technology.

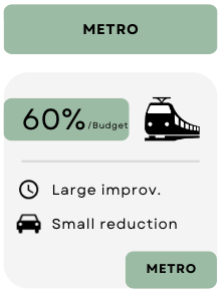


Figure 6.2: Cluster 2: Metro is a Must, Work and live in the same city: Yes

Cluster 3: The Long-distance Commuters (18 %)

Individuals who belong to the third cluster identified (size: 18%) predominantly chose the metro project as well as the light rail project. People in this cluster therefore preferred spending the budget on the two most expensive projects in the consultation, and preferred projects and modes of transport (mass transit) that are not operational (yet) in the region. Finally, people are more likely to belong to this cluster if they *do not* live and work in the same city.

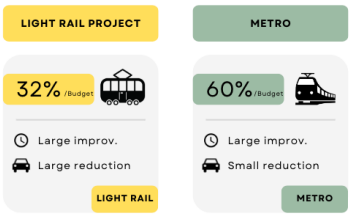


Figure 6.3: Cluster 3: New Modes of Transport, Work and live in the same city: No

Cluster 4: Improve What We Already Have (12%)

The fourth cluster is unique (size: 12%) as this is the only cluster that preferred spending the budget on many cheaper projects rather than few expensive projects. People in this cluster preferred spending the budget on projects that improve the existing public transport services, and is comprised of respondents that live and work in the same city. For the buses in the region they recommended: improving the connectivity via bus to the train stations, adding direct bus lines to employment centers and creating a better connected public transport dedicated road network. This cluster was also the only cluster which supported both walking and cycling encouraging policies, and the addition of free public transport services on Saturday.

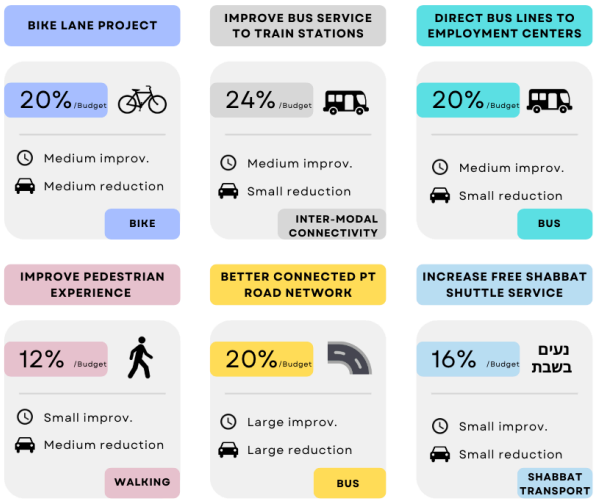


Figure 6.4: Cluster 4: Improve What We Already Have, Work and live in the same city: Yes

7

(Q2) Israeli Face Validity

In this chapter, we address research question 2. Firstly, we discuss the results of the Israeli PVE face validity experiment, providing answers to question Q2.1. Subsequently, we compare the results of the Tel Aviv PVE to similar case studies conducted in the Netherlands, addressing question Q2.2. Ultimately, a concise overview is furnished concerning the perspective of Israeli transportation and policy professionals regarding the validity of PVE within the Israeli context.

7.1. (Q2.1) Israeli Results

The last part of the consultation focused on evaluating the face validity of the PVE in the eyes of respondents, summarized in figure 7.1 and table 7.1. For each statement, most respondents chose the answer option Agree or Highly Agree. In fact, all statements were overwhelmingly answered Agree or Highly Agree by *at least* 80% of respondents. Moreover, the face validity statement that was ranked the highest was surrounding relevance: *'I think improving public transport is an important topic to give my opinion on'*. 69% of respondents responded they Highly Agree, while 24% Agree. In contrast, the face validity statement ranked lowest was surrounding completeness: *'I received sufficient information for me to make choices'*, where 14% responded Neutral and 5% Disagree. However, 80% of respondents evaluated also this statement with Agree or Highly Agree.

Table 7.1: Face validity results, $N = 269$. The average score is calculated via: Highly Disagree=1, Disagree=2, Neutral=3, Agree=4, Highly Agree=5

Face Validity Category	Statement	Highly Disagree	Disagree	Neutral	Agree	Highly Agree	*Average score*
Readability & Clarity	I understood the task I was asked to complete.	1 (0%)	4 (1%)	27 (10%)	114 (42%)	123 (46%)	4,32
Completeness	I received sufficient information for me to make choices.	2 (1%)	13 (5%)	39 (14%)	111 (41%)	104 (39%)	4,12
Acceptance	I was convinced of my choices.	3 (1%)	6 (2%)	28 (10%)	121 (45%)	111 (41%)	4,23
	I think this is a good method to include citizens in decision-making processes.	4 (1%)	12 (4%)	31 (12%)	103 (38%)	119 (44%)	4,19
Relevance	I think improving public transport is an important topic to give my opinion on.	2 (1%)	2 (1%)	14 (5%)	65 (24%)	186 (69%)	4,60
Transparency & Legitimacy	I trust that this research is honest.	3 (1%)	4 (1%)	43 (16%)	106 (39%)	113 (42%)	4,20
	The research was objective and did not steer my choices in a certain direction.	4 (1%)	8 (3%)	37 (14%)	106 (39%)	114 (42%)	4,18

7.2. (Q2.2) Comparison to Dutch Face Validity

Based on the results in section 7.1, the face validity results obtained in the first Israeli consultation were overwhelmingly high, in all categories, especially relevance. However, some sort of benchmark is necessary in order to indicate whether each category was evaluated relatively high or low by Israelis, in comparison to past dutch face validity evaluations.

The Amsterdam transport PVE is optimal as a benchmark for this PVE, since it is the closest resembling PVE in terms of both topic and style (allocation of a public budget, one meter, information on each transport policy, box selection style). However, since the PVE was conducted in 2017, the face validity questions were older and only included the following similar categories: acceptance, relevance. In order to compare the two PVEs, a Mann-Whitney U test is conducted, shown in table 7.2. This entails that it is tested, whether there is a significant difference in the scores that the respondents gave to the specific acceptance and relevance statements between both experiments. The Mann-Whitney U tests performed in table 7.2, and the resulting $p = 0$ values, indicate that there is a significant difference between the two case studies with regard to the assessment of both the acceptance and relevance categories. Meaning, in both categories the Tel Aviv experiment was ranked substantially higher than the Amsterdam experiment.

Table 7.2: Mann-Whitney U test comparing Tel Aviv and Amsterdam PVE face validity results for: Acceptance (I was convinced of my choices), Relevance (I think improving transport is an important topic to give my opinion on to the government).

	PVE Consultation	# Respondents	Average score	Mann-Whitney U	P-Value
Acceptance	Tel Aviv	269	4.23	510769	0
	Amsterdam	1768	4.19		
Relevance	Tel Aviv	269	4.60	572539	0
	Amsterdam	1998	4.08		

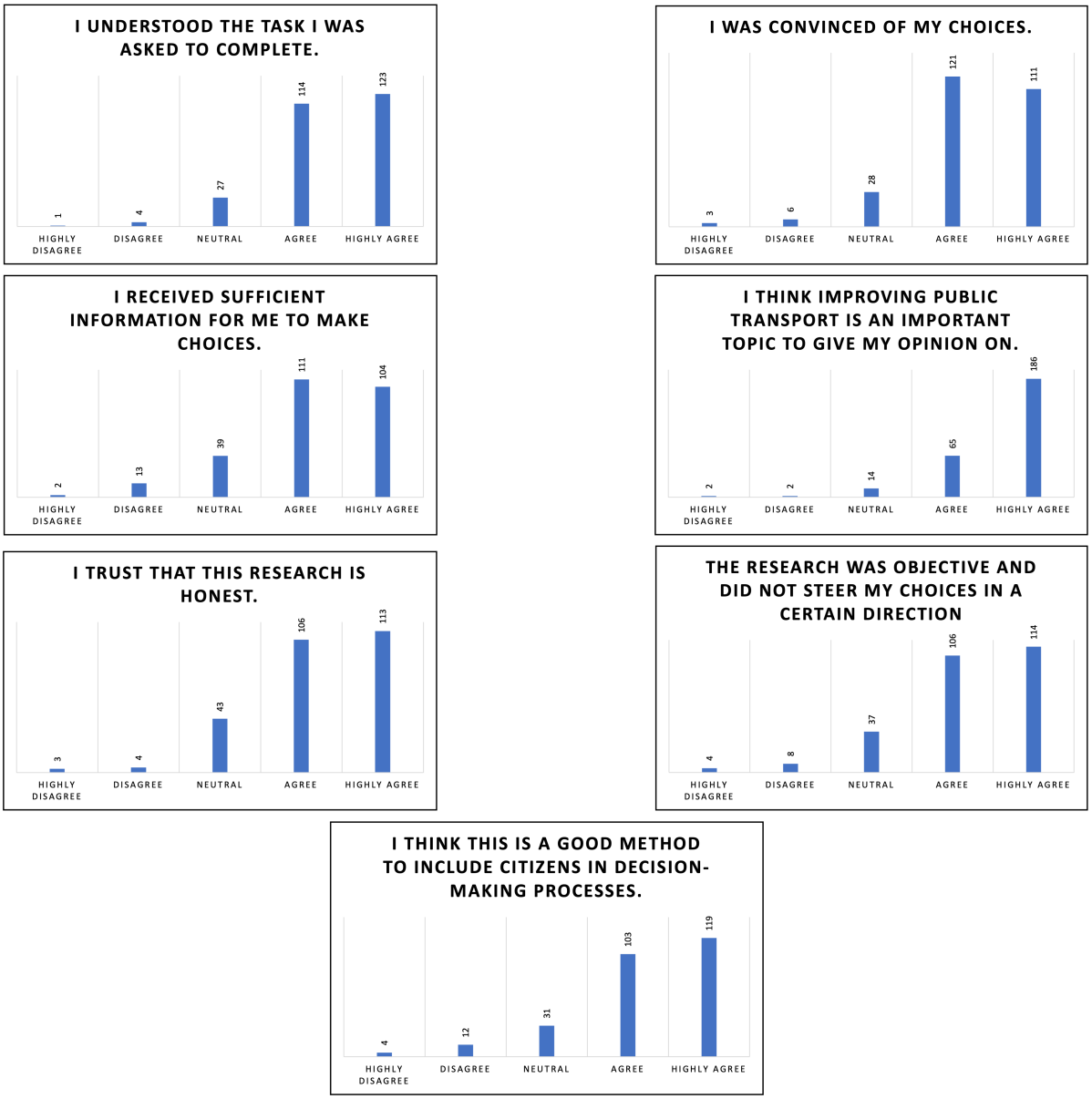


Figure 7.1: Face validity bar charts.

Moreover, besides comparing the Israeli face validity results to the comparable Dutch benchmark (the Amsterdam transport PVE), the face validity results of this PVE were also compared to other non-transport related PVEs conducted in the Netherlands, summarized in table 7.3. However, it should be noted that this comparison aims to place the results of the Israeli PVE in a wider context, and that the consultations are slightly different than the setup in this experiment, rendering this particular comparison not a fully accurate benchmark. Firstly, one can conclude that the Israeli PVE overall scores higher (or equivalently high) on all face validity categories. Secondly, while completeness was ranked the lowest out of the Israeli scores (though still high at 80%), interestingly, it can be observed that this statement is usually ranked lower than others also in other (Dutch) consultations. Thirdly, only one other recent PVE was found to check whether respondents felt the experiment steered them to certain choices - the Lelylijn 2023 consultation. While in this PVE 81% felt the research was objective and did not steer, in the Lelylijn consultation only 40% felt this way.

Table 7.3: Percentage of Participants who (Strongly) Agree with the above statements: How did the 2023 Tel Aviv Transport PVE compare to previous dutch consultations in other fields?

	Completeness: I think that this consultation provided me with sufficient information to make a choice	Acceptance: I am confident about my choices	Acceptance: I think this is a good method to include citizens in decision-making processes	Transparency & legitimacy: The research was objective and did not steer my choices in a certain direction	Transparency & legitimacy: I trust that this research is honest	Relevance: I think this is an important topic to give my opinion on	Readability: I understood the task I was asked to complete.
Tel Aviv Transport 2023	80%	86%	82%	81%	81%	93%	88%
RES Flevoland (closed)	37%	x	70%	x	x	x	x
Climate Consultation Gelderland	54%	x	78%	x	x	x	x
National Climate Consultation 2021	62%	78%	75%	x	x	x	x
Wind energy Amsterdam 2021	49%	53%	x	x	x	x	x
Heat transition Utrecht 2019	62%	74%	58%	x	x	x	x
Consultation Corona 2022 (exp 1)	67%	81%	73%	x	x	x	x
Energy Consultation June 2023 (closed)	42%	78%	75%	x	x	x	x
Lelylijn 2023 (closed)	x	x	83%	40%	78%	74%	x
Schiphol 2022 (closed)	54%	x	68%	x	x	x	72%

7.3. PVE Validity & Relevance - Israeli Expert Opinion

The outcomes of the PVE undertaken in chapters 5, 6, and 7 were conveyed to the interviewed cohort of Israeli experts in transportation and public policy through an executive summary presented in slide deck format. Subsequently, these experts were solicited for their assessments concerning the efficacy of the aforementioned results, as well as the relevance and validity of conducting PVE endeavors within the unique context of Israel. The following insights were concluded based on their remarks.

PVE emerges as a **pragmatic avenue** for experts to discern public priorities. In the Israeli context, the confluence of limited space, constrained resources, and a diverse society underscores the need for judicious policy decisions. Central inquiries encompass the identification of vested stakeholders, their motivations, and their preferences for specific policies and projects. Furthermore, the Israeli public's conceptualization of a pivotal project portfolio capable of reshaping transportation norms assumes significance. The **compelling attributes** of PVE — its wide outreach, expeditious completion within a concise time-frame of under 15 minutes, and superior insights compared to conventional online surveys—constitute a potent combination. This amalgamation manifests as a nuanced and insightful process, notable for its cost and time effectiveness, rendering it conducive for implementation by government bodies, municipalities, and transport operators.

A notable advantage that resonates among most stakeholders is PVE's potential to address the prevalent **Not In My Back Yard (NIMBY)** phenomenon within Israeli society. Particularly relevant to ongoing challenges in public transport infrastructure initiatives, PVE's facilitation of open dialogues and deliberative processes holds promise in countering misperceptions, unfounded fears, and opposition stemming from NIMBY sentiments. Furthermore, the integration of PVE into the decision-making process has the potential to foster **communal ownership and co-creation**. By incorporating community insights into the planning and execution of public transport initiatives, this participatory approach identifies potential mutually beneficial resolutions that attend to public concerns while advancing sustainable transport development.

8

Discussion

This chapter begins by situating the research findings within the existing literature and highlighting their primary contribution. Subsequently, the research limitations are identified, opening avenues for future investigations. Finally, practical and policy recommendations are formulated based on the study's outcomes.

8.1. Positioning this Case Study in the Literature

This study aimed to shed light on the previously under-researched preferences of Israeli citizens concerning transport projects aimed at improving sustainable mobility options. Traditionally excluded from regional transport budget decisions, Israeli citizens were given a voice through the first-ever PVE experiment in Israel.

Notably, the results demonstrate a pronounced emphasis on **travel time** improvement as a crucial factor influencing Israeli PVE respondents' project selection. This aligns with existing research that underscores the significance of travel time in decision-making processes. Both quantitative analyses of influential factors and qualitative motivations behind the most favored policies underscore the strong influence of enhanced travel time, mirroring the findings of the Dutch transport PVE by Mouter, Koster, and Dekker, 2021b, where travel time improvement also emerged as a popular impact. In contrast, the research reveals that **cost** does not significantly impact transport preferences among Israeli respondents. Despite the expensive nature of certain transport projects, they ranked among the top choices for most PVE participants. This finding diverges from the Dutch PVE by Mouter, Koster, and Dekker (2021b), where respondents favored numerous but less expensive projects. Moreover, the factors of **reducing noise pollution, improving health, and enhancing the environment** were not found to exert significant influence on Israeli respondents' transport preferences, based on both qualitative motivations and quantitative results. This stands in contrast to the Dutch PVE by Mouter, Koster, and Dekker (2021b), where these three impacts were influential and popular among Dutch respondents.

A notable **trade-off** is evident in the PVE results, wherein the most favored projects, excluding light rail, have a limited impact on car infrastructure reduction but considerably improve travel time. This observation may be explained by the lower financial and behavioral costs associated with such policies, particularly for car users (Drews & van den Bergh, 2016). Remarkably, this study represents the first preference elicitation experiment in the middle east investigating the influence of car infrastructure reduction on the attractiveness of sustainable transport policies. The concept of reducing car infrastructure and its potential impact on transport preferences falls within the broader context of sustainable transportation research. Extensive prior international studies have explored individuals' preferences for sustainable transportation options and factors shaping their choices (Hössinger et al., 2023; Wicki et al., 2019), as well as the effectiveness of policies and interventions promoting sustainable mobility (Bhardwaj et al., 2020; Thaller et al., 2021a).

Furthermore, **cycling and walking** projects were ranked as the two least popular choices in the PVE. However, respondents selecting cycling and walking projects were highly influenced by values associated with environmental and health benefits, diverging from the Dutch PVE results by Mouter, Koster, and Dekker (2021b), where cycling projects were highly popular. Additionally, the research reveals that respondents living and working in the same city are more inclined to select projects aimed at improving cycling and walking, consistent with findings by Ruiz and Bernabe (2014), which demonstrate that support for cycling to and from work/school depends on the distance of the residential area. Numerous studies have observed that inhabitants of higher-density, mixed-use neighborhoods exhibit greater willingness to walk or cycle and reduced reliance on driving compared to those in lower-density, suburban areas (Cervero & Duncan, 2003; Frank et al., 2006).

Moreover, the LCCA revealed that whether or not respondents **live and work in the same city** determines similar transport preferences, which relates to the concept of residential self-selection. Residential location choices based on travel needs and preferences (Litman, 2023) contribute to the nonrandom spatial distribution of population concerning socio-demographics and travel attitudes (Cao et al., 2008). Guan and Wang (2020) found that the choices of residential location and work place are found to be mutually dependent. Consequently, both choices have indirect impacts on travel behavior and preferences through the other choice.

In addition, this research investigated respondents' willingness to **support reducing car infrastructure** in favor of alternative transport methods. After the choice task, most respondents stated their willingness to support policy decisions promoting such reductions. Their reasoning aligns with findings by Hayden et al. (2017), indicating that car-dependent individuals are willing to reduce car use in the presence of effective alternative transportation strategies, although many Israeli respondents expressed skepticism regarding the practical implementation of such strategies.

Finally, this study also investigates the **face validity** of PVE from an Israeli perspective. Comparing the responses to past Dutch PVEs, all categories received substantially high scores (at least 80% of respondents provided positive evaluations across all categories). However, the weakest face validity

category relative to the others was ”completeness” (”I received sufficient information for me to make choices”). This observation aligns with findings from numerous other (non-transport) PVEs conducted in the Netherlands, such as the RES Flevoland PVE consultation, Climate Consultation Gelderland, National Climate Consultation 2021, Wind energy Amsterdam 2021, and Heat transition Utrecht 2019. In each of these PVE consultations, completeness consistently ranked the lowest compared to other statements. This raises the question of whether the current PVE design approach incorporates sufficient complexity or potentially oversimplifies the policy problem for some respondents, thereby underestimating the public's ability to comprehend greater complexity and detail.

8.2. Contributions & Policy Relevance

This study makes significant contributions to existing methods and knowledge in several aspects.

Firstly, research on sustainable transport policies and transitioning from automobile use to more sustainable modes in the Middle East is limited compared to Western countries and other regions. However, the region's urbanization, traffic congestion, air pollution, and climate change challenges have driven growing interest in this area. This study contributes to understanding policy bundles and pull policies perceived as effective and acceptable by citizens, as well as the influencing characteristics and critical impacts for achieving the desired transport behavior shift. Tel Aviv citizens favored expensive and large-scale projects introducing new transport modes, such as metro and light rail. In contrast to Western studies, cycling and walking were not as favored in encouraging travel behavior shifts in this society. These findings highlight the context-specific nature of transport preferences, as seen through comparisons with a similar transport PVE conducted in the Netherlands Mouter, Koster, and Dekker, 2021b. The research emphasizes the importance of considering contextual nuances in developing and implementing sustainable transport policies, given the significant variability in preferences across different societies and regions.

Secondly, it holds policy relevance, and is the first-ever implementation of PVE in Israel. Theoretically, the findings enhance the understanding of policies that strike a balance between budget-efficiency and policy acceptance, a critical consideration in designing sustainable transport policy packages, as established by previous literature (e.g. Huber and Wicki, 2021b; Thaller et al., 2021b). Methodologically, the results indicate promising potential for future applications of PVE on a larger scale in Tel Aviv and Israel. Both Israeli experts and the public demonstrated high interest and perceived added value in utilizing PVE, signifying its realistic applicability in terms of time and effort required from both policymakers and the public (with a median time of only 6 minutes spent by participants on selecting their preferred policy bundle). The study suggests that participatory online tools can enrich public discussions on transportation and may increase citizens' acceptance of inconvenient but necessary changes, fostering a sense of involvement and consequently enhancing policy acceptance (Mouter, Koster, & Dekker, 2021b).

8.3. Limitations & Recommendations for Future Research

This case study is subject to several limitations that should be acknowledged, and these limitations provide valuable opportunities for future research.

To enhance the applicability and representativeness of future PVEs, it is recommended to implement them on a larger scale, involving a broader panel of participants and allowing open responses from the general public through an open PVE. Comparing the results of both panel and open PVEs can help assess their representativeness and offer valuable insights into potential differences in preferences. Moreover, conducting a larger-scale PVE with a more diverse sample would address overrepresentation of educated individuals observed in this research, enabling more robust factorization and addressing potential representative issues.

In addition to conducting a larger-scale replication of this PVE, this study has brought to light several other pertinent areas that warrant further research on public preferences within the Israeli transport context. These topics include discerning public preferences for different push policies, such as congestion pricing, as the current research focused predominantly on pull policies (though some pull policies involved substantial reduction of car infrastructure, potentially yielding a push effect as well). Additionally, there is a need to investigate policies aimed at enhancing female security in public transport and public spaces, and to explore projects aimed at improving the quality of public transport services in non-Jewish cities currently grappling with transportation challenges.

Local expert interviews highlighted the need for further investigation into framing effects and their impacts on PVE results. Understanding how framing, such as presenting trade-offs between car infrastructure reduction and public transport improvements, influences project rankings and preferences can provide valuable insights into policy decision-making. For example, would bike and pedestrian projects for example have performed better in this PVE if safety impacts were shown quantitatively like travel time improvement and reduction of car infrastructure, safety, or environmental impacts had their own meter in the PVE? This research gap was similarly identified during an examination of previous Dutch PVE consultations. There seems to be a limited focus on investigating respondents' perceptions of being influenced or directed, as well as the perceived objectivity of PVE experiments. This potentially represents a promising area for subsequent scholarly investigation. Moreover, given the possibility that respondents might experience steering effects without consciously recognizing them as such, empirical investigations could be undertaken to comprehensively comprehend the impact of framing across various PVE design choices.

Drawing from the face validity insights, another critical aspect requiring further academic inquiry pertains to the complexity versus comprehensiveness debate encountered by PVE designers. The findings of this PVE are consistent with prior Dutch PVE consultations, demonstrating that the attribute of completeness is frequently assigned a lower rank in comparison to other statements within each consultation. Does this pattern suggest potential information gaps among the respondents? To what extent can participants effectively manage an increased level of complexity and data volume during such consultations? Furthermore, it is essential to discern the threshold at which the introduction of heightened complexity might jeopardize the legibility and coherence of PVE experiments. Achieving an optimal balance in PVEs by providing respondents with adequate complexity and information, while avoiding overwhelming them, holds potential implications for face validity and decision outcomes. To this end, researchers should investigate frameworks that facilitate the assessment of complexity levels integrated into PVE designs, ensuring a scientifically robust approach.

Finally, the direct method of assessing the importance and influence of certain impacts on participant choices in this PVE can benefit from alternative approaches, such as sensitivity analysis, to verify the robustness of this study's results. In addition, comparing the results of a choice experiment to this PVE can offer valuable insights into understanding the differences in eliciting preferences between these two methods.

8.4. Recommendations & Implications for Practice

The following policy insights were derived from this research to enhance public transport and promote alternative mobility methods based on the public's perspective:

1. Promote Light Rail & Metro for Long-Distance Commuters and Encourage Walking & Cycling for Local Travel: The study revealed that encouraging walking and cycling as travel modes in the Tel-Aviv metropolitan area is more feasible for those who reside and work within the same city. Respondents who shared this characteristic were more likely to select walking and cycling projects in the LCCA. On the other hand, the LCCA showed that the metro and light rail projects were more favored by respondents who do not live and work in the same city, indicating their potential in reducing car reliance for this group.

2. Prioritize Improving Public Transport Travel Time, Capacity, and Connectivity: The public's primary concern for enhancing the current public transport system is travel time. The costs associated with improving travel time were considered less important by the majority of respondents. This finding was consistent across various aspects of the research, such as direct responses, qualitative motivations for popular projects, and the selection of policies with the highest impact on travel time. While values like public health, safety, and sustainability are of lesser urgency, promoting mass adoption of public transport modes like light rail and metro is perceived as a substantial step towards overall sustainability, air quality, and safety.

3. Address Car Infrastructure Reduction with Openness and Efficiency: Contrary to policymakers' concerns, most respondents in the consultation were supportive of the trade-off involving car infrastructure reduction in favor of public transport. They viewed public transport as the future of mobility.

While many respondents conditionally supported the trade-off if done efficiently to genuinely improve public transport, skepticism remains about the speed of improvements. The worsening parking crisis emerged as a significant reason for opposing public transport enhancements. Policymakers should find alternative solutions and mitigate parking impacts until public transport gains users' full reliance.

4. Ensure Inclusivity in Public Transport Design to Mitigate Objections: Public objection to car infrastructure reduction was partly rooted in concerns that it may adversely affect certain groups heavily reliant on private car use, such as the elderly, disabled, and families with strollers. Addressing the needs of these groups and demonstrating genuine inclusion initiatives in public transport design could sway more opposition towards supporting the necessary car infrastructure reduction for substantial public transport improvements.

5. Implement Projects with Speed and Minimize Disruptions: Accelerating the light rail project emerged as the most popular policy choice, chosen by over 60% of respondents. A significant motivation for selecting this policy was the desire to minimize continuous inconvenience caused by slow project progress for metropolitan residents. Policymakers can learn from past delays in the light rail red line project and apply swift implementation strategies for future light rail and metro developments to reduce public antagonism towards public transport improvements.

6. Public Aspiration for Inclusivity and Engagement in Transport System Design: The findings of the face validity evaluation underscore the public's strong desire to actively participate in shaping the future of the transport system. Respondents expressed a profound sense of importance attached to the transport domain and expressed a keen interest in voicing their opinions on the matter. The utilization of online participatory methods was perceived favorably, with respondents viewing PVE as an effective means to foster inclusivity and facilitate the sharing of their perspectives.

9

Conclusions

In culmination of this thesis, this chapter presents a comprehensive summary of the principal findings obtained for each research question.

Q1.1. What are the strengths and weaknesses of utilising public participation for decision-making specifically in the Israeli public transport context?
In this thesis, a comprehensive review of the literature and extensive interviews with experts from the public transport industry were conducted to identify the strengths, weaknesses, threats, and opportunities for public participation in decision-making within the Israeli public transport context. These insights were deemed valuable for informing the design process of the PVE study.

Regarding strengths, there is a notable interest in incorporating public participation among various stakeholders at both local and governmental levels, including public transport operators, NGOs, municipalities, and the Israeli transport ministry. These stakeholders are already utilizing other forms of public participation, but PVE offers a novel perspective. Residents in specific areas of the Tel Aviv metropolitan region are familiar with different forms of public participation, indicating a readiness for such engagement. Moreover, PVE provides time-efficient methods for considering public opinion, particularly that of the silent majority, a significant strength in this context. Additionally, as a novel appraisal approach, PVE could offer fresh insights compared to the current used practices in Israel of CBA and MCA.

Conversely, there are identifiable weaknesses in the current implementation of public participation in the Israeli government and many municipalities in the Gush Dan region. Public participation methods are often utilized merely for tokenistic purposes, lacking substantial impact on decision-making. Additionally, experts acknowledge the need for simplifying public transport jargon and concepts to ensure effective communication with the general public.

Substantial opportunities arise from employing public participation, particularly in addressing political and public acceptability challenges when public transport policies impinge upon private car parking and cause delays in public transport improvements. PVE can shed light on public preferences and the trade-offs policymakers must navigate between enhancing public transport and reducing car infrastructure, thereby increasing public support and understanding. Furthermore, PVE could exert pressure on local municipalities to cooperate with large public transport projects, which currently suffer delays due to lack of cooperation.

Despite these opportunities, certain threats should be considered before commencing the PVE design. Meaningful public participation may face difficulties due to issues falling between different stakeholders without sufficient coordination. Although there is a shared desire for time-efficient public participation, uncertainties remain about policymakers' willingness to incorporate public input into shaping policies. Furthermore, the highly contentious nature of public transport and congestion in Israel, coupled with a perception of delayed major projects, might deter citizen participation in the PVE process.

Q1.2. Which potential policies could improve the quality of public-transport in Tel-Aviv and encourage usage of other mobility methods?

The process of identifying the most substantial policies to enhance the quality of public transport in Tel-Aviv and promote the usage of other mobility methods involved several stages. Initially, 11 key issues were identified within the current Israeli public transport network, of which eight were deemed relevant for Tel Aviv. These issues encompassed aspects such as insufficient frequency of regional and inter-city bus lines leading to overcrowding, extended travel times and delays, lack of public transport services on Saturdays, inadequate accessibility for elderly and physically/mentally challenged individuals, marginalized alternative travel modes (walking/cycling), accidents related to electric scooters and bikes, insufficient accessibility to train stations from residential areas via bus, and significant delays in major public transport projects.

Subsequently, for each identified problem, at least two potential solutions were proposed, constituting policies or projects that could address specific issues and enhance the quality of public transport. Through a selection process that narrowed down the list of policies, the following ten policies were deemed most crucial and relevant to include in the Participatory Value Evaluation (PVE) based on an extensive review of the literature and, notably, expert opinion: First, policies to improve the existing public transport quality: 1) Better connected public transport dedicated road network within and between cities 2) Increase of Saturday shuttle service from suburbs to TLV and within TLV 3) Improvement of accessibility of buses and stations to the physically disadvantaged community 4) Promoting technological infrastructure for smart transportation 5) Addition of direct bus lines to employment centers 6) Improve bus service from residential neighborhoods to train stations. Second, policies to improve alternative

transport quality: 7) Acceleration of the bike lane project 8) Improving the pedestrian experience within cities. Lastly, policies to accelerate new large scale projects: 9) Acceleration of the metro project 10) Acceleration of the light rail project.

Q1.3. How do Tel-Aviv residents evaluate the options and impacts of the policy options in the context of a PVE?

In this choice task, the analysis revealed that a majority of respondents preferred selecting fewer, albeit more expensive projects, as opposed to opting for a larger number of cheaper projects. Furthermore, most respondents chose to allocate (almost) the entire budget. The project that emerged as overwhelmingly the most popular, chosen by over 60% of respondents, was the acceleration of the light rail project. Following closely were the following popular policies (in order of popularity): the improvement of bus services from residential neighborhoods to train stations (41%), the addition of direct bus lines to employment centers (39%), and the acceleration of the metro project (36%). The primary motivation for selecting these projects, as expressed by respondents, was their significant impact on improving travel time and their potential to attract a considerable number of current car users to shift to public transport. Other compelling reasons included their contributions to enhancing the public transport network's connectivity, capacity, and accessibility to large industrial areas.

Conversely, the least popular projects focused on alternative mobility options: specifically, the improvement of the pedestrian experience in cities and the acceleration of the bike lane network project. The rationale behind selecting these projects, according to respondents, was their potential to attract a large number of current car users to shift to public transport, along with their positive impacts on public health, the environment, and safety. Additionally, when examining the most influential impact on respondents' decisions in the choice task, travel time emerged as the prevailing factor. In contrast, the impact of cost and car infrastructure reduction displayed greater variation and was less decisive.

To gain deeper insights into the public's perceptions of reducing car infrastructure in favor of public transport improvement, a more in-depth investigation was undertaken. Approximately half of the respondents (50%) expressed support for such a trade-off, citing their belief that enhanced public transport would eventually alleviate congestion, while simultaneously considering public transport as the future of mobility, expected to enhance overall safety and air quality. Respondents who were undecided about supporting the trade-off (24%) expressed doubts about the extent to which public transport would improve to the point of reducing their reliance on personal vehicles. Others believed that public transport and car infrastructure improvements were not mutually exclusive and that public transport could be enhanced without significant impact on car infrastructure, as exemplified by the metro project. On the other hand, resistance to such a trade-off (26%) primarily stemmed from concerns about exacerbating the parking crisis in the country and the fear of discriminating against individuals who currently have no alternative but to rely on private cars, such as the elderly and disabled populations.

Q1.4. Which preference profile clusters arise within the Tel-Aviv metropolitan residents when con- ducting the PVE?

In this thesis, a LCCA was conducted to investigate whether respondents with similar characteristics exhibited similar preferences for groups of projects. The indicators used for the LCCA included all ten projects presented in the PVE choice task, while the covariates encompassed various respondent characteristics, such as public transport profile, gender, presence of children, education level, concurrence of workplace and residence, financial status, and preferred mode of transport on Saturdays (indirectly indicating religious status). The analysis revealed that the only covariate significantly predicting class membership and, consequently, public transport project preference was whether respondents lived and worked in the same city.

Based on the LCCA results, four distinct clusters of respondents were identified. First, a cluster characterized by a preference for combining the light rail project with two other bus-related projects, specifically, improving connectivity to train stations via buses and adding direct bus lines to employment centers. This cluster tended to favor a few moderately to very expensive projects. Respondents were more likely to belong to this cluster if they lived and worked in the same city. Second, another cluster emerged, favoring the metro project along with a few other less costly projects. Similar to the first cluster, respondents in this group were more likely to reside and work in the same city.

The third cluster, also likely to consist of individuals living and working in the same city, predominantly preferred many cheaper projects aimed at improving the existing public transport service. This

cluster displayed support for policies promoting walking and cycling and the provision of free public transport services on Saturdays. Lastly, the fourth cluster, composed of respondents not living and working in the same city, exhibited overwhelming support for both the light rail and metro projects, which were the two most expensive projects in the portfolio.

Q2.1. How do Israeli citizens evaluate the face-validity of a PVE?

In this research, the study examined the face-validity of various categories, including (1) Readability & Clarity: participants' understanding of the task, (2) Completeness: the adequacy of information provided for decision-making, (3) Acceptance: participants' conviction regarding their choices and their perception of participatory methods in decision-making, (4) Relevance: the importance attributed to giving opinions on improving public transport, (5) Transparency & Legitimacy: participants' trust in the research's honesty and objectivity, ensuring their choices were not influenced. All statements received overwhelmingly high rankings, with the lowest-ranked category being completeness, still ranking notably high with an average score of $4.12/5$, and the highest-ranked category being relevance, attaining a score of $4.6/5$.

Q2.2. What is the difference in face validity evaluation results when comparing the Tel Aviv PVE to past Dutch PVEs?

The face validity results obtained from the Tel Aviv PVE were compared with a Dutch benchmark, specifically, the 2017 Amsterdam transport PVE conducted by Mouter, Koster, and Dekker (2021b). The choice of the Amsterdam PVE as the benchmark was based on its close resemblance to the Tel Aviv PVE in terms of both topic and style. A Mann-Whitney U test was conducted to compare two face validity categories, namely, acceptance and relevance. The results of the test revealed that the Tel Aviv PVE received significantly higher rankings than the Amsterdam PVE in these categories. This finding suggests the method's relevance and applicability to the Tel Aviv context, while also shedding light on the potential differences in PVE face-validity across different regions globally.

A

Appendix: Semi-structured Expert Interviews

In this appendix, we present the interview questions and structure used to consult experts, followed by a summary of the key insights obtained from each interview. Three distinct groups of experts were consulted. Firstly, a group interview was conducted with three Israeli public transport policy and implementation experts. Secondly, an Israeli government expert specializing in transport politics was consulted. Thirdly, a consultation presentation was conducted with PVE experts to refine the consultation drafts, leading to the final version presented in this thesis.

A.1. Israeli Public Transport Policy & Implementation Experts

In this section, the interview questions and structure used to consult the Israeli transport experts is introduced, and the key insights of the interview is then summarized.

A.1.1. Interview Protocol Used

Introduction

- **Self introduction:** Introduce myself and the purpose of the study
- **PVE introduction:** Introduce what is PVE is in general, show examples translated to English from Dutch, and introduce what we are researching.
- **Reflection on costs:** Show the problems & policies under consideration for improvement of public transport. Ask if the overall specific costs seem about right to them in the list.

Guiding questions on the public transport policies & problems

- **Public Transport Problems:** Which problems on the list do you think are most crucial to solve right away in order to improve public transport? Which problems are being neglected by policy makers? Any additional problems not addressed in this research that should be added?
- **The Public's Perspective:** Are there specific transport policies/projects on which the Israeli public has a strong need in terms of expressing their values and opinions? Where is the public opinion important for decision making? Where is public opinion loud and needs to be heard?
- **Socio-demographic characteristics:** Which socio-demographic characteristics would be relevant to ask Israeli Participants in a Israeli transport PVE? How should religious affiliation be addressed given the current sensitivity regarding the topic?
- **Impacts Discussion Instructions** The experts were shown a list of 10 policies and asked to discuss how they would rank each in terms of their impact on a scale of 0-5 (0 - no impact, 5 - very high impact) on their contribution to faster public transport travel times, reliability and their impact on the available car infrastructure.

Guiding questions on past public participation experience and PVE

- **Israeli Public Participation:**- What have been the most apparent pros and cons when involving the Israeli public in transport-policy decision-making so far using current methods? What benefits did this add to public transport planning? What kinds of difficulties have you encountered in your attempts to promote civil participation in Israel? What do you think about cases where the opinion and wishes of the public (whether it's in surveys you promote or other projects) and the opinion of the decision makers (whether it's the Ministry of Transportation, local councils, etc.) are significantly different from each other?
- **Opinion on PVE:** For which type of policy or projects is PVE a more useful and less useful appraisal method? What value or (challenges) could it add for your public participation efforts? What do you think of PVE in comparison to current methods used for public participation in Israel? When and where could PVE potentially be implemented? What could be some advantages and struggles of implementing such a method in practice in the Israeli Transport sector and in general?

Closing Remarks

- **Thank you and closing:** Thank interviewees and ask whether they would like to participate/see the final version of the PVE once finalized.

A.1.2. Key Insights Summary

The key insights and knowledge that came up during the interview are summarized (in English) in this section.

Interview insights summary: Israeli Public Transport Policy & Public Participation Experts

PVE in comparison to other methods of public participation and as an appraisal method:

- **A method that can be deployed also in early stages of decision making rather than only after the fact:** Provides citizens with much more information to share their opinion and can be done already in the earlier stages of policy design (לפני התזכיר, בטיוטה כבר חוק. אפשר). This is unlike current public participation methods that are conducted already way after policies and major decisions have been made, since any meaningful participation earlier in the policy and decision making process would either be infeasible in terms of time and money to reach the larger public, or smaller in terms of public reach and perhaps therefore less meaningful.
- **Meaningful and nuanced public opinion:** with this method policy makers can learn more about not just which policies citizens would prefer, but also potentially why. Rather then sending out polls and letting citizens vote yes/no.
- **Solve the "not in my back yard" phenomenon:** especially in infrastructure policy related decisions, there is a phenomenon called NIMBY: opposition by residents to proposed developments in their local area, as well as support for strict land use regulations. It carries the connotation that such residents are only opposing the development because it is close to them and that they would tolerate or support it if it were built farther away. This is an amazing way for policy-makers to also mitigate the NIMBY impacts, and show residents "the bigger picture" while also taking into consideration the local NIMBY public's concerns and give them a voice to also mitigate these impacts. This is especially relevant for instance for increasing support for the metro, which currently has some NIMBY effect. Many people do not even know what a metro is, therefore consider also explaining what it is.
- **Bridge between between the design and public perspectives:** The public perspective is very different than the design perspective when it comes to Israeli public transport, and a PVE can capture this and mitigate between the differences. Up until recent years, there was no norm to include the public's perspective when making any infrastructure or public transport decisions. The perspective taken into account was very operational, and there was even a lack of connection between the urban and city perspective and its connection to public transport, which experts find astounding. Only when the light rail project began in recent years to speed up, and disrupt daily life of citizens in Tel Aviv who were outraged and wanted to voice their opinions, then policy-makers realised they should take into account the public's perspective when making such design decisions and policy decisions. In fact, currently in Israel there is barely any cooperation and connection between the policy and design, with the operational perspective, let alone public perspective. This tool could be a great way to connect the public perspectives directly to both the design and operational perspective where and when needed.
- **Tool for breaking strong public myths rooted in the country**: for example:
  1. **Myth 1: Another highway will solve Israeli congestion:** designing a PVE, asking residents how to solve the congestion issue, and showing them for instance 3 options and their impact on congestion: adding another highway, adding a metro line, adding a public transport lane. This way, many current myths regarding how to solve congestion can be broken and the public can be better educated on the importance of public transport like a metro in reduction of congestion in comparison to adding another highway.
  2. **Myth 2: Congestion pricing - useless to mitigate congestion:** congestion pricing is a highly controversial topic in the country. Congestion pricing was included in the previous years official budget, but was left out of the current budget. There is vast fear from the public and therefore politicians surrounding including congestion pricing in the country. A PVE could help learn more exactly what these fears are and how to

solve them, it could also share some of the positive impacts congestion pricing could have on the current congestion issue.

PVE Design:

- Framing the PVE: Public participation in the field of public transport expert recommended framing the question not only by asking residents how to improve public transport, but relating the public transport issue as a direct solution to the major congestion issue in the country, since this is the problem the public has most connection to.

Transport policy in Israel & (lack of) public participation:

- **lack of power of local municipalities:** At the end of October there will be local municipal elections in the entire region. Local municipalities have currently no jurisdiction and power over making any decisions regarding public transport and congestion. Currently, all decisions for the entire country are done by the ministry of transport. For future PVEs it could be interesting to even ask residents whether and how much power they think local municipalities should have on making such decisions.
- **Lack of (any/sufficient) public participation:** Disconnection between the people and the government: there is no connection between the government and the people, so if the people would like to propose changes to their public transport it is really difficult. The only way the public can currently give their opinion and local knowledge and thoughts to the government is mainly via a form which they do not look into or use, definitely not to make decisions. The public is therefore frustrated that if they have issues with their public transport, they can for instance go to local municipalities (since they have no direct contact with the government) but these local municipalities are powerless to make such changes.
- **Lack of cooperation between local municipalities and the government:** only in recent years has public participation norms grew, up until recently it was definitely not the norm in Israel even in infrastructure decisions. It started mainly due to larger projects that started in the region like the bike lane project and the light rail project, which have been delayed and been taking many years. In fact, currently, there is still no public participation or even local municipality cooperation when it comes to designing the lines of buses, stations etc.

A.2. Israeli Transport Political Expert

In this section, the interview questions and structure used to consult the Israeli government (transport) policy expert is introduced, followed by the key insights of the interview.

A.2.1. Interview Protocol Used

Introduction

- **Self introduction:** Introduce myself and the purpose of the study
- **PVE introduction:** Introduce what is PVE is in general, show examples translated to English from Dutch, and introduce what we are researching.

Guiding questions on Israeli public participation experience and PVE

- **Israeli Public Participation:** How do the different stakeholders in Israel incorporate public opinion in decision making in the public transport sector? Which methods are popular? For what purpose is public opinion used and when is it usually incorporated in the decision-making process? How do politicians perceive public participation for policy-making in the transport ministry and the ministry in general?
- **Opinion on PVE:** For which type of policy or projects is PVE a more useful and less useful appraisal method? What value or (challenges) could it add for your public participation efforts?

What do you think of PVE in comparison to current methods used for public participation in Israel? When and where could PVE potentially be implemented? What could be some advantages and struggles of implementing such a method in practice in the Israeli Transport sector and in general?

Closing Remarks

- **Thank you and closing:** Thank interviewees and ask whether they would like to participate/see the final version of the PVE once finalized.

A.2.2. Key Insights Summary

Consultation insights summary: Israeli Transport Political Expert

The public transport political field

- Stakeholders: when diving into the public transport world, there are several players to keep in mind, all with different power for change in the public transport realm and different public participation practices. They are: the minisitry of transport (currently holding all and most power in decision-making), public transport operators, local municipalities and various NGOs.

Breakdown of public participation for decision-making in practice in Israel:

- **Public transport operators:** their responsibility is the execution of transport projects. They are responsible for all things operational, after decision-making and policy design has majorily been done: trip execution, schedules, supply and demand (meeting what is established by the Ministry of Transportation of coursde, not deciding themselves based on public feedback), responsible for the drivers and workers and publishing and communicating information with the public etc.
  - State of public participation: usually do include public opinion however not via digital consultations normally. They tend to send scouts to look into an area and ask locals for opinions and insights into the changes are debating to make. That is their main form of public participation.
- **Ministry of transport and Israeli government:** is in charge of anything budget related, and decide how much money will be invested for different transport initiatives in the country, with the ministry of Finance. All major decisions regarding transport and public transport for the entire country is done in the governmental level. For example, determining the routes of the different public transport lines (for all modes of transport: bus, train, light rail, metro, etc), frequency, location of stations, how coordinated the schedules and connectivity between the modes of transport need to be etc. They also supervises all public transport operators.
  - State of public participation: in recent years, the government implements and wishes to implement more public participation methods. The company tends to cooperate with companies like ”Tovanot” and also favor online participation tools. However, these tools ask ”open questions” to respondents to express their opinions and insights. Though it still helps to gain insight into the local standpoints and opinions, they claim that this encourages opinions only of what they believe to be the ”annoying” public ציבור נודניק). The main purpose however currently of including the public’s opinion and conducting such polls and questionnaires, to ”check a box” and just say ”we consulted with the public - look”. The ministry of transport in particular has consulted with the public using also normal questionnaires, for example the nation wide poll of American-style questions (aka: multiple choice).
- **Local municipalities**: have limited power in terms of decision-making, especially in earlier stages (and receive money from the ministry of transport regarding any public transport decisions). They are responsible for the establishment of urban public transportation

routes (within the scope of the local authority), their enforcement, and for instance for the design of the bus stops in the city.

  - State of public participation: also cooperate with online tools (different than PVE) and also conduct more local participation like citizen panels. The meaningfulness of public participation depends on the municipality and differs vastly. Some local municipalities have some desire for public participation and inclusiveness, but more often they too just want to ”check the box” of public participation.

- **NGOs**: are trying to push for the importance of public opinion and public participation in the country, but seem to be a minority. They aim to change the transportation policy in the country and to include the public's voice to be included in the decision-making process itself, not after the fact.

  - State of public participation: NGOs are the ones in the from seat and currently pushing to include the public's voice. They employ methods like: large surveys, panel consultations, physical interviews on the streets etc.

A.3. Information Provided Before Interviews to Israeli Experts

Every Israeli expert interviewed received via email an explanation package with information on PVE as a method (Figures A.1, A.2, A.3) and on the PVE case study in Israel (Figure A.4). This was done to provide some context on what PVE is and the interview will be about.

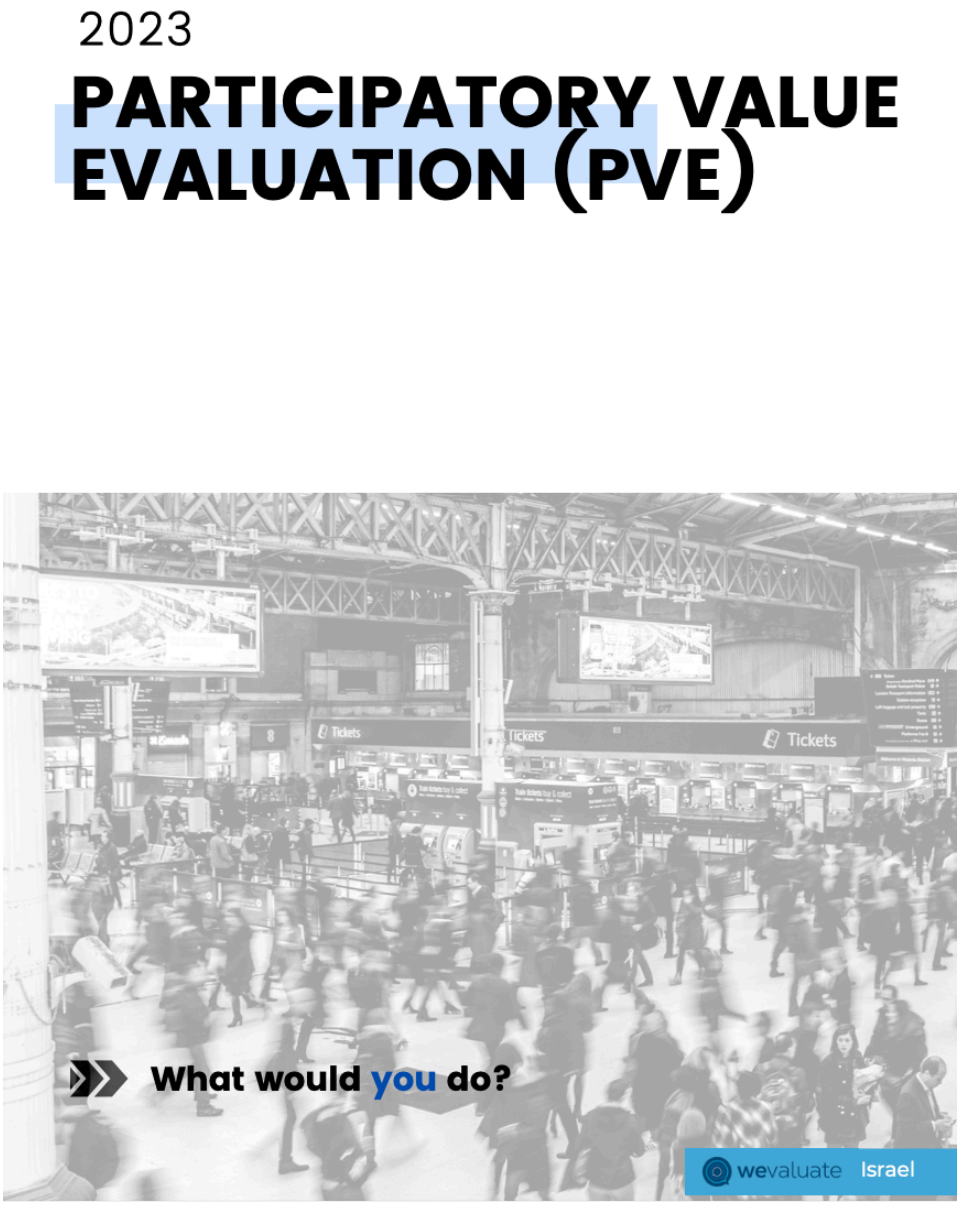
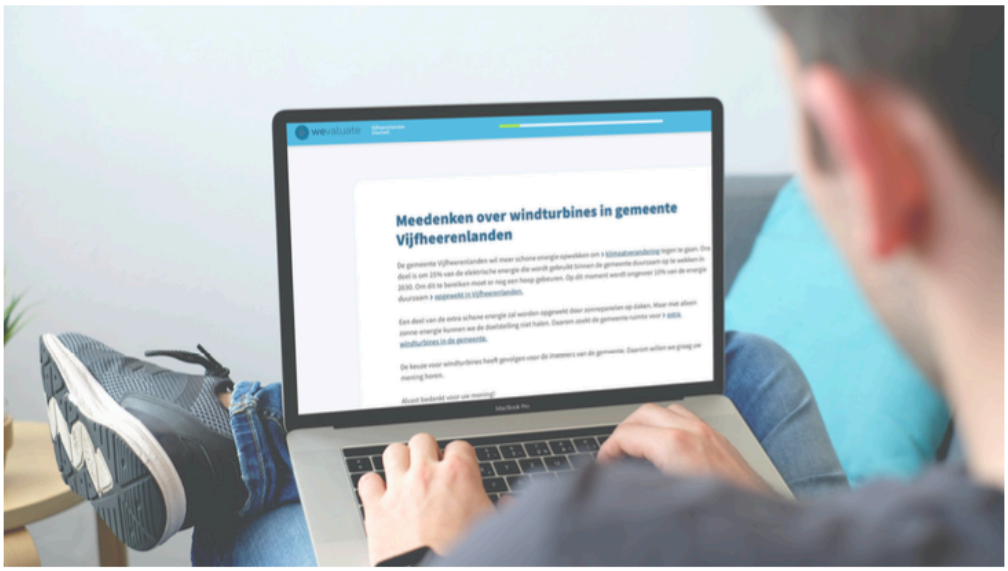


Figure A.1: Information on PVE and the research sent to interviewees before the interview (Cover Page)

WHAT IS PVE?



Participatory Value Evaluation (PVE) is a consultation method that can be used to find out how large groups of citizens weigh public values in a specific context and how they believe that values should be concretely translated into policy. The essence of a PVE is that a choice situation of a government is simulated so that citizens can experience the dilemma. Citizens see the issue in an accessible way, online, they are shown an overview of the consequences of the policy options and the limitations that exist (eg limited budget). Subsequently, citizens provide advice including substantiation. This provides a clear picture of their preferences, of common values, how values according to citizens should be translated into policy and what concerns are behind resistance.

Letting citizens experience governmental dilemmas online & participate in policy-making

wevaluate Israel

Figure A.2: Information on PVE and the research sent to interviewees before the interview (Introduction to PVE Page)

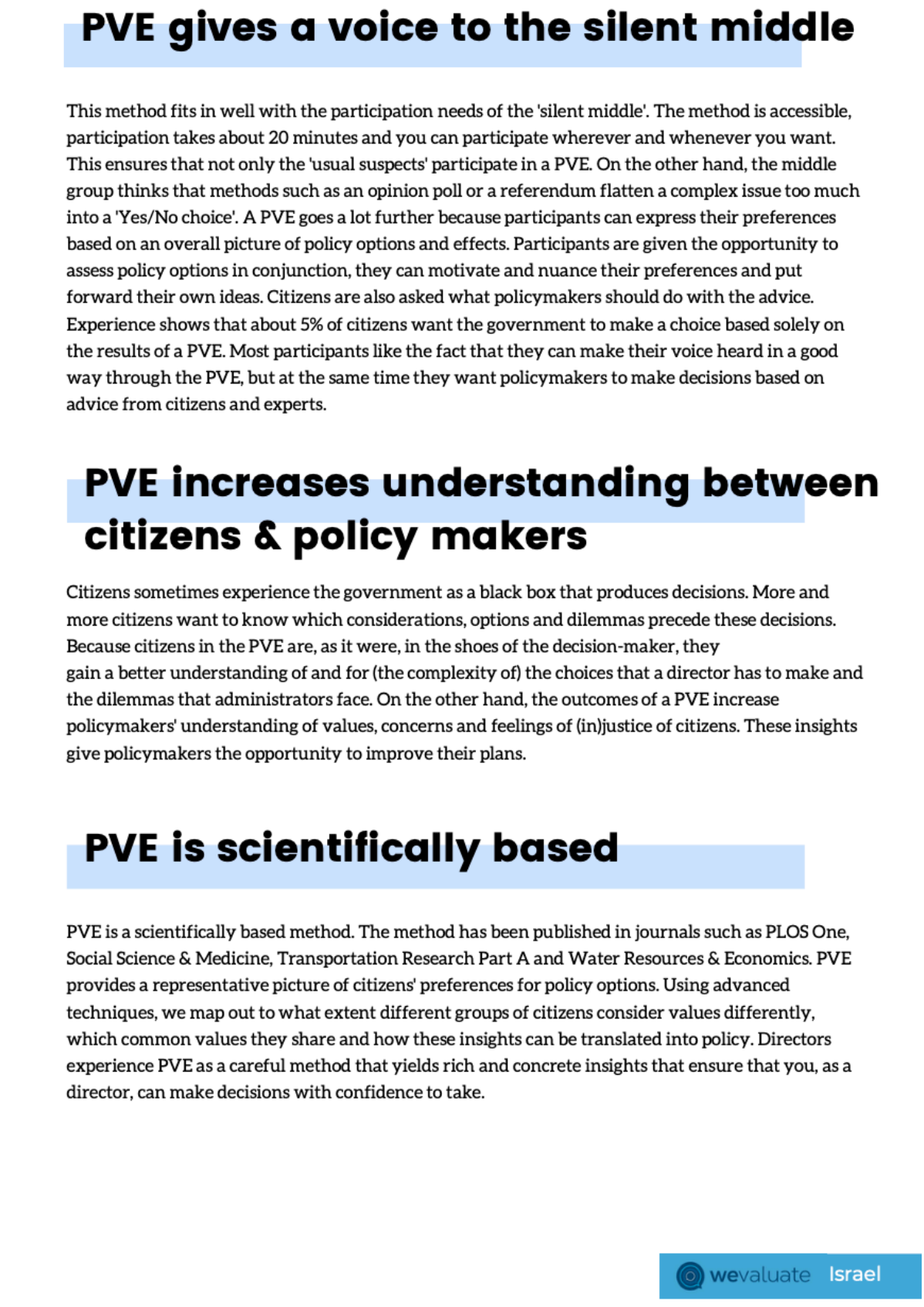


Figure A.3: Information on PVE and the research sent to interviewees before the interview (Key information on PVE Page)

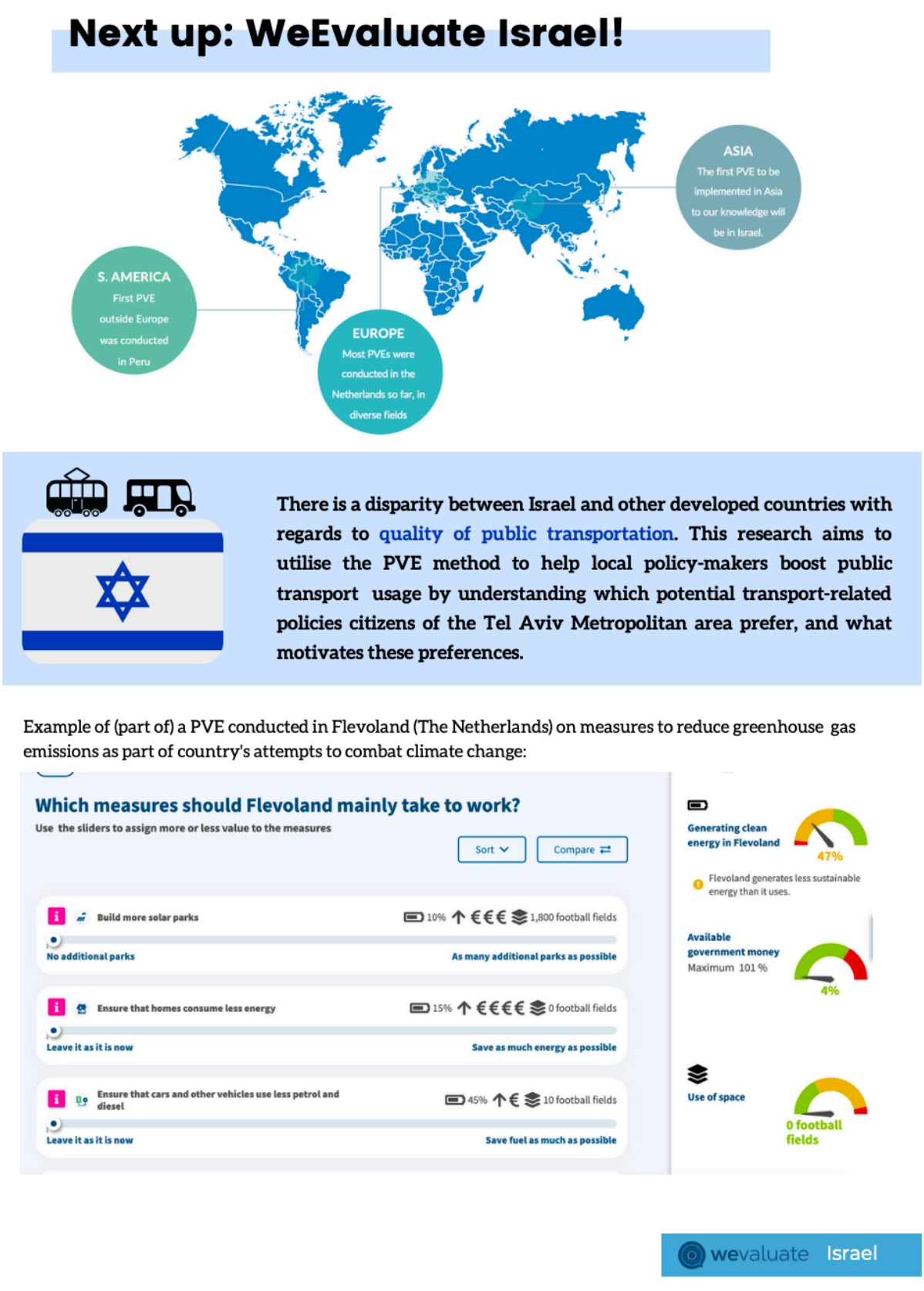


Figure A.4: Information on PVE and the research sent to interviewees before the interview (Introduction to Israel PVE & Flevoland example Page)

A.4. Consultation with PVE Experts

In this research, a consultation in a form of a presentation and feedback was conducted in order to improve the initial drafts of the Tel-Aviv PVE consultation with experts who design PVEs on a regular basis, and are knowledgeable on how to design consultations in the most efficient yet user-friendly way. In this section, first, the information provided to experts before the consultation is shown which introduced PVE experts to the context of the Tel-Aviv PVE. Secondly, the concept PVE presentation shown to experts is shown, followed by a summary of the feedback and tips received to improve the consultation even further.

A.4.1. Background information provided to PVE experts before consultation

Before presenting to PVE experts, an information package was sent out to the group of PVE experts in advance in order to provide background information surrounding the Israeli public transport problem the PVE deals with (see figures A.5, A.6, A.7, A.8, A.9, A.10). Experts interested in this context in depth could read this information package before the consultation.

Figure A.5: Tel Aviv PVE Introduction package to PVE experts - page 1

INTRODUCTION

Traffic jams in Israel are among the worst in the world.

Israeli society, especially in the Tel-Aviv region, is highly automobile oriented, and most families own multiple cars. Consequently, the road networks cannot withstand the number of cars, especially during the hours of arrival and return from work. Air pollution levels are rising, working hours are wasted in traffic jams, housing prices are rising and the costs to the economy only increase. The economic cost of road congestion is estimated at 10 billion euros per year, and if significant changes are not promoted to improve public transportation, traffic jams will only get worse. In order to solve the congestion problem in the Tel Aviv Metropolitan Area (known as: Gush Dan), and in light of the expected accelerated development in the area in the coming years and rapid population increase, great efforts are required in the development of modern public and alternative transportation, which will lead to the relief of congestion on the roads. In this PVE, the residents of Gush Dan can give advice on what types of public transportation policies they would promote in order to improve the public transportation system in their area.

We ask Israeli citizens to "sit in the driver's seat" and give their advice on how to improve public transport in the Tel Aviv metropolitan area.

Figure A.6: Tel Aviv PVE Introduction package to PVE experts - page 2

PVE DESIGN STAGES

The core of this PVE choice task, is that respondents will be asked to make a trade-off between imposing a (portfolio of) public transport policies and the allocation of a scarce public resource - government budget. The PVE was designed in 6 main stages:

01 Problem Analysis: What are the main problems with Israeli public transport?

The biggest problems with current public transport were identified. This was done using both expert consultations and mainly a (grey) literature review. The review collected problems both from an internal Israeli perspective (e.g., The State Comptroller of Israel inspects and reviews) and international perspectives (e.g., OECD reports). The following problems were found:

PROBLEMS WITH CURRENT ISRAELI PUBLIC TRANSPORT

1. Insufficient frequency of regional and inter-city bus lines & overcrowding
2. Longer travel time than expected & delays
3. Lack of public transport on Saturdays
4. Lagging accessibility to elderly & physically challenged individuals
5. Accidents related to electric scooters & bikes
6. Alternative travel modes (walking/cycling) marginalised
7. Insufficient accessibility to train stations via bus from residential areas
8. Substantial delays in major public transport projects

02 Policy Identification: Which policies could solve the public transport problems?

Policies were identified to solve each problem. A literature search was conducted to find solutions to each problem. It relied mainly on grey literature. The study made use of the Israeli government's database containing all potential policies, investments and plans to improve/change the state of public transport (especially in the center of Israel), discourage car-use and deal with the growing congestion issue in the country and specifically the Tel Aviv region.

Problem	Policies
Insufficient frequency of regional and inter-city bus lines & overcrowding	• Increase salary and working conditions of drivers • Support pilot projects of new technologies and operating concepts
Longer travel time than expected & delays	• Stricter enforcement of illegal use of public transport dedicated roads • More continuous connection of public transportation routes and high-occupancy routes
Lack of public transport on Saturdays	• Increase parking and fleet of car-sharing at the expense of regular parking in busy locations • Increase of Saturday shuttle service from suburbs to TLV and within TLV
Lagging accessibility to elderly & physically challenged individuals	• Improving the accessibility of stations and buses for everyone, including people with disabilities • Promoting technological infrastructure for smart transportation
Accidents related to electric scooters & bikes	• Traffic education programs • Stricter enforcement of (electric) scooter and bike laws
Alternative travel modes (walking/cycling) marginalised	• Acceleration of the bike lane project • Improving the pedestrian experience within cities • Improve bike parking capacity in main stations, working and leisure zones
Insufficient accessibility to train stations via bus from residential areas	• Increasing frequency and expanding bus service from residential neighbourhoods to train stations & synchronisation with the train schedule • Addition of direct bus lines to employment centers
Substantial delays in major public transport projects	• Accelerate light rail project • Accelerate metro project

Figure A.7: Tel Aviv PVE Introduction package to PVE experts - page 3

03

Policy Selection Process: How did we narrow down the list of policies?

The policies were then narrowed down using 6 selection criteria:

C1

Substantial policy to improve public transport?

Some policies are potentially more influential than others to improve the state of public transport in Israel. Therefore, this criteria was used in order to prioritise the policies that are especially beneficial and relevant to improve the state of public transport. This was determined via a (transport policy) expert consultation.

C2

Where is public opinion most apparent and needed?

Each policy was evaluated by whether there is a need from the public to find input, or for which policies or types of policies public opinion is substantial and should therefore still be considered, even if it is not necessarily directly needed. This was determined via a (public participation in Israeli transport) expert consultation.

C3

Diversity of mobility options & measure type

The PVE should include policies that target the improvement of different types of (current and future-planned) public transport and alternative mobility options to diversify options within the PVE choice task.

C4

Diversity in transport problems addressed

Although not all problems can be addressed in one PVE, the PVE should aim to include policies that contribute to multiple different problems identified in this study.

C5

Diversity in transport problems addressed

The PVE should include both policies that vary in their relative cost.

C6

Policies that tend to have a disadvantage in traditional appraisal

In Israel, most transport and infrastructure projects are evaluated using Cost Benefit Analysis (CBA) and Multi Criteria Analysis (MCA). This criteria aims to include policies in this PVE that have a disadvantage when evaluated via traditional appraisal methods.

THE SELECTION PROCESS LED TO THE FOLLOWING 10 POLICIES:

1. Better connected public transport dedicated road network within and between cities
2. Increase of Saturday shuttle service from suburbs to TLV and within TLV
3. Improvement of accessibility of the street and bus stations to the physically disadvantaged community
4. Promoting technological infrastructure for smart transportation
5. Addition of direct bus lines to employment centers
6. Increasing frequency and expanding bus service from residential neighborhoods to train stations and synchronization with the train schedule
7. Acceleration of the bike lane project
8. Improving the pedestrian experience within cities
9. Acceleration of the metro project
10. Acceleration of the light rail project

Figure A.8: Tel Aviv PVE Introduction package to PVE experts - page 4

04

Estimating Policy Costs & The Budget Constraint

In order to simulate the choice the Israeli Transport Ministry has to face, participants were given a constraint for selecting projects: a budget. Therefore, for this PVE, costs were estimated for each policy, and converted into percentages based on a fictive budget that was chosen to help minimize the amount of policies participants can choose, shown below.

Policy	Cost [million ILS]	Percentage of Budget [%]	Source
Better connected public transport dedicated road network within and between cities	50	20%	Key (2023b)
Increase of Saturday shuttle service from suburbs to TLV and within TLV	40	16%	Liberman (2021)
Improvement of accessibility of the street and bus stations to the physically disadvantaged community	10	4%	Key (2023e)
Promoting technological infrastructure for smart transportation	20	8%	Key (2023f)
Acceleration of the bike lane project	50	20%	Key (2023d)
Improving the pedestrian experience within cities	30	12%	Kinan, Tal, Jacob, et al. (2018)
Acceleration of the metro project	150	60%	Key (2023c)
Acceleration of the light rail project	80	32%	Key (2023a)
Addition of direct bus lines to employment centers	50	20%	Kinan, Tal, Jacob, et al. (2018)
Increasing frequency and expanding bus service from residential neighborhoods to train stations and synchronization with the train schedule	60	24%	Kinan, Tal, Jacob, et al. (2018)
Total Cost	***540***		
Fictive Budget to constraint respondents	***250***		

In current Israeli transport project funding, only the government determines the funding for different types of transport policies and infrastructure projects. Hence, **costs were estimated from a governmental funding perspective**, even though some of the projects have multiple contributors and other costs to consider. Most of the costs were estimated by using an open-data database where all past Israeli government expenditures and fundings are recorded called "Key to the budget". Using information from recent-year funding, the approximate governmental funding available for most policies could be inferred.

An important clarification to be made, is that for the policies that aim to accelerate new large scale projects (light rail, metro, bike lane network), the total cost of implementing said projects was not taken into account, but rather the budgets/costs the government has been investing (or intends to invest) in order to speed up the process of pushing forward said projects that are progressing very slowly.

05

Selection & estimation of impacts

In order to simulate the choice the Israeli Transport Ministry has to face, participants were given a constraint for selecting projects: a budget. Therefore, for this PVE, costs were estimated for each policy, and converted into percentages based on a fictive budget that was chosen to help minimize the amount of policies participants can choose, shown below.

How did we pick which impacts to show respondents?

An analysis of the current state of Israeli public transport led to the following main conclusion: public acceptability of policies to improve the state of public transport is especially low when they come directly at the expense of private car parking/lanes. On the other hand, the public has been reported to complain about the long travel times and unreliability of Israeli public transport, forcing them to rely on private cars.

Figure A.9: Tel Aviv PVE Introduction package to PVE experts - page 5

The idea here, is that respondents are shown the (often times) trade-off policy-makers in Israel must make between improving substantially the average travel time and reliability of public transport in the region, and reducing car infrastructure citizens currently rely on. **The impacts will be shown explicitly in the PVE: reliability improvement, travel time improvement and reduction in car infrastructure.**

How did we estimate these impacts?

Since exact information regarding the above three impacts could not be exactly determined using public sources, and since the correlations between some of the policies (and their impacts when implemented together) are very high, respondents in the PVE will be provided with categorical information on the impacts of each policy, to emphasize the relative impacts. The categorical impacts were estimated by conducting a group interview (focus group) with three Israeli transport policy experts, who debated and agreed upon the categorical impacts, shown in table 5.5 below.

Table 5.5: Categorical impacts of each policy. Travel time improvement and reliability improvement effects are evaluated on a categorical scale of between 0 (no impact) and 5 (highest impact), while Reduction in available public car parking & roads is evaluated on a (negative) categorical scale of between 0 (no reduction) and -5 (highest reduction)

Policy	Reduction in available public car parking & roads	Travel time improvement	Reliability improvement
Better connected public transport dedicated road network within and between cities	-5	4	4
Increase of Saturday shuttle service from suburbs to TLV and within TLV	0	0	1
Improvement of accessibility of the street and bus stations to the physically disadvantaged community	-2	1	1
Promoting technological infrastructure for smart transportation	0	3	2
Acceleration of the bike lane project	-3	2	4
Improving the pedestrian experience within cities	-2	1	0
Acceleration of the metro project	0	5	5
Acceleration of the light rail project	-4	4	5
Addition of direct bus lines to employment centers	0	3	2
Increasing frequency and expanding bus service from residential neighborhoods to train stations and synchronization with the train schedule	0	3	2

06 Face Validity Questions: How do Israeli respondents evaluate the face validity of a PVE?

This thesis also aims to investigate how Israeli citizens evaluate the face validity of a PVE. This is done to obtain more insight into the face-validity of PVE when tested on different countries and cultures, other than the Netherlands. To be able to reflect on the face validity results of this thesis in comparison to other PVEs conducted in the Netherlands, the face-validity questions from a similar transport-related PVE in Amsterdam were used also for this experiment:

FACE VALIDITY QUESTIONS INCLUDED:

The following face validity statements were included in the PVE, where individuals had to rank each statement with a 5-point Likert scale (strongly agree, agree, neutral, disagree, strongly disagree):

- I was convinced of my choices
- I found the questions asked to me in this study understandable
- I think it is good that the decision-makers involve citizens in making choices between transport projects.
- The experiment provides decision-makers with relevant information for making choices between transport projects.

Figure A.10: Tel Aviv PVE Introduction package to PVE experts - page 6

A.4.2. Concept PVE presented to PVE Experts

In this section, the presentation given to PVE experts showing the initial concept of the Tel Aviv PVE (in English) is shown. Based on this information, feedback was provided to improve the consultation by PVE experts.

Figure A.11: Tel Aviv PVE Concept Presentation - Slide 1

Figure A.12: Tel Aviv PVE Concept Presentation - Slide 2

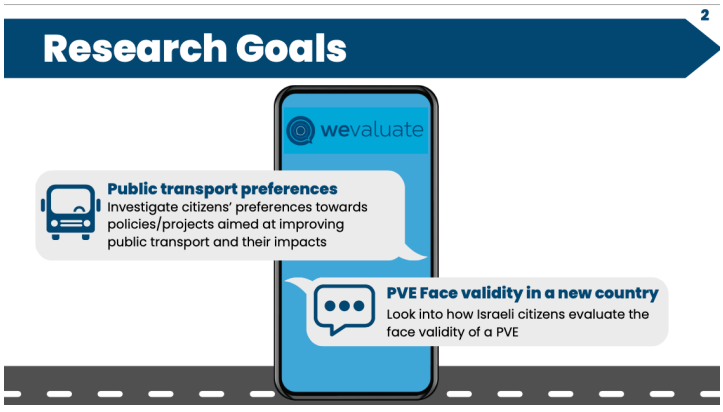


Figure A.13: Tel Aviv PVE Concept Presentation - Slide 3

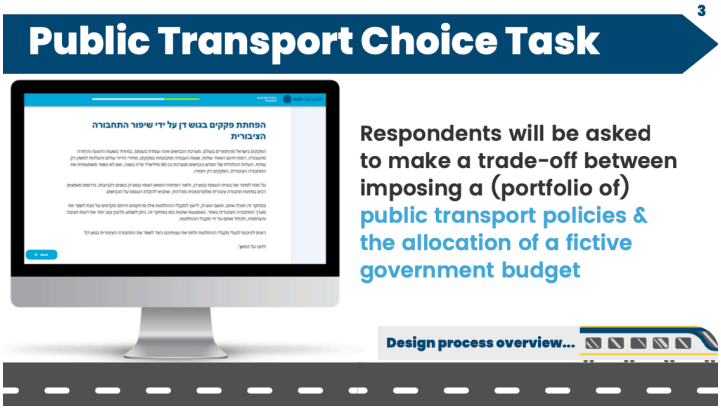


Figure A.14: Tel Aviv PVE Concept Presentation - Slide 4

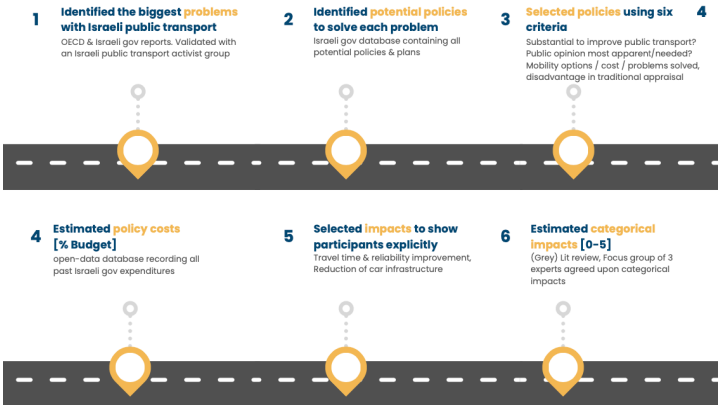


Figure A.15: Tel Aviv PVE Concept Presentation - Slide 5

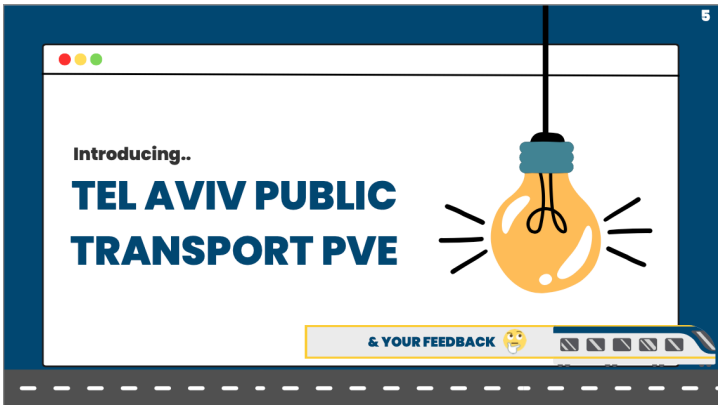


Figure A.16: Tel Aviv PVE Concept Presentation - Slide 6

Figure A.17: Tel Aviv PVE Concept Presentation - Slide 7

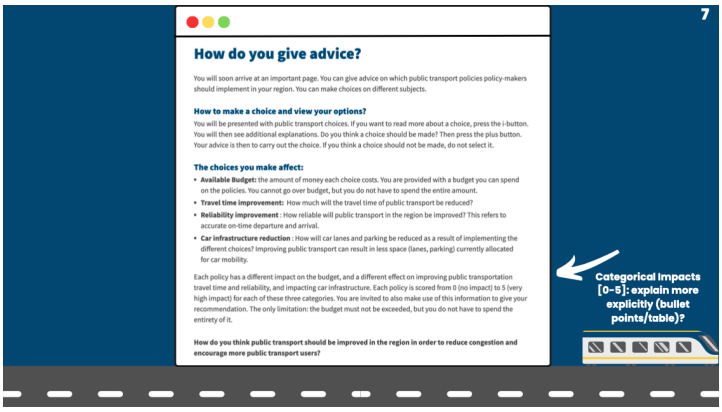


Figure A.18: Tel Aviv PVE Concept Presentation - Slide 8

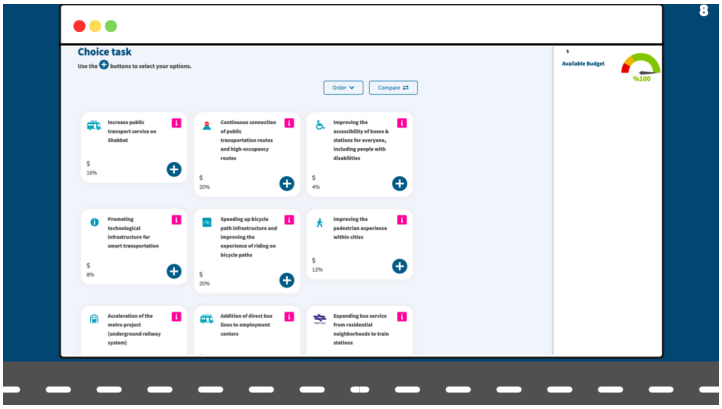


Figure A.19: Tel Aviv PVE Concept Presentation - Slide 9

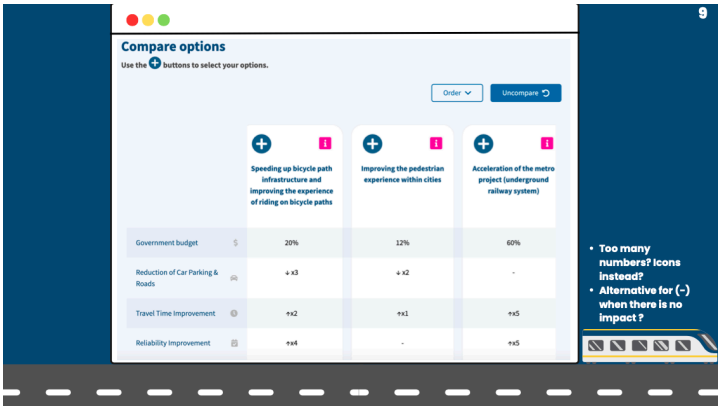


Figure A.20: Tel Aviv PVE Concept Presentation - Slide 10

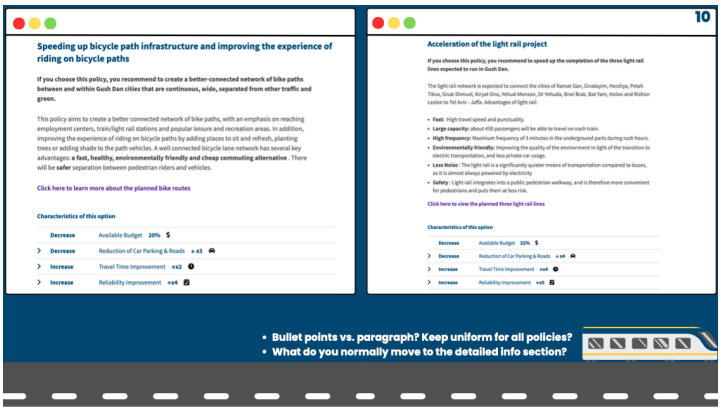


Figure A.21: Tel Aviv PVE Concept Presentation - Slide 11

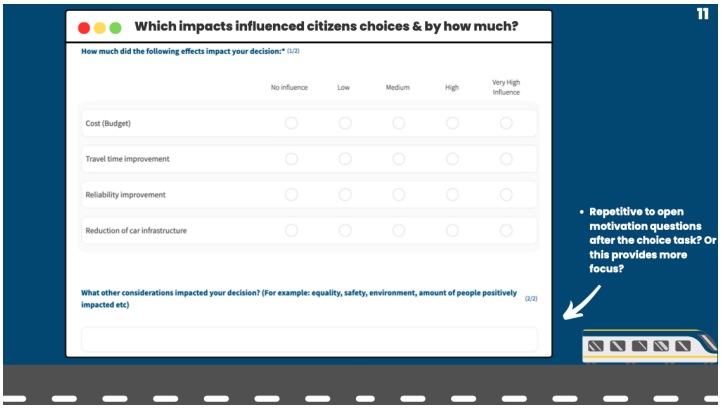


Figure A.22: Tel Aviv PVE Concept Presentation - Slide 12

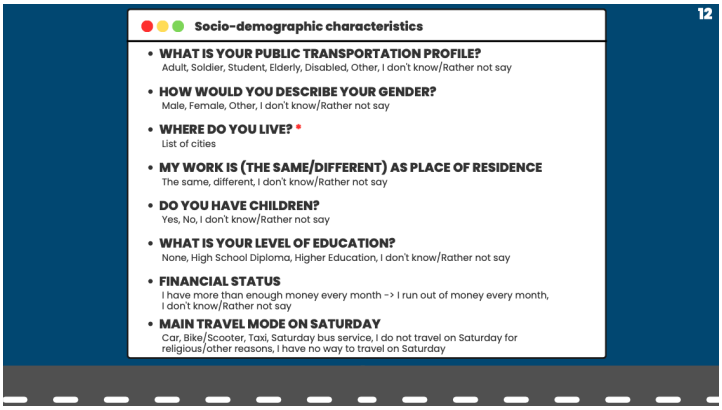


Figure A.23: Tel Aviv PVE Concept Presentation - Slide 13

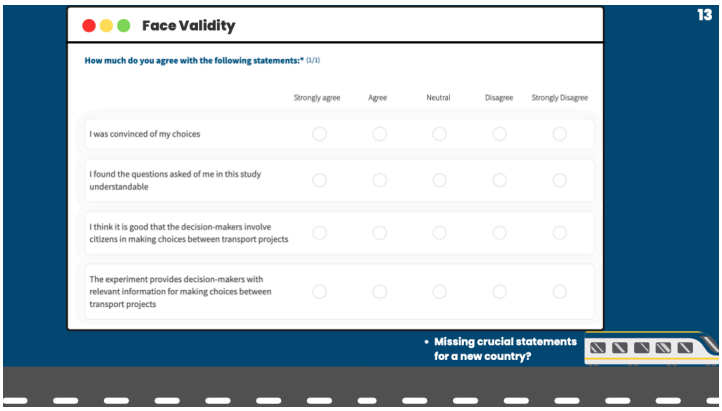


Figure A.24: Tel Aviv PVE Concept Presentation - Slide 14

Figure A.25: Tel Aviv PVE Concept Presentation - Slide 15

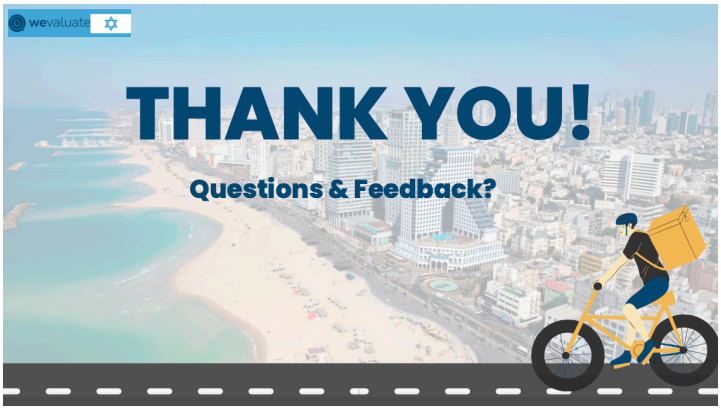


Figure A.26: Tel Aviv PVE Concept Presentation - Slide 16

A.4.3. Summary of feedback and improvement tips

After the presentation was given to PVE experts, they provided feedback on how to improve the PVE consultation. The feedback is summarized below.

Consultation insights summary: PVE Design experts

Intro page

- Writing style too academic, adapt to laypeople. For example ”air pollution levels are rising”, ”working hours are wasted In traffic”. Better to appeal to ’lay people’. They experience ”poor air quality In the city” and ”long traffic jams” etc.
- The sentences are also very long. For example: In order to solve the congestion problem in Gush Dan, and in light of the expected accelerated development in the area in the coming years, great efforts are required in the development of modern public and alternative transportation, which will lead to the relief of congestion on the roads. Below an example of how you can shorten and make more Informal.

Explanation of choice task page

- Explanation on the choice task is also too long. Shorten the first two paragraphs if possible.
- You can just leave out this paragraph: Each policy has a different impact on the budget, and a different effect on improving public transportation travel time and reliability, and impacting car infrastructure. Each policy is scored from 0 (no impact) to 5 (very high impact) for each of these three categories. You are invited to also make use of this information to give your recommendation. The only limitation: the budget must not be exceeded, but you do not have to spend the entirety of it.

Choice task

- Change the title. We generally put the general question here. So: How should the public transport in Gush Dan be improved?
- The bold paragraph you see when you click on the Information button helps a lot. As a respondent, I Immediately focus on this. But It contains quite a lot of text. See If you can shorten this. For example (for the continuous connection option):
  - What do you recommend?Creating more connected network of public transportation routes and existing high-occupancy routes.

  - How can this be done? by adding routes in the intercity and urban space based on existing road infrastructure (with an emphasis on reaching large employment centers).
  - What are the advantages? Maybe use bullet points to list the advantages/disadvantages. Now there Is a lot of text when you click the Information button.
- Instead of showing the effects with numbers, better to use icons and arrows. Alternatively, by using text. However numbers are far too confusing to follow for many laypeople.

Face Validity Questions

- The questions are taken from the Amsterdam transport 2017 PVE, which is quite old. Newer and more relevant face validity questions can be found in more recent consultations, which you should consider implementing for your research.

Socio-demographic questions

- It's a good Idea to ask questions Instead of Introducing headers such as ' Financial status'. So for example: How is your household's financial situation at the moment?
- Ask experts and make sure whether people would know what a "public transport profile" is.

B

Appendix: PVE Final Design

In this appendix the final design of the PVE is shown. Each Hebrew screenshot is accompanied by English translations. This contributes to chapter **??** of this study.

B.1. Hebrew PVE Final Design

In this section, screenshots of how the final Hebrew design looked like are presented, as well as English translations.

B.1.1. Introduction to PVE

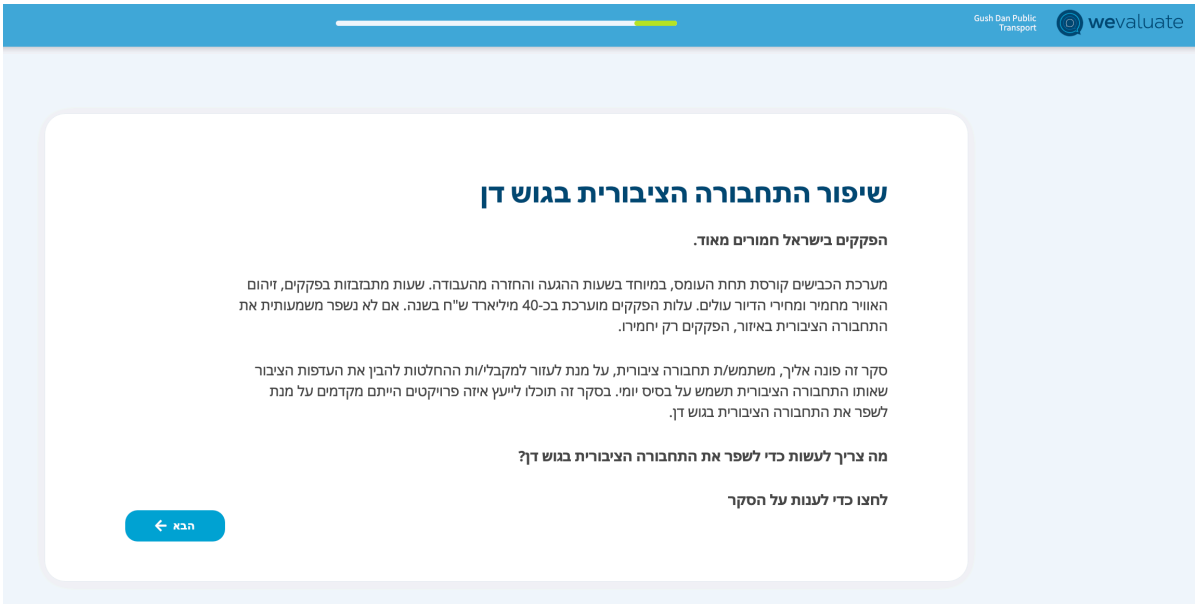


Figure B.1: Hebrew PVE introduction page: introducing respondents to the public transport issue and aim of the PVE: including their thoughts on how to improve it

English Translation

Title: Improving public transportation in Gush Dan
The traffic jams in Israel are very serious. The road system collapses under the load, especially during the hours of arrival and return from work. Hours are wasted in traffic jams, air pollution worsens and housing prices rise. The cost of the traffic jams is estimated at about 40 billion NIS per year. If we do not significantly improve public transportation in the area, the traffic jams will only get worse.
This survey addresses you, the user of public transportation, in order to help the decision makers understand the preferences of the public that will use public transportation on a daily basis. In this survey you can advise which projects you would promote in order to improve public transportation in Gush Dan.
What needs to be done to improve public transportation in Gush Dan?
Click to answer the survey.

B.1.2. Participant Consent & Privacy

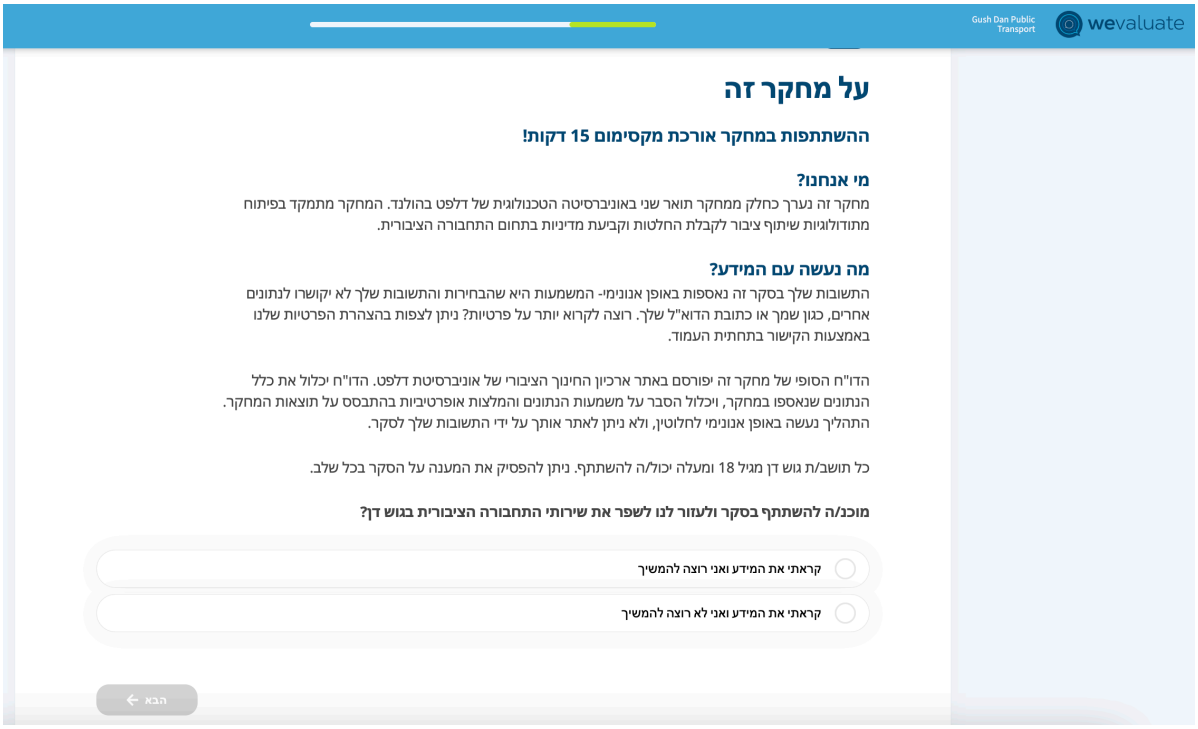


Figure B.2: Hebrew PVE consent page: introducing respondents to the research and the privacy conditions, asking respondents for their consent to participate

English Translation

Title: About this research Participation in the study takes a maximum of 15 minutes!
Who we are? This study was conducted as part of a master's degree study at the Delft University of Technology in the Netherlands. The research focuses on the development of public participation methodologies for decision-making and policy-making in the field of public transportation.
What will we do with the information? Your answers to this survey are collected anonymously - this means that your choices and answers will not be linked to other data, such as your name or email address. Want to read more about privacy? You can view our privacy statement using the link at the bottom of the page.
The final report of this study will be published on the Delft University Public Education Archive website. The report will include all the data collected in the study, and will include an explanation of the meaning of the data and operative recommendations based on the results of the study. The process is done completely anonymously, and you cannot be traced by your answers to the survey.
Any resident of Gush Dan over the age of 18 can participate. You can stop answering the survey at any stage.
Are you willing to participate in the survey and help us improve public transportation services in Gush Dan?

B.1.3. Choice Task Introduction & Explanation

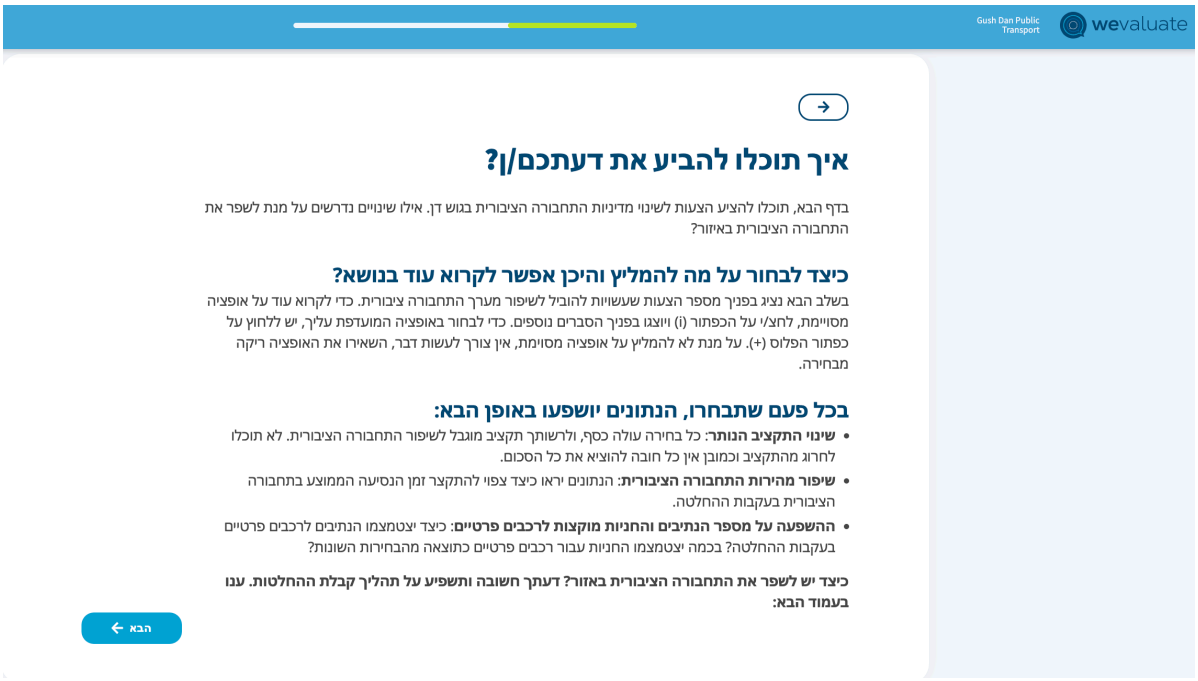


Figure B.3: Hebrew PVE choice task explanation page: introducing respondents to the choice task and explaining how they can express their opinion

English Translation

Title: How can you express your opinion?
On the next page, you can make suggestions for changing the public transportation policy in Gush Dan. What changes are needed to improve public transportation in the area?
How to choose what to recommend and where can you read more about it? In the next step, we will present to you several proposals that may lead to the improvement of the public transportation system. To read more about a certain option, click on the button (i) and you will be presented with further explanations. To choose your preferred option, press the plus (+) button. In order not to recommend a certain option, there is no need to do anything, leave the option blank by choice.
Each time you choose, the data will be affected as follows:

- **Remaining budget**: each choice costs money, and you have a limited budget to improve public transportation. You cannot exceed the budget and of course there is no obligation to spend the entire amount.
- **Improving the speed of public transportation**: The data will show how the average travel time on public transportation is expected to shorten following the decision.
- **The impact on the number of lanes and parking spaces assigned to private vehicles**: how will the lanes for private vehicles be reduced following the decision? How much will the parking for private vehicles be reduced as a result of the various elections?

How should public transportation in the area be improved? Your opinion is important and will influence the decision-making process. Answer on the next page:

B.1.4. Choice Task

Regular view of policies

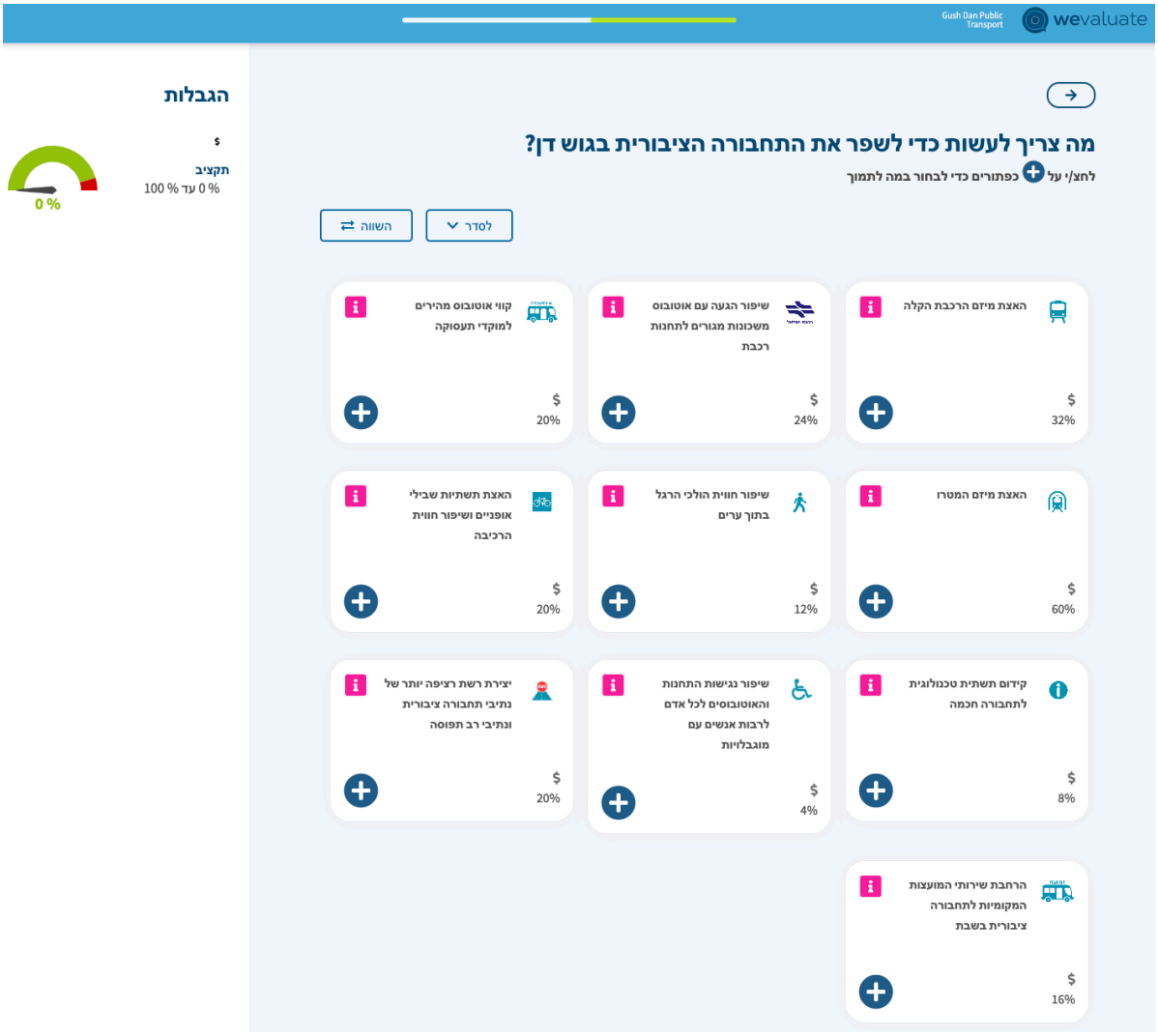


Figure B.4: Hebrew PVE choice task page: every policy option includes the percentage of the budget it requires, and respondents can click (i) to learn more about the various impacts of each policy. On the right, the budget limit is shown to respondents.

English Translation

Title: What needs to be done to improve public transportation in Gush Dan?

- **First row policies (from right to left):** Acceleration of the light rail project, Increasing frequency and expanding bus service from residential neighborhoods to train stations, Direct bus lines to employment centers.
- **Second row policies (from right to left):** Acceleration of the metro project, Improving the pedestrian/walking experience within cities, Acceleration of the bike lane project
- **Third row policies (from right to left):** Promoting technological infrastructure for smart transportation, Improvement of accessibility of the street and bus stations to the physically disadvantaged community, Better connected public transport dedicated road network
- **Fourth row policies (from right to left):** Increase of Saturday shuttle service

Comparison of policies view

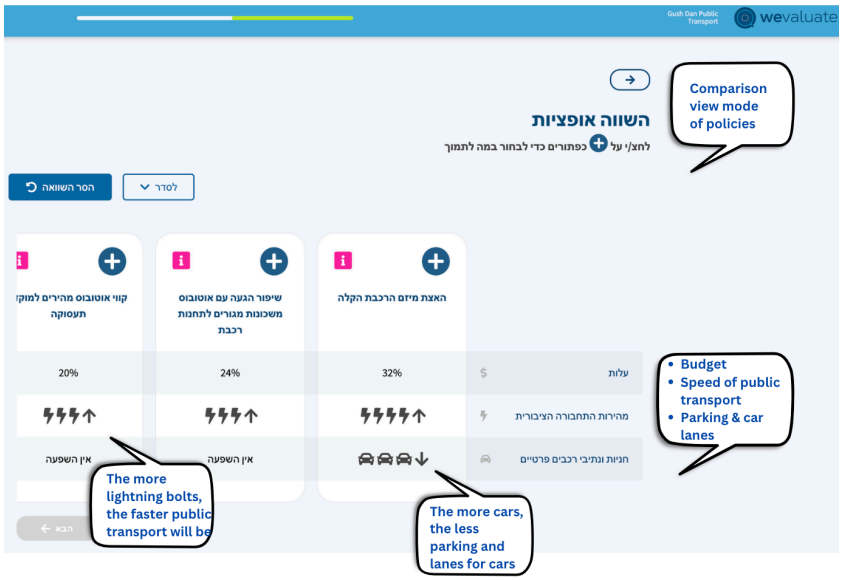


Figure B.5: Hebrew PVE choice task page: respondents can choose this comparison mode, if they would like to view the impacts on budget, public transport speed and impact on lanes and parking spaces for private cars.

B.1.5. Motivation of Choices

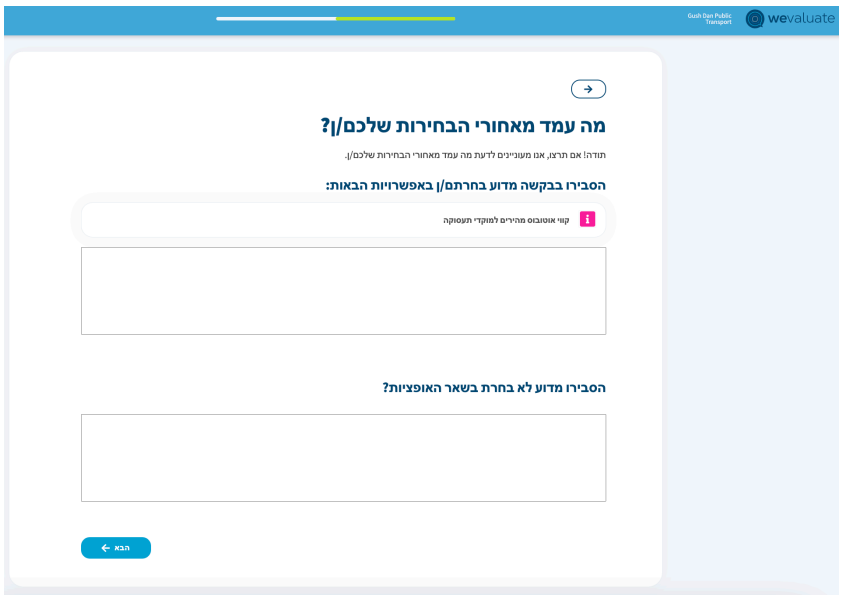


Figure B.6: Hebrew PVE motivation page: respondents can motivate via text why they chose each policy. In addition, they can motivate why they did not choose the rest of the policies.

English Translation

Title: What motivated your choices?
Thank you! If you wish, we are interested to know why you chose the following policies.
Please explain why you chose the following options:
Author note: Respondents are here shown policies they chose
Please explain the reason you did not choose the rest of the options:

B.1.6. Questions on Importance of Impacts

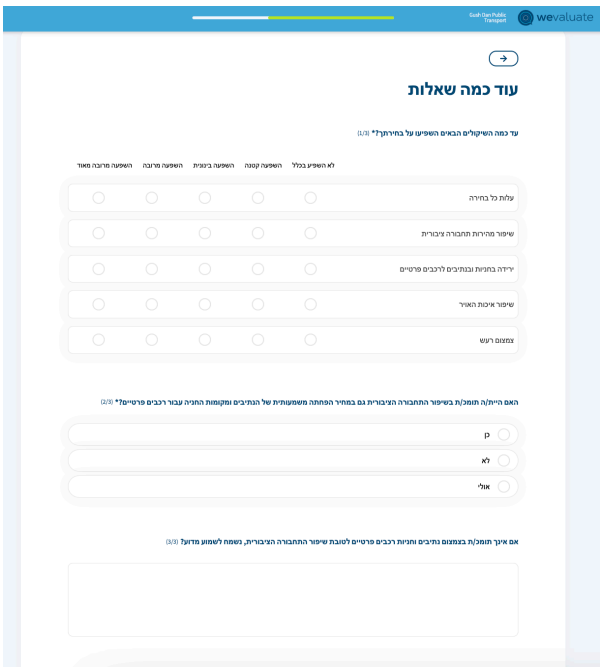


Figure B.7: Hebrew PVE impact questions: respondents are asked after completing the choice task to motivate which impacts influenced their decision making

English Translation

Title: A few more questions
How much did the following impact your decision? (Scale: did not impact at all, small impact, medium impact, large impact, very large impact)

- Cost of each choice
- Improving the travel time of public transport
- Decrease of parking and private car lanes
- Improving air quality
- Noise reduction

Would you support the improvement of public transportation even at the cost of a significant reduction in the lanes and parking spaces for private vehicles?

- Yes
- No
- Maybe

If you do not support the reduction of lanes and private car parks for the benefit of improving public transportation, we would be happy to hear why?

B.1.7. Socio-demographic Questions

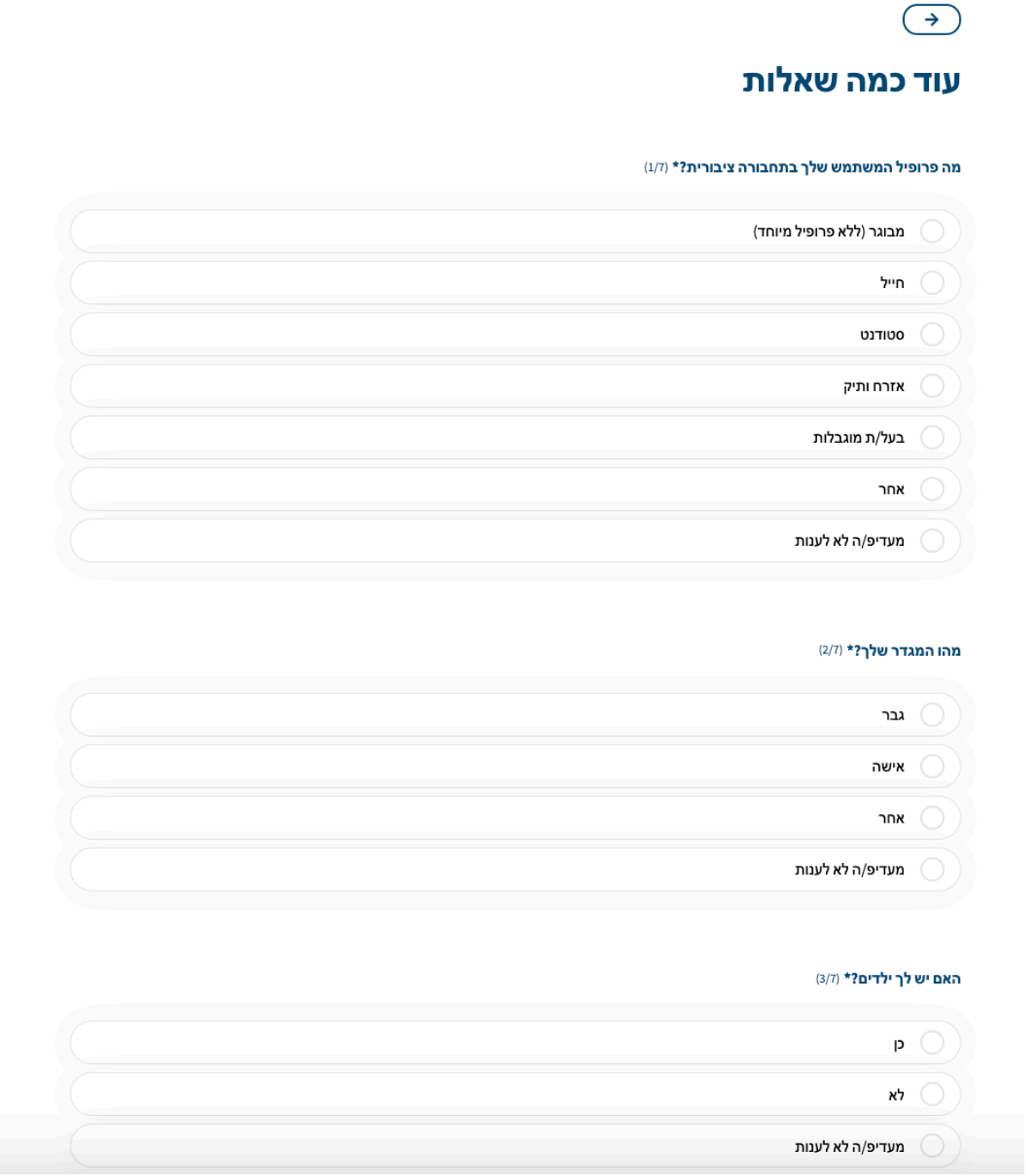


Figure B.8: Hebrew PVE socio-demographic questions (1)

מהי רמת ההשכלה שלך?* (4/7)

- אין לי השכלה רישמית
- תעודת בגרות/תיכון
- השכלה גבוהה (תואר ראשון, תואר שני, דוקטורט)
- אחר
- מעדיפ/ה לא לענות

העיר בה אני עובד/ת זהה לעיר שבה אני גר/ה* (5/7)

- נכון
- לא נכון
- אחר
- מעדיפ/ה לא לענות

איך המצב הכלכלי שלך כרגע?* (6/7)

- יש לי הרבה יותר ממספיק כסף בכל חודש
- יש לי מספיק כסף בחודש
- בקושי יש לי מספיק כסף בחודש
- נגמר לי הכסף כל חודש
- מעדיפ/ה לא לענות

באיזה כלי תחבורה את/ה הכי משתמש/ת כדי להתנייד בשבת?* (7/7)

- אופניים/קורקינט
- רכב פרטי
- מוניות
- תחבורה ציבורית חינם בשבת (לדוגמה: נעים בסופ"ש)
- אין לי איך להתנייד בשבת
- אני לא מתנייד בשבת מסיבות דתיות
- מעדיפ/ה לא לענות

Figure B.9: Hebrew PVE socio-demographic questions (2)

English Translation

Title: A few more questions
What is your public transport user profile?

- Adult (no special profile)
- Solder
- Student
- Senior citizen
- Disabled
- Other
- Rather not answer

What is your gender?

- Man
- Woman
- Other
- Rather not answer

Do you have children?

- Yes
- No
- Rather not answer

What is your education level?

- I do not have formal education
- Bagrut/High-school diploma
- Higher education (Bachelors, Masters, PhD)
- Other
- Rather not answer

The city I work in is the same city I live in:

- Yes
- No
- Other
- Rather not answer

What is your financial situation currently?

- I have more than enough money every month
- I have enough money every month
- I barely have enough money every month

- I run out of money every month
- Rather not answer

Which mode of transport do you use to get around on Saturday?

- Bike/Scooter
- Private car
- Taxis
- Free Saturday Shuttles
- I do not have any way to commute on Saturday
- I do not commute on Saturday for religious reasons
- Rather not answer

B.1.8. Face Validity Questions

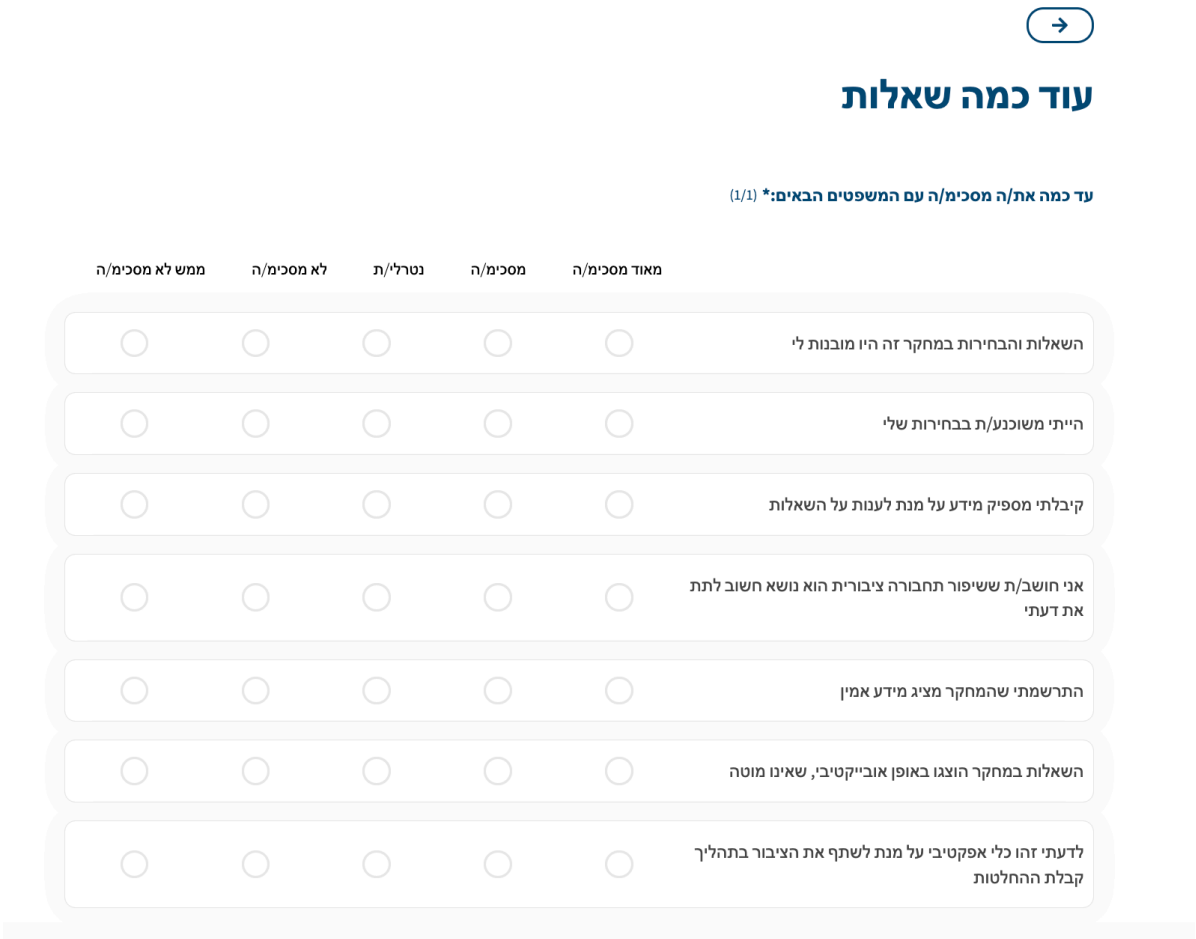


Figure B.10: Hebrew PVE face validity questions

English Translation

How much do you agree with the following statements?

- I understood the task I was asked to complete.
- I was convinced of my choices
- I received enough information for me to make choices.
- I think public transport is an important topic to give my opinion on.
- I trust that this research is honest.
- I think this is a good method to include citizens in decision-making processes.
- The research was objective and did not steer my choices in a certain direction.

C

Appendix: Positioning PVE against other participatory methods

In this appendix a literature review conducted positioning PVE as a participatory method is shown in detail. This contributes to the methodology section and motivation behind choosing PVE as a suitable participatory method.

Table C.1: Popular public participation methods other than PVE

	Description
Deliberative Mini-publics	Deliberative mini-publics (DMP) are public participatory processes where a random and heterogenous group of citizens is selected at random and invited to develop recommendations and ideas to a specific issue, together (Pow, 2023). The group must be demographically representative of the population, yet small enough to allow genuine deliberation. They tend to consist of between 15-100 individuals (though sometimes higher), and with the guidance of a facilitator, collectively provide advice on a policy issue (Goodin & Dryzek, 2006). An example of a type of DMP are citizen assemblies, which have been found to be successful in improving divisive policy issues (for example: same sex marriage). Such assemblies aim to conduct a cross-section of the citizens to understand the possibilities available to decision-makers to solve a certain issue, by encouraging dialogue (Pal, 2012). Deliberative participation approaches, are based on the premise that a diverse group of people, if given sufficient information, time and resources to deliberate on a specific topic, can produce a rational, informed judgment. For example, a recent popular outcome of a citizen's assembly was the referendum on same-sex marriage in Ireland (Shortall, 2020). Citizens deliberate a specific problem collectively, and share their unique perspectives and opinions (Pow, 2023). DAM lead to better decisions, build civic capacity and provide unique and beneficial insights for decision-makers (Shortall, 2020). However, one of the major downsides to such deliberative approaches is that they are generally time consuming. This is largely because the selection process of citizens is time consuming, since for the deliberation to be meaningful, a representative sample of a specific population must be found in addition to a diverse range of experts with different perspectives on the problem at hand (Pearse, 2020) (for example, the Irish Citizen Assembly on Abortion previously mentioned lasted longer than a year). Secondly, another disadvantages of deliberative approaches is the potential trade-off between the size and thus diversity of perspectives of the group, and the quality of deliberation which decreases with size (Pow, 2023). Meaning, often times representatives and effective deliberation clash. Related to this disadvantage, another potential disadvantage is that due to the fact that deliberation requires small groups, the amount of citizens which the method increases awareness for (which is often one of the benefits of participation methods) is limited (Pal, 2012).
Referendum	Another popular participation method which allows the inclusion of a much larger group of citizens is a referendum, a popular vote on a particular political issue. This participation method has very low 'barrier to entry for participating', and therefore can include many citizens as all they have to do is cast their vote. Referendums allow reaching a larger and more diverse group of citizens because of its low 'barrier to entry for participating'. The only effort from the citizens side, is that they must cast their vote. Moreover, a referendum can be be used as a tool to restore the legitimacy of a public decision-making (Frey & Stutzer, 2000). Nevertheless, one of the main disadvantages of referendums is that they simplify a problem into a for/against answer for a specific proposal from the public. This does not allow the public to express any nuanced opinions aside from being for/against a policy. However, some problems, and particularly in the urban and transport policy sector, policy issues are multi-dimensional and cannot be simplified into yes/no responses (similar to the problem investigated in this research) (Offe, 2017). Meaning, this method does not allow participants to share new ideas, perspectives and values to the relevant decision-makers.
Opinion Polls/Surveys	Opinion polls and surveys are often used by governments to consult citizens and are used to gather information from a community regarding a specific issue. In surveys and polls, respondents are usually asked for the extent to which they support specific policies/statements. Surveys and polls have been found to be cost and time efficient to deploy, and can reach large and representative panels, and can also be highly inclusive as they can be open for all to participate (USA Environmental Protection Agency, 2023). However, similar to referendums, such surveys can often times be too generic to provide much meaningful policy insight. Consequently, their ability to inform decision-makers is limited, and even more so in the case of transport infrastructure policy-making when respondents are not informed of the impacts of their decisions on their lives.
Participatory Budgeting	A newer type of public participation is participatory budgeting, which involves citizens directly in making decisions about budget issues. In participatory budgeting methods, citizens are invited to select a portfolio of policies, out of many potential portfolios that are possible, given a specific budget limitation (Sánchez-Pagés & Aragonès, 2009). On one hand, such methods include the advantages of many aforementioned participation methods. First, they can include a large number of participants and diverse groups of people due to the low 'barriers to entry'. Secondly, they raise awareness and knowledge of large groups of respondents at a time by putting citizens in the shoes of decision makers, educating them about a specific policy dilemma and as a result potentially creating mutual learning and understanding between the public and policy-makers (Sintomer et al., 2008).

D

Appendix: Potential Policies for the PVE

In this appendix, a detailed explanation of all policies considered for the Israel PVE is presented, even those that were not included at the end in the PVE, due to the selection process. This information and process helped solve question Q1.2.

- **Increase salary and working conditions of drivers:** Improving the quality of service (behavior and driving style) of the bus drivers. For example, examining the desired training system, defining mandatory criteria for driver training, improving driver wages and working hours, adding to tenders and operator licenses, preparing the operators and carrying out, using the bus data to control the driver's driving style, building a control mechanism. This will allow to increase the frequency of busy bus lines or add additional bus routes currently non-existent but necessary.

- **Support pilot projects of new technologies and operating concepts:** Promote field trials and pilot projects ("pilots") of new technologies and operating concepts, which have the potential to reduce congestion and encourage and transition to the use of public transportation while analyzing the response in full implementation after the end of the pilot.

- **Stricter enforcement of illegal use of public transport dedicated roads:** More advanced enforcement of prohibited use of public transportation routes within and between cities by: increasing the enforcement program of the motorcycle patrol in the traffic police, purchasing means for electronic enforcement, recruiting and certifying dedicated inspectors, and obtaining permits and required coordination.

- **Better connection of public transportation routes and high-occupancy routes (with an emphasis on large employment centers)**: Creating a more connected network of existing public transport routes and heavily occupied routes by adding more routes in the inter-urban and urban space, based on existing road infrastructure, and adding traffic lights that prioritize public transport. Preference routes for public transportation allow reliable and relatively fast bus traffic even during rush hours.

- **Increase parking and fleet of car-sharing at the expense of regular parking in busy locations**: Improving the establishment of a dedicated infrastructure for shared electric vehicles, which includes laying lines, meters, charging points and parking in busy industrial and recreational areas.

- **Increase of Saturday shuttle service from suburbs to TLV and within TLV:** Financial support for local municipalities that wish to increase bus services on Saturdays. Adding new lines from more municipalities in the region that are interested in providing this service to their residents but have difficulty committing to the budget required to participate, in addition to creating more lines and increasing this unique "free" public service on saturday.

- **Improving the accessibility of stations and buses for everyone, including people with disabilities:** Improving and promoting the existence of all the measures necessary according to the law to ensure accessibility to the public transportation infrastructure, without the passenger being required to pay extra.

- **Promoting technological infrastructure for smart transportation:** To concentrate and pool transportation information using advanced methods and tools, in unified technological infrastructures, to maximize the benefits inherent in this information for the purposes of planning, measurement, control, real-time traffic management, and more. Among other things, these efforts will improve the information for passengers in real time regarding departure and arrival times, journey duration, crowding, delays, etc. Adapting the route of the lines to the needs of the passengers will improve the travel times and the convenience of changing the lines on the one hand, and on the other hand will bring new passengers for whom the service is currently not accessible. Adjusting the locations of the stations will shorten the distance to the stations and improve accessibility on foot and by bike to the station.

- **Traffic education programs:** To encourage sustainable and safe transportation that will be integrated into the curriculum, it is possible to promote programs designed for students, children and the elderly. The program will include, for example, theory and practical experience in cycling, public transport and light transport and will be adapted to different ages and different population groups. In addition, the education program will raise awareness of new transportation options that passengers may not have known before (e.g., new bus lines, etc.).

- **Stricter enforcement of (electric) scooter and bike laws:** Increasing intra-city enforcement of cycling and electric scooter laws (such as the use of helmets, permitted speed, prohibition of riding on sidewalks, etc.), by purchasing means for electronic enforcement, and recruiting and certifying dedicated inspectors.
- **Acceleration of the bike lane project (with an emphasis on reaching employment centers and train/light rail/metro stations):** Accelerating the existing plan to create a network of connected bicycle paths in Gush Dan and improving the experience of riding on bicycle paths by adding places to sit and refresh, planting trees or adding shade to the path vehicles.
- **Improving the pedestrian experience within cities:** Improving the pedestrian experience in cities by, for example, widening sidewalks while reducing parking spaces, adding shade by planting trees, adding pleasant seating. Creating preferential infrastructures with an emphasis on city centers, employment centers and train stations.
- **Improve bike parking capacity in main PT stations, working and leasure zones:** Increasing the capacity of parking spaces for bicycles especially in train stations, in light rail stations that will be opened in the future, and in busy industrial and entertainment areas.
- **Increasing frequency and expanding bus service from residential neighborhoods to train stations and synchronization with the train schedule:** Addition of new daily trips and increased frequency of existing lines to Israel Railways stations. As part of the upgrade, new bus lines will be operated, which will improve the transportation connection between residential areas and Israel Railways stations.
- **Accelerate light rail project:** Act to accelerate the light rail project, and to shorten the schedule for the completion of projects that are in the stages of execution or in advanced transportation planning.
- **Accelerate metro project:** Act to accelerate the metro project, and to shorten the schedule for the completion of projects that are in the stages of execution or in advanced transportation planning.

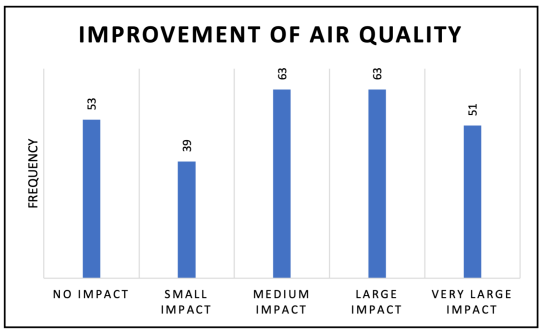
E

Appendix: PVE Results

In this appendix the results of the statistical analysis of the policy preferences and impact preferences of Tel Aviv residents is shown. Also, more extensive results from the content analysis of the written motivations of participants are shown. These insights contributed to answer question Q1.3.

E.1. Results Q1.3: Policy Preferences & Impacts

E.1.1. Bar Charts of Impacts



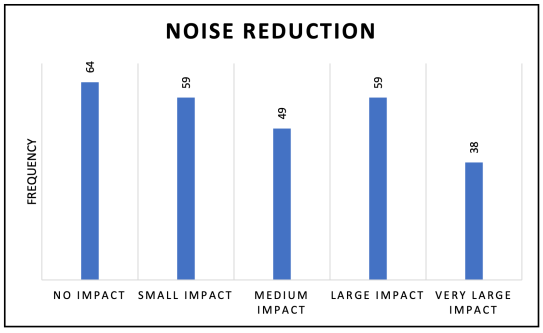


Figure E.1: Bar charts of impacts, $N = 269$

E.2. Content Analysis: Qualitative Motivations Pro Each Policy

Table E.1: Overview of qualitative motivations for each policy, where 23 categories were identified in total after analysing all written motivations (716 in total). Motivations comprising over 10% are highlighted.

Catetegory	Priority Lanes	Accessibility	Smart Transport	Bike Lanes	Walking infrastructure	Metro	Employment center buses	Bus connectivity to trains	Light Rail	Shabbat Transport
Improve travel time	**34 (22%)**	8 (8%)	**25 (25%)**	**22 (28%)**	1 (2%)	1 (2%)	**16 (21%)**	3 (5%)	**20 (37%)**	1 (2%)
Improve PT efficiency	9 (6%)	3 (3%)	8 (9%)	**13 (16%)**		1 (2%)	**20 (27%)**		**8 (15%)**	
Improve PT reliability	7 (5%)	5 (5%)	7 (8%)	5 (6%)		1 (2%)	4 (5%)		**7 (13%)**	
Large commuter capacity	**17 (11%)**	3 (3%)		**15 (19%)**					**1**	
Believe this will reduce congestion substantially by encouraging commuters to use this mode of transport	**44 (28%)**	**14 (15%)**	**26 (28%)**	**23 (29%)**	**10 (20%)**	**15 (33%)**	**10 (13%)**	**7 (11%)**	**23 (43%)**	2 (3%)
Add new public transport mode that doesn't exist yet	7 (5%)			4 (5%)						
Better for environment & health	2 (1%)		2 (2%)	5 (6%)	**8 (16%)**	**13 (29%)**	2 (3%)			
Slow progress is disturbing the surroundings	**20 (13%)**			3 (4%)						
Public transport similar to "abroad"	4 (3%)			6 (8%)		1 (2%)	3 (4%)		1 (2%)	
Increase safety	1 (1%)				**22 (43%)**	**13 (29%)**	1 (1%)	2 (3%)		
Improve connectivity to work	2 (1%)	5 (5%)	**17 (18%)**	1 (1%)		2 (4%)	1 (1%)			
Increase flexibility	1 (1%)					3 (7%)			3 (6%)	
Improve connectivity between cities	**13 (8%)**	1 (1%)		**10 (13%)**			2 (3%)			
"Must have" in public transport	**14 (9%)**	5 (5%)	6 (7%)	**21 (26%)**	3 (6%)	3 (7%)	3 (4%)	**11 (18%)**	**4 (7%)**	**7 (11%)**
Improve accessibility to train stations as it is severely lagging and preventing from relying on the train	2 (1%)	**47 (49%)**								
Cheap mode of transport	1 (1%)	1 (1%)	1 (1%)	1 (1%)	**3 (6%)**	2 (4%)				
Improve accessibility for all		3 (3%)	2 (2%)	2 (3%)	**6 (12%)**	2 (4%)	1 (1%)	**20 (33%)**	1 (2%)	
The future of public transport	1 (1%)			1 (1%)			**13 (17%)**			
Self-interest	1 (1%)		1 (1%)	1 (1%)			5 (7%)	1 (2%)		
Equality in public transport for all								**21 (34%)**		**35 (56%)**
Highly beneficial policy for families and children								2 (3%)		2 (3%)
Lack of PT on Saturday forces car-usage & ownership throughout the week										**12 (19%)**
Increase accessibility to (safe) nightlife										5 (8%)
TOTAL # Responses	***155***	***96***	***92***	***81***	***51***	***45***	***75***	***61***	***54***	***62***

F

Appendix: LCCA Results

In this appendix the results of the LCCA are shown, helping answer Q1.4.

F.1. Full Covariate Profiles for all Clusters

Table F.1: Full list of covariate profiles for all four clusters in the LCCA, where project selection are indicators and the covariates are the demographics above

	Cluster 1	Cluster 2	Cluster 3	Cluster 4
Public transport profile				
Adult (No special profile)	0.5910	0.6595	0.7930	0.6681
Disabled	0.0508	0.0000	0.0000	0.0962
Other	0.0362	0.0545	0.0204	0.0000
Rather not answer	0.0181	0.0273	0.0000	0.0000
Senior citizen	0.0632	0.0819	0.1431	0.0856
Soldier	0.0360	0.0130	0.0000	0.0304
Student	0.2048	0.1638	0.0434	0.1197
Gender				
Female	0.5766	0.5316	0.4697	0.4337
Male	0.4144	0.4684	0.5303	0.5663
Other	0.0090	0.0000	0.0000	0.0000
Have Children				
No	0.4663	0.4148	0.2775	0.4964
Rather not answer	0.0000	0.0137	0.0204	0.0858
Yes	0.5337	0.5715	0.7021	0.4178
Education Level				
Bagrut/High-School diploma	0.4173	0.3130	0.2771	0.4650
Higher education (Bachelor, Master, PhD)	0.4394	0.5097	0.5976	0.4205
No formal education	0.0270	0.0546	0.0000	0.0001
Other	0.1162	0.1090	0.1049	0.0286
Rather not answer	0.0000	0.0137	0.0204	0.0858
Work and live in the same city				
No	0.3960	0.3977	0.7290	0.2797
Other	0.0709	0.0292	0.1226	0.0858
Rather not answer	0.0269	0.0410	0.0000	0.0863
Yes	0.5062	0.5321	0.1484	0.5482
Financial Status				
I barely have enough money every month	0.2702	0.2151	0.1961	0.1628
I have enough money every month	0.4356	0.3404	0.5912	0.4526
I have more than enough money every month	0.0471	0.1115	0.0612	0.1324
I run out of money every month	0.1606	0.1504	0.0409	0.1199
Rather not answer	0.0865	0.1826	0.1106	0.1324
Mobility on Saturday				
Bike/Scooter	0.0000	0.0274	0.0612	0.2289
Do not commute for religious reasons	0.2167	0.2321	0.2562	0.1271
Free Saturday transport shuttles	0.0988	0.0666	0.0215	0.0320
I do not have a way to commute on Saturday	0.0632	0.0409	0.0000	0.0000
Private car	0.5778	0.5510	0.6375	0.5830
Rather not answer	0.0090	0.0410	0.0000	0.0286
Taxi	0.0345	0.0410	0.0235	0.0004

G

Appendix: Literature Review of the Institutional Barriers for Improving Transport

In this appendix, the extensive literature review conducted to help solve Q1.1 is shown. Specifically, the political and institutional barriers for improving public transport in the Tel Aviv metropolitan area. The government is trying to improve transport in three following areas: improving the current bus transport quality, improving alternative transport, quality and acceleration of new large scale projects.

Improving Bus Transport Quality

Buses are the main mode of public transport in the country, and it is expected that even after the larger planned projects like the Tel Aviv Metropolitan metro and light rail are completed, the public transport network will still heavily rely on buses as well (Kinan et al., 2018; OECD, 2020) and would therefore still require improvement.

In terms of political acceptance, the following was found to vary between governmental and local authorities. Among the government ministries and especially the finance, transportation, interior, and housing - the political acceptability for improving the current public transport is high, with the exception of projects where there is a conflict between the needs of the private vehicle and the needs of public transport, and the need to provide service to the private vehicle is increasing (Israeli Goverment Transport Policy Expert, 2023). At the municipal level, a large part of the mayors do not see their role in promoting public transport usage, and the public does not demand it from them, therefore they do not deal with the issue at all and lack a clear statement on the issue of encouraging public transport usage, increasing awareness to new public transport developments and improving current transport options (Israeli Public Transport Experts, 2023; Kinan et al., 2018).

In terms of the institutional barriers to improve the quality of bus service in the country, multiple barriers were found. First, the lack of an effective control system within the Ministry of Transportation and analysis and learning processes of the service level indicators in transportation in general and public transportation in particular, does not allow an understanding of the true costs of promoting various transportation projects. Secondly, the lack of a comprehensive transportation policy in the Ministry of Transportation for all departments that sets priorities, budgets and leads horizontal moves to improve the level of service in public transportation, and first and foremost the intercity public transportation route system, means the bus network cannot truly improve. Thirdly, there is an absence of binding instructions for the transportation annex in the planning committees regarding the establishment of new infrastructures. Fourthly, there is insufficient connection between the control system and the decision makers regarding the operation of existing infrastructures or their replacement. For example, an effective use of the control system data that is already collected would have most likely led to setting priorities for converting routes into public transportation routes. Moreover, the local authorities do not concentrate resources to collect information about the level of service to the passenger - the one that exists and the one required by the residents - for its concentration and treatment. Finally, there are gaps between adjacent local authorities that prevent rapid advancement of solutions that require continuity between adjacent cities, such as public transportation routes, metropolitan traffic control, etc (Kinan et al., 2018).

Improving Alternative Transport Quality

In terms of political acceptance, there is moderate acceptability of the local political level for the allocation of bicycle infrastructure at the expense of private vehicles (Kinan et al., 2018). Some of the elected officials in the local authorities disapprove of changing the street section that comes at the expense of private car users. However, there appears to be greater political acceptability for implementing cycling infrastructure on new roads or when expanding an existing road (Kinan et al., 2018). The mixed perception of decision makers regarding the means to create bicycle infrastructure stems from the following reasons. First, the parking crisis is seen as a politically sensitive issue, which can decide local election systems. Second, the turnover of mayors harms the chance to establish infrastructure, since the necessary cognitive and political process takes time. Finally, disagreements between the local authority and the Ministry of Transportation. Though the local authority has authority to make public transport decisions, the budgeting of all transport projects is the responsibility of the Ministry of Transportation and Ministry of Finance (15 Minutes Public Transportation Alliance, 2023).

In terms of institutional barriers, multiple were found. First, the lack of synchronization between neighboring authorities hinders the creation of a continuous cycling network between nearby cities. The absence of metropolitan authorities makes it difficult to create continuous infrastructure for bicycles or cross-municipal projects for sharing bicycles that are shared by several cities (Israeli Goverment Transport Policy Expert, 2023; Israeli Public Transport Experts, 2023). Secondly, sometimes the political unwillingness of elected officials and residents to allocate infrastructure for bicycles/sidewalks at the expense of car lanes and parking permeates the professional level and delays processes (Kinan et al., 2018). Thirdly, the Ministry of Finance could be concerned about the financial consequences of changing the economic incentives to encourage the use of cars and the inclusion of tax benefits for the

use of bicycles (Israeli 20th Knesset, 2017).

Acceleration of New Large Transport Projects

In terms of acceleration of new large projects in the Tel-Aviv region, two can be identified: the light rail project and the metro project. After years of political opposition to the metro plan, the Israeli government recently approved the promotion of the metro law in the Knesset (Baron, 2023). The metro is one of the most ambitious infrastructure projects in Israel, and its cost is estimated at 150 billion shekels. Some local municipalities however have been unsupportive of this law, because they view it as losing their power, as it will strip them of some of their powers, resources, and priorities (Kinan et al., 2018). There is a fear that local authorities will delay the metro development, as happened during the light rail project, which will significantly harm substantial progress to be made for such larger mass transit projects (15 Minutes Public Transportation Alliance, 2023). This is also seen as one of the main barriers for implementing such larger infrastructure projects (such as light rail, metro, a network of public transport lanes) - local municipality hesitation and objections. Implementing a bottom-up approach could be beneficial here in order to strengthen public support for the metro project from the entire region, and therefore put pressure on local authorities to support and speed up the metro project.

In terms of institutional barriers, the light rail project has been developing very slowly. The first plans started in the 90's and the first light rail line "the red line" is yet operational, was delayed multiple times, and is currently expected to be operational at the end of 2023. The opening of the red line of the light rail was significantly delayed, partially due to the fact that several companies worked independently on the construction of the Gush Dan red line, and there was no synchronization between them, in additional to vast opposition and lack of cooperation of local municipalities, according to the CEO of the NTA company (Daskal, 2022).

After the many disruptions that led to the slow development and approval of light rail, there was more political willingness to support the metro law in order to avoid such further disruptions. The metro project was promoted even without the metro law, but a metro law will definitely make the process simpler (Kinan et al., 2018). So far, they have mainly dealt with the planning of the lines, and the National Planning Commission has already approved the M3 and M1 South lines. The other lines are also in the stages of planning and approval. The metro law includes several sections that constitute a real precedent. For example, a section that allows, for the first time, to expropriate land for non-public purposes and collect land as a tax. The ultimate goal is to state in law that this is the infrastructure project that will be at the top of the national priority order, which will make it possible to require contractors to prioritize it over other government projects, and will give it priority both in execution and planning (Daskal, 2022).

Appendix: Literature Review of the Problems with Tel Aviv Transport System

In this appendix, the extensive literature review conducted to help solve Q1.2 is shown. In order to identify the best policies to include in the PVE to improve transport, first, problems in the current transport system were identified. This was done in detail in the literature review below.

1. **Insufficient frequency of regional and inter-city bus lines and resulting overcrowding**: In a survey conducted by the State Comptroller of Israel, the general Israeli public has found to be unhappy with the frequency of the regional and inter-city bus lines offered to them, especially during peak hours as the lack of frequency results in overcrowding. One of the main reasons for this problem, is the underlying problem of lack of bus drivers in the country. Bus drivers salary and working conditions have been improved starting 2023, and therefore it is assumed more drivers will be available to support additional frequency in the upcoming years (Israel State Comptroller, 2019).

2. **Longer travel time than expected and delays**: Though this problem applies to all modes of transport, it is especially emphasized for bus transport. This problem stems especially from a lack of preferential infrastructure for public transportation. The government in general and the Ministry of Transportation in particular stated that the promotion of public transportation is essential for the development of the country and the development of its economy. Although in the last decade - for the first time in the country's history - most of the development budgets of the Ministry of Transportation were allocated to the field of public transportation, the lack of infrastructure intended for public transportation is still evident and felt (Israel State Comptroller, 2019). At the national level, it is seen for example in a lack of railways and a small and insufficient number of preferential routes for public transport on intercity roads. In the urban and inter-city level, there is a noticeable lack of supporting infrastructure, which makes it difficult to run high-quality and efficient bus services (OECD, 2020).

3. **Lack of public transport on Saturdays**: Israel currently does not allow public transportation on Saturday (also known as: Shabbat). This policy stemmed from government decisions based on the status quo from before the establishment of the state. The controversial Shabbat issue often comes up on the political and public agenda between the religious and the secular, and highlights the contrasts between the various publics (OECD, 2019). Due to vast public demand in the Tel Aviv region, during the second decade of the 21st century, a number of private initiatives arose whose goal was to provide transportation services on the weekends, and in particular on the Sabbath, through the establishment of cooperative associations.

4. **Lagging accessibility to elderly and physically and mentally challenged individuals**: According to studies conducted between 2020-2021, most people with disabilities in all types of disabilities (about 60%) are not satisfied with the existing public transportation accessibility solutions. Passengers with a cognitive or physical disability or with a visual disability experience difficulties during most of the journey on public transport, while people with a hearing disability or a mental disability have difficulty leaving the house, waiting and traveling. Accordingly, the proportion of people with disabilities who use the various transportation services is small, compared to the general population. Though the train system was found to be much more accessible than buses in the region, both were found lagging in terms of what is required to truly make public transport accessible to these groups in society (Israel State Comptroller, 2021).

5. **Alternative travel modes (walking/cycling) marginalized**: In Israel, the pedestrian faces many challenges and obstacles in the public space. Pedestrians are still not counted in traffic counts and are not integrated into transportation models, and their needs are not reflected in spatial planning (Kinan & Tal, 2017). Moreover, in recent years there has been an increase in the use of bicycles and two-wheeled vehicles in cities mainly due to the development of cycling infrastructure and technological applications in Israel. Despite the high public acceptability for safe riding, the political and public acceptability of redistributing the right of way, at the expense of travel and parking lanes, is low to moderate (OECD, 2019). The development of bicycle transportation on a significant scale requires the creation of a network of bicycle paths that are physically separated from vehicle and pedestrian traffic in a more accelerated manner, in order to avoid unnecessary accidents. The main barrier to increasing the rate of cyclists in Israel is the exposure of the cyclists to damage due to the lack of infrastructure, for example: when the bike lanes are not continuous and riders are forced to ride on the road (Kinan & Tal, 2017).

6. **Accidents related to electric scooters and bikes**: This problem is related to the previously mentioned problem on the list. A result of some cities lack of consistent bike infrastructure and lack

of sufficient political (and public) willingness to prioritize cycling lanes over car infrastructure are accidents involving pedestrians harmed by cyclists commuting the sidewalk, or cyclists harmed due to cycling with cars on the same road (Kinan & Tal, 2017; OECD, 2018). In addition, the utmost care is crucial for ongoing and regular maintenance of the system of paths and bicycle paths, since poor maintenance in cities around Israel and in Gush Dan have a large negative effect on the level of bicycle accidents. In contrast to maintenance related to vehicles with a large mass, any minor hazard can cause a serious bicycle accident, for example a tree branch protruding into the area of the bicycle's traffic lane, sand scattered on the bicycle path, and many other hazards (Israel Ministry of Transport, 2020).

7. **Insufficient accessibility to train stations via bus from residential areas**: For many years, villages and cities in Israel were established and developed while devoting minimal attention to public transportation to and within the residential areas. Even today, the physical planning of some of the neighborhoods that are expanding and renewing lacks essential components that would enable the provision of high-quality public transportation services. Thus, in the planning of the neighborhoods, attention is not paid to the need for proper connection to industrial and recreation areas and to mass transportation systems, and their internal planning is not adapted to the needs of public transportation (Israel State Comptroller, 2019).

8. **Substantial delays in major public transport projects**: It was found that there was a low ability to promote infrastructure projects in a short time and on the established schedules. The delays lasted for years, and in some cases even decades (Israel State Comptroller, 2019). The Israeli Ministry of Transport's inefficient conduct surrounding carrying out important projects is for example evident in the Ministry's flagship project in recent years: the establishment of a light rail system in the Gush Dan metropolitan area. This project was placed on the government's agenda in the early 1990s. However, as a result of a list of delays, mis-coordination and faulty decisions, there is still no light rail operative in Gush Dan (Cohen, 2019).

9. **Lack of female security in public transport**: According to past research conducted in Israel, women will sometimes choose not to use transportation or avoid certain stops because they don't feel safe (Gabai, 2021). In 2022, countless horrifying videos began to appear of women documenting the intolerable phenomenon in which the bus or the train, which in most cases are the only means of transportation available to them, become an easy place for sexual harassment and assault, and the attackers take advantage of this consistently, most times without any shame. The overcrowding, the fact that it is a closed space with no escape route, as well as the drivers, who are not always properly briefed on the subject and do not know how to respond or who simply ignore the complainants, have created an impossible reality for girls and women all over the country (Sevar, 2022).

10. **Lack of incentive to move to public transport**: A failed implementation in the last decade of the decisions of the government and the professional teams that were engaged in promoting economic incentives to reduce the use of private vehicles, prevented the possibility of reducing the use of private vehicles and in any case reducing the load on the roads (Kinan & Tal, 2017). Instead, incentives to use private cars was created due to a set of factors such as a road system that has priority for a private car, the taxation policy in the automobile industry, the provision of salary benefits to employees who own a private car and the lack of public transportation on Shabbat (Israel State Comptroller, 2019).

11. **Lack of sufficient public transport in non-jewish residential areas**: Despite the government's decisions and actions to promote infrastructure and public transportation services in the non-Jewish communities, there are still gaps between the non-Jewish communities and the Jewish communities, as well as large gaps between the non-Jewish communities themselves (Israel State Comptroller, 2019).

Appendix: Literature Review on the Public Participation State in Israeli Transport

In this appendix, the extensive literature review conducted to help solve Q1.1 is shown. In this review, the current state of public participation in Israeli transport and particularly the Tel Aviv metropolitan is addressed. This contributes to understanding the strengths and weaknesses of implementing public participation (and a PVE) in this context.

In terms of the current state of public participation, first one can reflect on the context and history of participation and involvement in Israel. On one hand, it is a unique context, and on the other hand the problems and challenges for public participation are also similar to many other countries. The concept of public participation first arised in Israel in the late 1970's. However until then, several major obstacles hindered public participation in decision making. Firstly, the Israeli government was structured by the British Mandate, which continues till this day, to be very centralized and hierarchical. Secondly, the first decades of the country were characterized as highly unstable economically and security wise, and therefore issues related to quality of life (public transportation, environmental quality etc) were considered luxuries and were not high in priority, reducing the interest of the government for public input on these topics. Thirdly, many politicians, public decision-makers and planners held the belief that experts know what is best for the people. Finally, when the concept of public participation began gaining popularity in public discourse, both the politicians and the public were not prepared for it and neither were the professionals and decision-makers that were expected to implement it (Sadan & Churchman, 2012).

A way to reflect on the status of public participation in Israel on a national scale since the 2000's, is by comparing it with the OECD requirements for participation. The OECD has reviewed the state of public participation in the country, as Israel is a OECD member state which means it should meet said requirements. In a report by the OECD which examined the state of public participation in the country (Sadan & Churchman, 2012), the following main conclusions were reached. First, the public is involved in decision-making often times relatively late in the process, often times only after a plan has been deposited. Secondly, the OECD generally calls for encouraging the participation of the public in decision-making regarding decisions and projects with environmental implications - a process that is not well established in the country (Israeli Public Transport Experts, 2023).

In recent years however, the concept of sustainable development has become a larger part of the discourse in government and public offices and private planning transport/infrastructure professionals. Public participation is seen as one of the major principles in the theory and practice of sustainability and as a result, public participation has gained visibility in planning circles in the country, and increased openness to public participation within the government and local municipalities. In terms of willingness and practice of public participation in the transport policy sector in Israel, one can distinguish between four main groups: private and governmental transport operators and companies, Israeli ministry of transport, local municipalities and finally, public organizations and NGO's encouraging public transport usage and development. Each group has different responsibilities and contributions to the public transport system in the country (15 Minutes Public Transportation Alliance, 2023).

Firstly, one can reflect on the usage of public participation of the **public transport operators** and companies that are responsible for the execution of transport projects. The public transport operators in Israel are responsible for the execution of the trips, for matching and meeting the schedules in accordance with the schedules established by the Ministry of Transportation, for the behavior of the drivers and for publishing information at the bus/train stops. The governmental companies and municipal companies that are responsible for the execution of projects (15 Minutes Public Transportation Alliance, 2023). For example, the Ayalon Routes company is responsible for projects of preferential routes in the Gush Dan metropolis (such as the "Fast to the City" project), and the NTA Company is responsible for the implementation of the light rail project in Gush Dan. Such companies usually do include public opinion when in their design process, however they do not usually use digital consultation tools. Such companies usually approach locals communities by sending scouts to investigate the area and physically ask locals for information, opinions and insights into the changes they wish to make to certain regions or streets. However, said consultations are usually not inclusive in the sense that anyone affected by these changes could share their opinions (Israeli Goverment Transport Policy Expert, 2023).

Secondly, one can reflect on how the **ministry of transport and Israeli government** uses public participation methods. The Ministry of Transport is in charge of budgeting different transport initiatives in the country (alongside the Ministry of Finance). In addition, it is responsible for determining the routes of the public transport lines (train, bus, and future light rail and metro lines), the location of stations, the frequency of the lines, the crowding of the buses/trains and other modes of public transport, the coordination between the schedules of different modes of transport and operators, intercity public transportation routes (and indirectly, also the urban public transportation routes), the multi-line tickets and the public transportation rates. In addition, it is the body that supervises public transport operators.

Public participation started being much more popular and in demand within the government. The government in general cooperates for example with companies like Insights (”Tovanot” in Hebrew), who also developed online public consultation platforms to allow the public to express opinions on certain matters (Insights, 2023). These platforms are different that the PVE platform, as they mainly provide ”open questions” for users to express their opinions and insights in. Though it still helps the government gain insight into the local standpoints and opinions, they claim that this encourages and collects the opinions only of the ”annoying/loud” public, as it requires the public to write and many without strong opinions would not necessarily take the time to participate (Israeli Goverment Transport Policy Expert, 2023). Nowadays, the government does tend to cooperate with such platforms as it allows them to gain insight into where public opinion is headed, but the purpose of including public opinion is mainly to just ”check a box” and state that they consulted with the public. Such public participation is especially apparent in local municipalities or governmental offices that either have some desire for public participation and inclusiveness, or more often in offices that want to ”check the box” of public participation. This is due to the fact that local and governmental decision makers still view public participation as a ”headache” and just want to say that did consult the public, for the sake saying they did. Therefore, it was found that such online tools do exist in Israel, but are used to a very limited extent and tend to encourage the ”loud audience” rather than the general public. Furthermore, the Ministry of Transport in particular does have some initiatives to consult with the public. However, when consulting, the aim of consulting the public is almost always to reduce opposition to their decisions and not designing decisions based on public opinion (Israeli Goverment Transport Policy Expert, 2023). For example, last year, they conducted a nation wide poll to collect peoples opinions on their transport presences and values (like travel time, safety etc) and it provided a lot of insight to the office regarding the public’s underlying desires, with hundreds of thousands of responses (Ministry of Transport, 2022). This was used not to shape policy making, but rather to understand the public’s overall opinion and decrease opposition to ongoing transport projects and initiatives (Israeli Goverment Transport Policy Expert, 2023).

Thirdly, there are the **local municipalities**. In terms of public transport responsibilities and power, they are responsible for the establishment of urban public transportation routes (within the scope of the local authority) and their enforcement, for the design of the bus stops in the city. In addition, they are supposed to represent the residents in front of the Ministry of Transportation (15 Minutes Public Transportation Alliance, 2023). In terms of public participation, some municipalities are more open than others. As mentioned previously, public participation is especially apparent in local municipalities that either have some desire for public participation and inclusiveness, or more often in municipalities that want to ”check the box” of public participation. They also cooperate with online tools described in the previous paragraph (Insights: (Insights, 2023)) and some municipalities conduct open town meetings to share with the public and get insight into their opinions. Moreover, initiatives to *directly* include the public in decision-making is starting to appear in the country, but is still rare and usually on a more local scale. For example, some neighborhoods in Jerusalem did start some initiatives where residents would receive a specific budget and then decide what they want to invest it in (in their region). However, these kinds of decision-making processes that directly consult the public and give them a voice on how to allocate public budget are currently mainly in pilot stages and far from an institutionalized policy or norm (Israeli Goverment Transport Policy Expert, 2023).

Finally, there are many **NGOs** that aim to change the transportation policy in Israel and promote the development of sustainable transport system which is based on high-quality public transport. For example, organizations like Transport Today & Tomorrow [1] and the 15 Minutes Public Transportation Alliance [2]. These organizations are the ones taking initiative in including public opinion in the discourse regarding public transport, and in transport decision-making. They tend to work with local authorities to push the public’s transport desires to the municipality decision-making level. These organization aim to give a platform to consumer voices in order to improve public transport nationwide. These organizations use and encourage public participation in transport policy design. Their mission is to change existing power dynamics by transforming transport users into a community of empowered activists who use their voices to advocate for their needs, and the changes required to create functional, user-friendly transport networks, and conduct a wide range of activities. For example: forming/supporting local activist groups, maintaining a hot-line for public transport passengers to share their complaints online and on the phone, surveying and analysis of travel habits via polls, working with large private employers

[1] https://www.transportation.org.il/en/about-us
[2] https://www.15minutes.co.il/home-en

to develop alternatives to car commuting for their employees, and deployment of media campaigns that encourage national conversations about the public transport issues (15 Minutes Public Transportation Alliance, 2023).

To summarize, there are many different players with different levels of influence in Israeli transport. Due to the large number of players in the public transportation arena in Israel, it is sometimes difficult to promote improvements and changes, and difficult to implement meaningful public-participation, because issues for treatment often ”fall” between the various parties due to a lack of coordination. In addition, even if the public does have complaints or would like to share their opinions, often times it is not clear who they should approach (15 Minutes Public Transportation Alliance, 2023). However, there is some level of interest in public participation both in the local and governmental levels, though until now public participation was only used to mitigate public responses to policies and not as tools to help shape transport changes. This was found to be because stakeholders find public participation time consuming and attracting mainly louder voices using the current methods being used in Israel today.

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