iMOVE 3-039 - Behaviour Change for sustainable Transport

Final report on the overall project outcomes

MS6 Report

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Executive summary

This final report synthesises the overall outcomes of iMOVE project 3-039 to provide actionable guidance for policymakers, operators and authorities on designing, developing, and implementing initiatives that deliver shifts towards sustainable travel behaviour. It brings together an international evidence base, a clear methodology and scope, core findings from new data collection, and a practical pathway for sustainable transport services in Australia with attention to both federal and state perspectives.

The study followed a three-phase, evidence-based approach. First, a comprehensive literature review identified key behavioural drivers, policy gaps, and intervention frameworks, organising widely used and emerging measures within a four-dimensional schema spanning push versus pull, soft versus hard, temporal horizon, and impact, with additional spatial and contextual considerations. Next, round table discussions with stakeholders from government, industry, service providers, academia, and international experts refined the survey instrument and clarified how attitudes, subjective norms, perceived behavioural control, and intention operate across individual, social, and system levels. Finally, an international online user survey provided the quantitative backbone of the project, yielding 4,088 valid responses across seven countries - Australia (1,034), United States (1,009), Finland (397), New Zealand (423), Singapore (411), Sweden (403), and the United Kingdom (411) - to explore public attitudes, windows of change, and responses to sustainable transport initiatives.

The main body of the report presents the empirical results from the international online user survey that underpins the study's quantitative analysis and moves from descriptive evidence to integrative indices, then to modelling for behavioural segmentation, and finally to modelling of policy acceptability. The analysis is presented in five parts. Firstly, we profile "windows of change (WoC)" (major transitions such as relocation, family formation, or job change during which travel routines may be re-evaluated) since 2023 and explain how respondents say these shaped their travel behaviour. Respondents selected up to three influences within each of four WoC domains, namely lifestyle and household, work and commuting, transport and mobility, and social and environmental factors. The data show clear variation in how often changes were selected, and how strongly they were perceived to affect behaviour. Secondly, we introduce a Sustainability Index that aggregates directional changes across modes to gauge whether a given influence tends to shift behaviour toward or away from more sustainable travel. The index

combined reported increases or decreases in public transport and active modes against reported increases or decreases in car use and adjusts for the frequency with which each influence occurs, before yielding a ratio that is comparable across the four domains. In further analysis, Negative Binomial (NegBin) count models are used to link windows of change and context to weekly one-way trips by mode and purpose. The models quantify how specific influences relate to changes in trip frequency while controlling for socio-demographics and other contextual variables. From seventy-one candidate influences, twenty-five showed statistically significant and policy relevant associations and are labelled as *Actionable Change Initiatives*. Examples include employer-linked measures, improvements to public transport networks, purchase and use of active micromobility devices, communication and public campaigns, and work location or schedule changes. The modelling clarifies which influences are associated with the largest absolute changes in weekly trips, both in desirable and undesirable directions, and therefore which levers deserve priority attention.

The third part of the user survey analysis provides descriptives of the public sentiment towards different transport initiatives. Public sentiment is strongest for measures that make public transport more affordable and accessible, such as free local services, fare discounts, and loyalty rewards, which attract around 60–70% approval with little opposition. Policies that add costs or limits to private car use, including congestion charges, peak-hour pricing, and distance-based fees, draw much higher negative sentiment and more polarised views, especially among car-dependent users. Oblimin factor analysis (eight factors) and a pooled ordered probit model was used to derive country-specific insights considering Australia as an example.

The fourth part of the analysis applies Latent Class Analysis (LCA) to segment respondents into three traveller groups that differ in resources, routines, and receptivity to interventions. The classes are labelled “Urban Strivers”, “Settled Simplifiers”, and “Dynamic Jugglers”. Descriptive profiles describe differences in age, income, work status, trip rates, and mode shares. The analysis compares how each class evaluates the transport-influencing initiatives. Urban Strivers tend to cluster around neutral assessments and show clearer support for free or lower cost public transport and some parking-related measures. Dynamic Jugglers express consistently high support across public transport, micromobility, and a range of incentive options, and they are more open to tolled options that guarantee time savings. Settled Simplifiers show selective support aligned with comfort, cost savings, and access, while expressing low support for initiatives that raise the cost of travel. In the case of Australia,

income levels indicate that Settled Simplifiers are either living on a retirement income or have very low incomes. Residence patterns differ by segment: Urban Strivers are concentrated in state capitals, with fewer in regional centres and rural towns. Settled Simplifiers are less city-based and more regional/rural, consistent with retirement profiles. Dynamic Jugglers occupy an intermediate position, showing slightly fewer capital-city residents and relatively more in regional centres. These insights segmentation provides a practical lens for tailoring intervention packages to audience needs.

The final part of the user survey analysis examines conditions under which road user charging attracts support. Generalised Ordered Logit models relate positive, neutral, and negative impact assessments to windows of change, socio-demographics, travel patterns, and country effects across eight pricing designs: four distance-based peak period charges, two priced congestion-free lanes, and two cordon charges. The models identify consistent drivers: higher environmental consciousness and employer provision of EV charging are associated with a greater probability of positive support, while tighter household finances and perceived declines in public transport quality reduce it. Country effects are notable and align with institutional experience and political context. In the UK, for example, people reacted more negatively to all eight pricing options. But in Australia and New Zealand, a significant negative reaction appeared only for the $15 cordon-based charge. Taken together, the findings indicate that acceptability hinges on perceived fairness, visible reinvestment in public and active modes, and the lived context of recent change and current travel habits.

In the final section of the report, we draw on our findings to recommend a set of actions to guide implementation in Section 6 under the heading of generating impact. Timing should be built into policy design by targeting windows of change, while strategies should be tailored using evidence-based segmentation - for example, prioritising initiatives attractive to Dynamic Jugglers while addressing cost and access barriers for Urban Strivers, and wellbeing and safety for Settled Simplifiers. The contribution of employers should be mobilised through provision of public transport subsidies, end-of-trip facilities, flexible work arrangements, and recognition schemes. Pricing mechanisms must be transparent, visibly fair, and reinvest revenues into public and active transport modes. Importantly, evaluation of impact should be embedded from the outset to enable piloting, measurement, iteration, and scaling. With equity, stable funding, and cross-sector coordination at their core, these measures provide a robust, evidence-based pathway for delivering durable and scalable sustainable behaviour change.

1 Introduction

iMOVE project 3-039, Behavioural Change for Sustainable Transport, aims to identify key attitudes and behaviours that can drive a shift towards more sustainable transport. Consequently, this project intends to provide evidence-based recommendations for policymakers and operators to support this transition through targeted interventions. Task 1 of the project reviewed key behaviour change models and their applicability to transport decisions. It assessed real-world policies and interventions implemented globally, highlighting their effectiveness in influencing travel behaviour and sustaining long-term modal shifts (Nelson et al., 2025). These insights informed the development of a framework used in subsequent stages of the project.

Task 2 gathered practical insights from organisations and governments that were actively implementing behaviour change initiatives. Through Round Table Discussions (RTDs), the task explored barriers, challenges, and enablers in policy design and implementation, particularly within the Australian context. The findings provided a critical understanding of real-world constraints and opportunities, shaping the approach for the next phase of the project (Kandanaarachchi et al., 2025a).

Task 3 focused on the design, testing, and implementation of an online survey to capture behavioural insights and assess the effectiveness of various incentives in influencing travel choices. It investigated travel behaviour changes over the past two years (from 2023) and explored how factors such as lifestyle and household changes, work and commuting adjustments, and changes in transport and mobility, along with respondents' social and environmental considerations, influenced travel behaviour. The survey also assessed the impact of government and business initiatives, including public transport pricing and frequency, active travel modes, road user charging, car sharing, and employer-led benefits such as on-site facilities to encourage active travel. Additionally, it examined the potential for packaging mobility and non-mobility services into a single app and how this might influence behaviour. The survey was implemented in Australia (1,034 responses), United States (1,009), Finland (397), New Zealand (423), Singapore (411), Sweden (403), and the United Kingdom (411).

Task 4 focused on analysing the results from the online user survey and modelling travel behaviour changes through the lens of the Window of Change (WoC) framework (Hensher et al., 2025a). This task examined how significant life events and contextual factors such as relocation, employment changes, or family transitions, can create opportunities for individuals

to reconsider and modify their travel behaviours. The analysis combined descriptive results with predictive modelling to identify key drivers influencing shifts towards more sustainable transport choices. By quantifying relationships between demographic, attitudinal, and situational variables, Task 4 provided evidence on when and why individuals are most receptive to alternative transport-influencing initiatives (Hensher et al., 2025b; Hensher et al., 2025c). The findings offer actionable insights into how targeted policies and incentives can leverage these windows of change to achieve lasting and non-marginal behavioural shifts.

This final report summarises the outcomes of the study, bringing together findings from all stages of the project. Section 2 synthesises insights from the literature review. Section 3 describes the methodology and approach applied in the qualitative roundtable discussions and the quantitative online survey. Section 4 presents the key findings from the roundtable discussions, and Section 5 reports the survey results, including the descriptive profile, the sustainability index based on windows of change, the latent class analysis, and the conditions under which road user charging would gain support. Section 6 provides recommendations for policy design and development aimed at enabling behaviour change and overall conclusions.

2 Insights from the literature

This section summarises relevant findings from available literature on behaviour-change theories and examines their relevance in the transport context. Building on these insights, we then present a framework (Nelson et al. (2025), see Appendix 1) to guide the design and evaluation of behaviour-change interventions. Finally, we introduce the literature on lifecycle events and transport before summarising the implications for this study.

2.1 Previous research on travel behaviour intervention

Arnott et al. (2014) conducted a meta-analysis across multiple transport databases and found that most transport interventions were not theory-driven, relying instead on ad-hoc information campaigns and minor regulatory measures. As a result, they were generally ineffective at changing travel behaviour, such as reducing car dependence. Subsequent research demonstrates that interventions grounded in behaviour change (BC) theories, like the Theory of Planned Behaviour (TPB), are far more successful. For instance, during the 2012 London Olympics, transport demand management (TDM) programmes based on TPB achieved significant shifts in travel behaviour across the city's network (Jones and Woolley, 2019). Behavioural insights reveal that individuals evaluate transport choices holistically, considering trade-offs between modes rather than relying solely on utility maximisation, underscoring the role of non-compensatory decision processes (Essen et al., 2020; Yusuf et al., 2022).

A number of BC theories have been applied in transport research, including TPB, the Diffusion of Innovation (DOI), the Transtheoretical Model (TTM), and more recently, Gamification each contributes to understanding sustainable travel behaviour. In summary, TPB links behaviour to intention, which is shaped by attitude (expected outcomes), subjective norms (social pressure), and perceived behavioural control (ease/difficulty). TTM frames change as five stages - precontemplation, contemplation, preparation, action, and maintenance - useful for timing and tailoring interventions in areas like smoking cessation, diet, and exercise. DOI explains how new ideas spread via innovation attributes, communication channels, time, and the social system, with adopters ranging from innovators to laggards. Gamification boosts engagement by adding points, badges, leaderboards, challenges, levels, and immediate feedback, plus social features to encourage participation—it is common in learning, health apps, employee training, and loyalty programs.

No single BC theory dominates the transport field, with more than 100 theories addressing the initiation, change, and maintenance of behaviour. Andersson et al. (2018) mapped four major BC theories namely, TPB, DOI, TTM, and Gamification across the stages of adopting, shaping, changing, and maintaining behaviours, offering a holistic view of the dynamic and multifaceted nature of behaviour change. Research increasingly integrates multiple BC theories to improve predictive and explanatory power. For example, TPB is often combined with the Technology Acceptance Model (TAM) to understand, for example, adoption of public transport apps and bike-sharing systems, while DOI and TAM have been used to jointly explain electric vehicle adoption by linking innovation attributes to perceived usefulness (Rezvani et al., 2015). The synergy of models such as TTM-TPB has proven valuable in health interventions, capturing both readiness and intention to change (Boonroungrut and Fei, 2018). Such integration enhances understanding of both behavioural intention and contextual acceptance, showing that transport interventions benefit from a multifaceted theoretical base.

A recurring insight from BC literature is the importance of traveller heterogeneity which recognises that people differ in attitudes, motivations, and constraints. Traditional models often neglect psychological and attitudinal variables, but hybrid choice models have begun incorporating them more accurately. Segmenting travellers based on attitudes and motivations, as in Anable's six traveller types (Anable, 2005) or City of Portland's cyclist categories (Dill and McNeil, 2013; Geller, 2006), allows for targeted interventions rather than "one-size-fits-all" solutions. The concept of personalised travel planning exemplifies this by tailoring strategies to specific workplaces, schools, or communities, significantly increasing active travel participation (Chatterjee, 2009; Petrunoff et al., 2016).

2.2 A conceptual framework for behavioural change interventions in sustainable transport

Recognising traveller diversity and grounding interventions in behavioural principles enables more durable and context-sensitive change. Building on the consideration of Behaviour Change (BC) theories presented in Section 2.1, we have proposed a conceptual framework (see Figure 1) which draws from insights gained from the TPB, TTM, DOI and Gamification principles and have mapped them with examples of transport interventions. Each of these theories offers complementary insights into how and why individuals adopt, maintain, or resist changes in transport behaviour. For example, TPB highlights the role of attitudes, subjective norms and perceived behavioural control in shaping travel intentions; TTM underscores the staged process

through which people move from pre-contemplation to maintenance of new behaviours; DOI explains the spread of innovations such as bike-sharing or electric vehicles through social

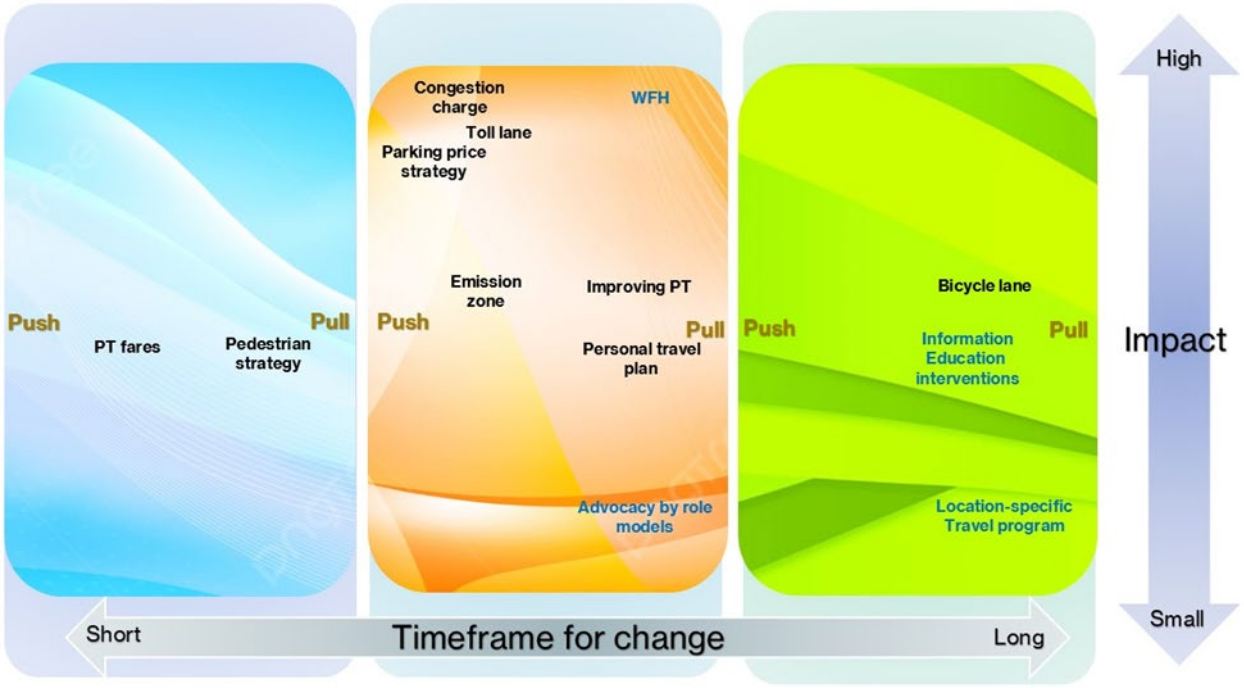

Figure 1. A new conceptual framework of behaviour change interventions in transport considering timeframe, impact and push / pull (Note: Blue text = soft measures and black / bold = hard measures) (Source: authors own)

networks; and Gamification taps into intrinsic motivation through feedback and rewards. Informed by these theoretical perspectives and previous research on transport behaviour change, the framework situates interventions along the four dimensions which influence their effectiveness, namely: time frame (short v long), impact levels (small to high), the push and pull nature of interventions, and whether they can be classified as "soft" or "hard". It also recognises the importance of considering the impact of interventions with reference to the context such as spatial location and socio-cultural context. In essence, the framework operationalises the mechanisms described by BC theories: it links individual-level psychological drivers (e.g., attitudes, readiness, motivation) with structural and contextual levers (e.g., policy strength, infrastructure, incentives).

Figure 1 introduces several further distinctions. The framework spans both transport and non-transport interventions. It can be used to highlight both successes and failures in behaviour change initiatives, and it accommodates both marginal and non-marginal change as well as temporal short and long term and spatial national, urban, and regional impacts. For illustration, measures introduced during the pandemic such as working from home (WFH) are classified as non-transport, long term, national, and high impact. Providing green infrastructure such as

parks and green corridors to promote active travel is urban and rural, long term, and moderate to high impact. Parking pricing strategies are transport, urban, medium term, and moderate impact. The remainder of this section examines the characteristics of push and pull and hard and soft measures, and their impacts, then considers temporary and long-term behaviour change. It also addresses geographic and socio-cultural context and the role of segmentation to account for traveller heterogeneity.

Transport Demand Management (TDM) measures align with the framework's push and pull and hard and soft axes, as summarised in Table 1. This classification follows Kitamura et al. (1997). Soft pull approaches, including personalised travel planning, targeted education and information, role model advocacy, persuasive technologies, and site-specific travel programmes, operate primarily through psychosocial pathways identified in TPB and TTM. They shape attitudes, social norms, and perceived control and support progression from contemplation to action and maintenance. Consistent with prior evidence, these approaches tend to yield small to moderate reductions in car use that vary by setting and by user segment, as shown in Table 2.

Table 1. Summary of examples - Hard vs Soft measures

Intervention measures	Push/ Pull	Hard /Soft	The time frame of behaviour change	Spatial Scale	Impact	Example References
Bicycle lanes	Pull	Hard	Long	Urban, regional	Small, moderate	Cleland et al. (2023)
Congestion charges	Push	Hard/ soft	Short, medium	Urban	High	Börjesson et al. (2012), Santos and Shaffer (2004), Hensher and Puckett (2007)
Parking pricing strategies	Push	Hard/ soft	Medium	Urban	Moderate, high	Kirschner and Lanzendorf (2020)
Toll lanes	Push	Hard/ soft	Short, medium	Urban	Moderate, high	Burris and Ashraf (2019), Abulibdeh et al. (2018)
Improving public transport	Pull	Hard	Medium	Urban, regional	Moderate	Fan et al. (2023)
Personalised travel plans	Pull	Soft	Short, medium	Urban	Small, moderate	Chatterjee (2009), Rye et al. (2011)
Emission zones	Push	Hard	Medium	Urban	Moderate	Nelson et al. (2022)
Information/education interventions	Pull	Soft	Medium, long	National	Small, moderate	Bamberg and Rees (2017)
Working from home (WFH)	Pull	Soft	Medium, long	Urban, regional	Moderate, high	De-Toledo et al. (2022), Hensher et al. (2024)
Location-specific travel programmes	Pull	Soft	Medium, long	National	Small	Petrunoff et al. (2016), Spack and Finkelstein (2014)

Advocacy by role models	Pull	Soft	Short, medium	National	Small	Cooper et al. (2024)
Pedestrian Strategies	Pull	Soft	Short	Urban	Small, moderate	Salon et al. (2012), Nelson et al. (2022)
Public transport fares	Push	Hard/ soft	Short	National	Small, moderate	Nelson et al. (2022)

Hard push instruments, such as road or cordon charging, emission zones, parking pricing, and managed or toll lanes, and hard pull investments, such as public transport and pedestrian infrastructure, change external constraints and opportunities. This aligns with control beliefs in TPB and with adoption dynamics in DOI as set out by Rogers et al. (2014). When objectives are explicit and context is well specified, these measures can produce moderate to high shifts in congestion and mode choice, although responses differ across user groups for example toll lane choosers versus frequent users (Abulibdeh, 2018; Burris and Ashraf, 2019). Trade-offs may also arise, such as between congestion and air quality in London, Stockholm, and Milan (Börjesson et al., 2012; Hensher and Puckett, 2007; Santos and Shaffer, 2004)

The joint consideration of impact and durability is essential for understanding long-term policy efficacy. Certain effects dissipate without continued reinforcement, whereas others, exemplified by remote work adoption and robust pricing design, exhibit notable temporal persistence (Bamberg and Rees, 2017; Hensher et al., 2023). Maintenance strategies that use feedback, self-monitoring, and timely prompts support the preservation of change over time (Cleland et al., 2023; Murray et al., 2017). These considerations are illustrated in Figure 1 and are cross referenced with Table 1 and Table 2. Together they reinforce the value of integrated packages that combine push and pull, clear outcome metrics, and ongoing evaluation across temporal and spatial scales (Austroads, 2024; Fan et al., 2023).

Table 2. Summary evidence on personalised travel planning and other soft interventions

Intervention measures	Location	Impact	Study
Personal travel planning – residential	England	Consistent reductions in car travel with an average of 11%, 4% increase in walking and 2% increase in cycling and public transport	Chatterjee (2009)
Personal travel planning – office	United States	Average vehicle trip generation was 36%-37% lower compared to other areas. Average peak parking generation was 17-24% lower than published parking generation rates	Spack and Finkelstein (2014)
Personal travel planning – university	United Kingdom	Reduction in car trips by staff and students of 11 %	Rye et al. (2011)

Personal travel planning – hospital	Australia	Driving to work among employees decreased by 13%	Petrunoff et al. (2016)
Persuasive technology – Apps	Europe (multi-country – a review of 44 studies)	Average improvements in sustainable mode use ranged between 5–15%, depending on feedback, gamification, and social comparison features.	Anagnostopoulou et al. (2018)
Special events - Ride to Workday	Australia	27% continued to ride to work, 80% of first timers indicated a positive impact on their readiness to ride to work, 57% indicated an influence on their decision to ride	Rose and Marfurt (2007)

Cities often combine push and pull and hard and soft interventions. In Oslo, a significant share of investment goes to public transport, complemented by congestion charging to reduce traffic volumes (Lian, 2008). Policy mixes align with TPB, TTM, and DOI by targeting attitudes, norms, and perceived control and by matching measures to readiness and diffusion pathways. Singapore combines high quality public transport, vehicle ownership limits, and road pricing to manage congestion despite population growth and rising incomes, though average speeds have not increased (Cheng et al., 2024). Evidence from Norway, Stockholm, Singapore, Milan, and Gothenburg shows durable benefits when congestion charging is paired with public transport improvements, while noting distributional and diversion effects (Börjesson et al., 2012; Börjesson and Kristoffersson, 2015; Givoni and Banister, 2012; Lian, 2008; Percoco, 2014). Working from home functions as a pull when enabled by flexible policies and information technology and can become harder when formalised or paired with commuting disincentives such as parking cash out or peak hour pricing, with persistence likely due to mutual benefits for employers and employees (Barrero et al., 2021; Hensher et al., 2023) . Structural changes are often supported by soft, pull-oriented information, education, and training to shift travel toward sustainable modes.

Beyond the four dimensions in Figure 1, locality matters across cities, suburbs, regional centres, and rural areas (Zhu et al., 2020). Long distance trips are few but account for most miles and emissions, so decarbonisation requires targeted strategies for long distance travel and aviation alongside urban measures (Wadud et al., 2024). Built environment choices reduce driving and support active modes, with mixed use and walkable access associated with more walking and cycling (Aditjandra et al., 2013; Cao et al., 2007). Social and cultural influences and community context shape outcomes, so interventions should be tailored using local travel data and an understanding of barriers (Cheshmehzangi and Thomas, 2016; De-Toledo et al., 2022).

Segmentation helps align Sustainable Urban Mobility Plans to regional clusters and cultural settings, and a socio ecological lens highlights subtle social cues, such as perceptions of cycling and the symbolic value of a driver license, that affect choices beyond environmental concern (Frater and Kingham, 2020; Gaborieau and Pronello, 2021; Haustein and Nielsen, 2016).

2.3 Lifecycle events and behaviour change

Some of the early studies related to lifecycle events and transport were conducted by Van der Waerden et al. (2003). They identified a set of potentially influential life events in their research and reported how the perceived characteristics of different travel modes change after such events. Klöckner (2004) conducted the first detailed online study about lifecycle events with 91 German participants aged 19 to 62 to investigate how life events influence travel mode choice and found that major events such as acquiring a driver's licence, changing schools, starting university, moving to a new town, and starting or losing a job significantly impacted transport preferences. The research also identified three distinct clusters of participants, each showing different patterns of behaviour linked to specific life events: one group whose car use rose sharply in adolescence due to early milestones like getting a driver's licence and buying a car; another whose car use declined after childhood despite similar early events; and a third whose car use remained low until age 25, when major life changes triggered a steady increase.

Scheiner (2014) utilised the German Mobility Panel (GMP) data spanning 1994 to 2010 to analyse how life events impact travel mode-specific trip rates. Key lifecycle events such as childbirth, labour market entry, and changes in residential location, accessibility, and mobility patterns showed notable effects. Notably, gender differences were observed, with men and women responding distinctly to similar life events. However, the study emphasised that while significant, the overall impact of lifecycle events on mode-specific trip rates was relatively modest. In a study from Portland, Oregon Gehrke et al. (2019) explored mode-switching behaviours through detailed observation periods, emphasizing transitions from non-car modes to car usage. Their analysis, employing mixed binary logit regression models, underscored that lifecycle events, particularly marriage, childbirth, and changes in commuting distance, distinctively influenced mode-switching behaviours. These findings aligned with the study by Li and Kamargianni (2019) conducted using Taiyuan citizens' travel behaviour survey in China in 2015. All of these studies emphasised the critical role of targeted policy interventions to prevent shifts toward car dependence during pivotal lifecycle moments, specifically in vulnerable transition periods.

In examining how lifecycle stages mediate the relationship between life events and travel behaviour, Janke et al. (2020) identified distinct patterns across different life stages, such as millennials living alone or with partners, families with children, and older adults without children. Although life stages themselves did not significantly moderate the impact of lifecycle events, they influenced the predominant travel modality types. For example, residential relocations among millennials living with partners and parents with children frequently resulted in shifts toward car dependence.

Residential relocation is one of the most extensively researched lifestyle transitions influencing travel behaviour. Systematic reviews (Ding et al., 2018; Zarabi and Lord, 2018) consistently show that moves can trigger shifts in walking, cycling, and driving, with built environment factors, such as access to public transport and parking exerting strong effects. Ding et al. (2018) found stronger evidence linking relocation to increases in walking, while Zarabi and Lord (2018) highlighted that parking access and availability of quality public transport were decisive in whether employees switched to commuting by car. Beige and Axhausen (2017) showed that people often relocate to shorten commutes, yet when moves coincide with job changes, commuting distances frequently grow longer. Their study also found that car and public transport pass ownership usually increase after relocation, while walking and cycling decline. Gehrke et al. (2019) emphasised that relocation decisions reflect broader lifestyle aspirations, with neighbourhood preferences strongly influenced by desired accessibility and housing qualities. Delbosc and Nakanishi (2017) further observed that Australian millennials planning to start families often end up in locations with poor public transport access, making it harder to maintain sustainable transport habits. Together, these studies underscore that residential moves can serve as critical intervention points for policies aimed at supporting walking, cycling, and transit use.

2.4 Implications for this study

The literature on behavioural change in transport demonstrates a growing recognition that infrastructure and incentive-based approaches remain essential but achieve greater impact when complemented by psychologically informed, theory-driven insights. Behaviour change theories such as the TPB, TTM, DOI, and Gamification provide a deeper understanding of the motivational, cognitive, and social processes underlying travel decisions. These frameworks reveal that effective interventions must address not only structural and contextual factors but also attitudes, social norms, and perceived control that influence everyday mobility choices.

The conceptual framework proposed by Nelson et al. (2025) builds on these insights by mapping interventions across temporal, spatial, and behavioural dimensions while distinguishing between hard and soft, push and pull measures. Evidence from initiatives such as congestion pricing, public transport enhancement, and personalised travel planning demonstrates that policy packages combining infrastructure, incentives, and behavioural mechanisms tend to yield stronger and more durable outcomes. Crucially, aligning policy tools with individuals' readiness to change, social contexts, and local environments supported by reinforcement and feedback strategies enhances the persistence of behaviour change over time.

The expanding literature on lifecycle events adds another important dimension by situating behavioural change within the broader course of people's lives. Major transitions such as relocation, family formation, or job change create "windows of change" during which travel routines may be re-evaluated. While effects are often context-dependent and moderate in scale, these moments represent strategic opportunities for targeted, life-stage-sensitive interventions. Understanding how life events interact with built environment characteristics, social norms, and personal aspirations allows for more precise and equitable policy design.

Overall, the literature underscores the importance of a comprehensive, life-course perspective that integrates infrastructure, incentives, and behavioural insights. Such an approach offers a promising pathway toward achieving lasting, system-wide shifts in sustainable and inclusive mobility, which is tested further in this research.

3 Study approach

Building on insights from the initial literature review, the next phase of the project gathered stakeholder perspectives and user insights to inform the development of evidence-based recommendations for advancing sustainable travel behaviour. First, we conducted Round Table Discussions to capture expert, governmental, and industry perspectives on policy, practice, and implementation challenges. Next, we designed and fielded an international online user survey to assess public attitudes and behavioural triggers that influence the adoption of sustainable transport options. This section details the design and implementation of each stage.

3.1 Qualitative phase - Design and implementation of round table discussions

The Round table discussions (RTD) were designed to provide an expert-informed, multi-stakeholder perspective on sustainable transport interventions and to shape the subsequent survey design. The central aim was to engage with representatives from government, industry, research organisations, and peak bodies currently implementing or supporting policies, pilots, and projects that promote behavioural change and modal shift toward sustainable transport.

3.1.1 Participant identification and grouping

Potential participants were identified through a combination of publicly available sources (e.g., organisational websites, published reports, and professional directories) and professional contacts provided by project partners namely, Intelligent Transport Systems Australia (ITSA), the Department of Infrastructure, Transport, Regional Development, Communications, Sport and the Arts (DITRDCSA), the Department of Transport and Main Roads (DTMR), and iMOVE CRC. To ensure balanced participation and reduce dominance bias, the contact list was stratified into four groups (refer Table 3 for details):

1. Government (all tiers)
2. Industry
3. Transport Service Providers (with selected researchers integrated into the previous two categories)
4. International (Mixed Group)

This structure supported thematic consistency while maintaining diversity in professional perspectives and regional contexts.

3.1.2 Recruitment and structure of discussions

Invitations were issued by ITLS and included an official invitation email, a discussion agenda, and a Participant Information Statement. Each RTD lasted approximately two hours and was facilitated by a professional market researcher to ensure consistency in moderation and participant engagement.

Each session followed a structured agenda that included:

- *Introduction and Project Overview:* Briefing on study objectives, background, and preliminary findings from the literature review.
- *Participant Introductions:* Each participant introduced their professional background and shared an initial reflection on the project scope.
- *Experience Sharing:* Open discussion of existing interventions, policies, or initiatives that successfully influenced sustainable travel behaviours.
- *Capacity Building:* Exploration of challenges and strategies for improving institutional or organisational capacity in delivering behaviour change (including leadership, resourcing, and skills development).
- *Preparation for the User Survey:* Solicitation of feedback on the forthcoming survey design and identification of key areas of focus for broader public consultation.

In addition, two one-on-one online interviews were conducted with participants unable to attend RTDs, ensuring their perspectives were still captured.

Table 3. Composition of the RTDs

Round Table	**Date**	**Participant Category**	**Number of Participants**
Peak Body / Industry	21 November 2024	Industry and Advocacy Groups	10
Government / Researchers	28 November 2024	Government and Academia	4
Transport Service Providers / Industry	4 December 2024	Service Providers and Industry Experts	9
International (Mixed)	5 December 2024	International Experts	6

Each RTD was recorded, and anonymised transcripts were prepared for subsequent analysis. A researcher from ITLS attended each discussion to provide project context, highlight evidence review findings, and collect concluding insights relevant to the forthcoming survey. Transcripts were thematically analysed to identify recurrent themes, contrasts between groups, and emergent recommendations regarding behavioural interventions.

3.2 Quantitative phase – Design and implementation of the online user survey

As noted in Section 2.3, the contemporary travel behaviour literature, and the RTDs (see Section 4) emphasises the importance of understanding the triggers behind sustainable behaviour change, which have been shown to play a crucial role in user adoption of sustainable transport solutions. These “windows of change"(WoC) focus on the moments when individuals are more likely to change their travel behaviour. In the survey design, these moments have been categorised into four broad areas: lifestyle and household changes (e.g., changes in living arrangements, family structure, or personal habits), work and commuting-related changes (e.g., changes in employment, workplace incentives or commuting patterns), transport and mobility changes (e.g., changes in vehicle ownership, public transport use or travel habits) and social and environmental considerations (including awareness and influence of others). The survey also explored how the participants react to fifty different initiatives that are employed by the government, organisations and employers to influence transport choices. It is increasingly recognised that non-mobility service providers (NMSPs), such as major employers, retailers and event managers, can play an important role in incentivising travel behaviour change , although this is less often recognised (Hensher and Nelson, 2025); this aspect was also explored in the survey. Figure 2 indicates the overarching framework developed to conceptualise the formation and change of mobility choice and trave behaviour. It shows that mobility choices and behaviour is affected by a respondent’s socio-demographics and their attitudes towards different transport modes and aspects of sustainability, supply side infrastructure (including facilities provided) and the influence of travel attributes such as cost, time and convenience.

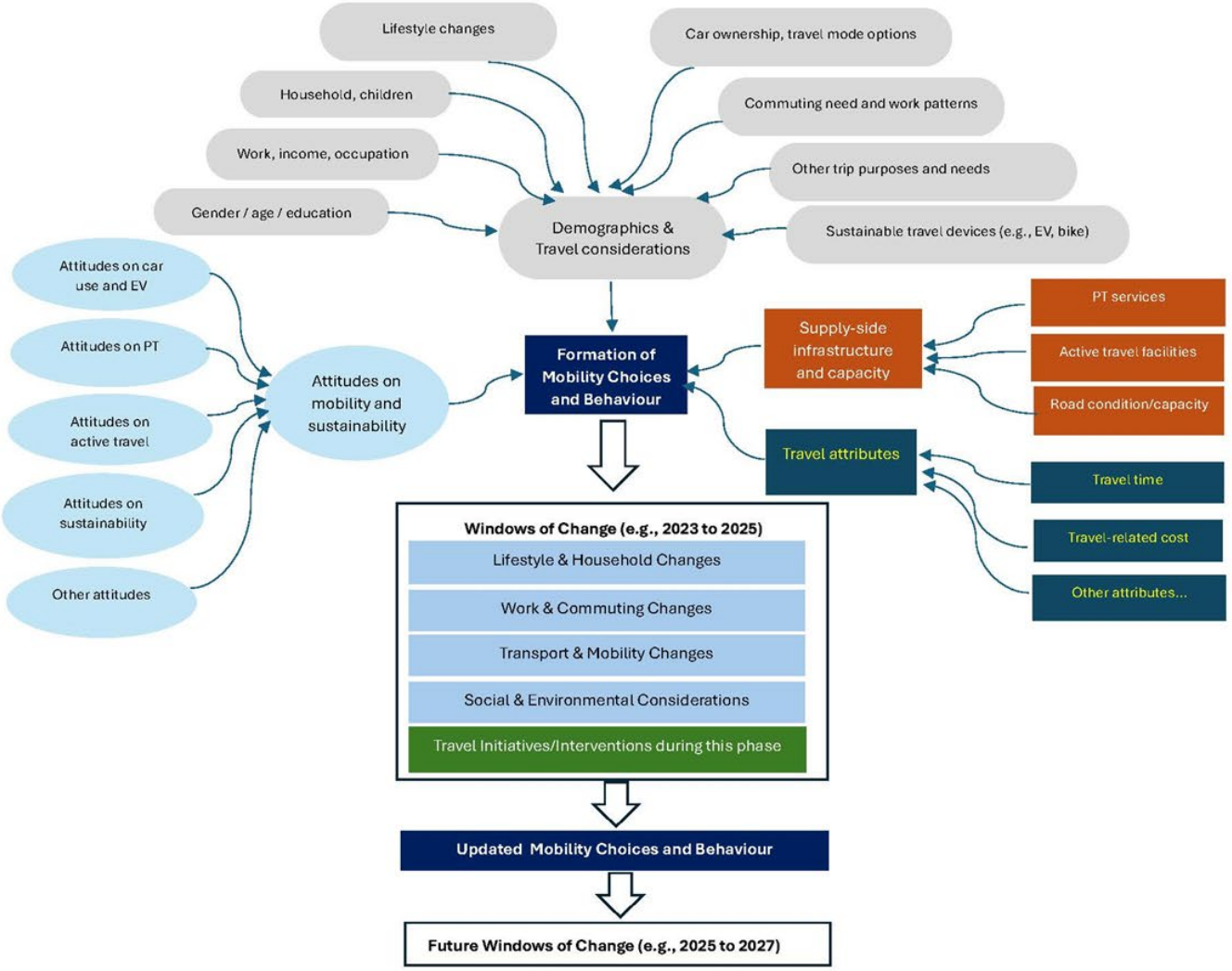

Figure 2. The framework of the formation and change of mobility choice and travel behaviour

With this context in mind, the following research questions were identified for the user survey. A mapping of the research questions addressed by the survey and the survey questions is included in Figure 3.

- *RQ 1 - Which interventions (both transport and non-transport) are perceived by respondents as most effective for accelerating sustainable transport use?*
- *RQ 2 - How do reference points for behavioural change, such as lifestyle and household changes and changes in work and commuting arrangements, shape public attitudes toward adopting sustainable travel behaviour?*
- *RQ 3 - What sustainable transport initiatives are likely to be most effective when linked with the reference points in RQ 2?*
- *RQ 4 - Is there a potential for packaging various non-mobility services with transport interventions to improve adoption?*

After finalising the draft survey design and content, it was coded into the ITLS web-based platform to enhance user-friendliness and streamline administration (see Appendix 2 for screenshots of the survey). Designed to take no longer than 15 minutes, the survey underwent internal testing to identify typographical errors, assess its length, and resolve inconsistencies. An internal pilot was conducted with the ITLS research team and the Queensland Department of Transport and Main Roads, after which the survey was revised considering the feedback received. The broader pilot involved 100 participants across Australia, Finland, New Zealand, the USA, the UK, Singapore, and Sweden, ensuring cross-cultural applicability and comparability.

With a target sample size of 4,000 participants, the final survey aimed to provide a comprehensive understanding of local travel patterns and relevant interventions. The survey primarily targeted respondents in Australia, reflecting the local context and transport policies influencing travel behaviour and the focus of this iMOVE project. In addition to 1,000 respondents from Australia, a comparative sample of 1,000 from the USA and 400 each from Finland, New Zealand, the UK, Singapore, and Sweden were obtained to offer a broader perspective and enable international comparisons. These countries were selected based on their advanced transport systems, progressive policy initiatives, diverse approaches to sustainable mobility, and the ability of respondents to complete the survey in English. By incorporating insights from multiple regions, the survey sought to identify common trends, key differences, and best practices in influencing travel behaviour. This comparative approach supports the

assessment of the effectiveness of various interventions and the level of awareness across different urban and policy contexts. A third-party panel survey provider was engaged to ensure robust data collection, with flexibility in sample sizes to adapt to evolving research needs. The ITLS research team continuously monitored data quality throughout the collection period and applied rigorous checks at both the pilot and full implementation stages to ensure the validity of survey responses. Accordingly, 526 responses were excluded due to unacceptable data quality. The final sample includes 1,034 respondents from Australia, 1,009 from the USA, 397 from Finland, 423 from New Zealand, 411 from Singapore, 403 from Sweden, and 411 from the UK, summing up to a total of 4,088 respondents.

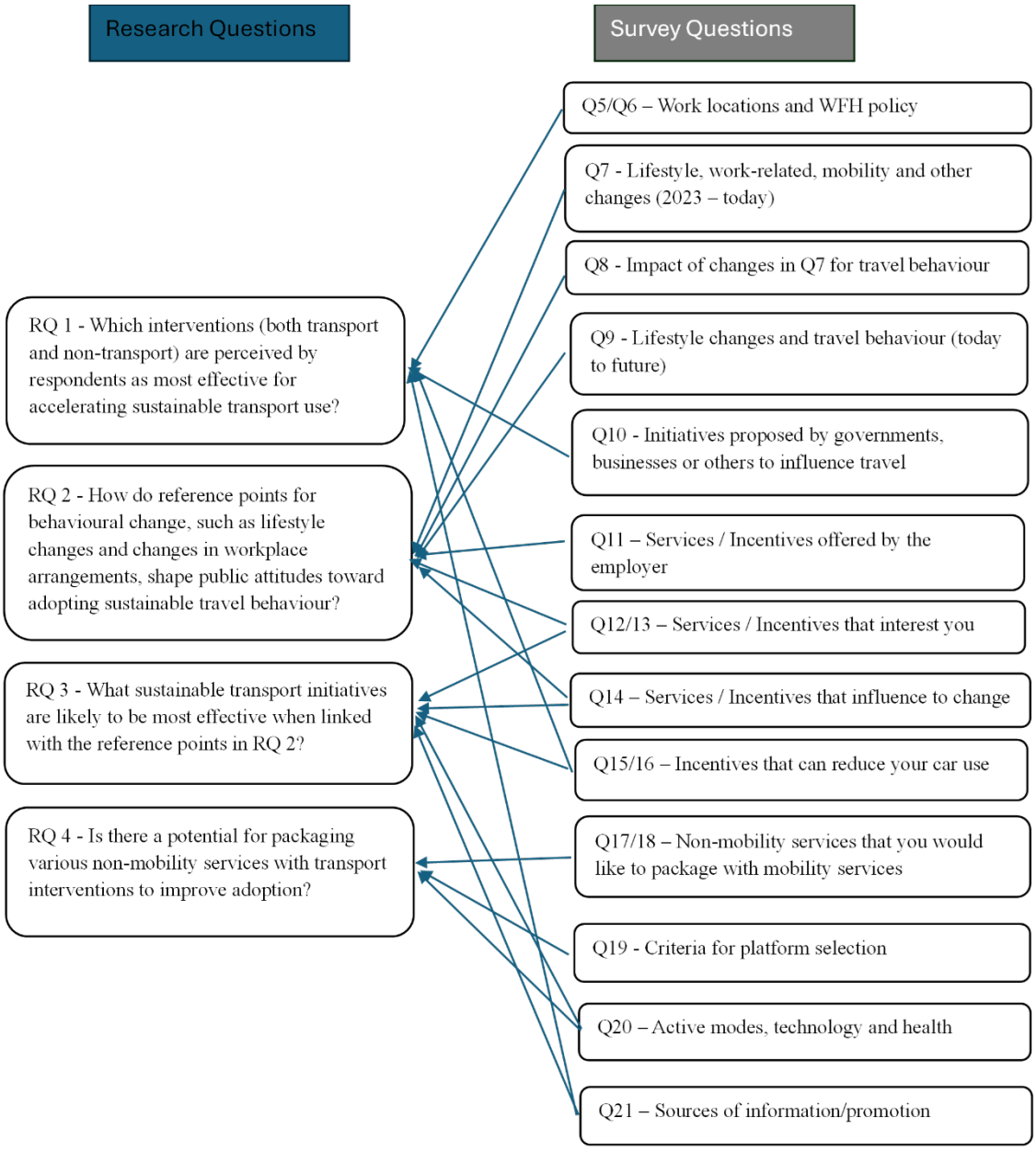

Figure 3. Mapping of the survey questions with the research questions

4 Findings from the Round table discussions

This section presents the key findings from the roundtable discussions (RTDs) in two parts. The first highlights some descriptive findings, followed by analytical insights situated within the TPB Ajzen (1991) and the Socio-Ecological Model (SEM) (Bronfenbrenner, 1986; Kilanowski, 2017). The conceptual framework developed (Figure 5) illustrates the dynamic interrelationships between attitudes, social norms, perceived behavioural control, and intention, as shaped by stakeholder experience and contextual factors.

4.1 Descriptive findings

Findings from the RTDs provided a wealth of insights into the opportunities, challenges, and strategies for advancing sustainable transport interventions. Feedback on the project objectives revealed broad support for its forward-thinking approach, particularly in promoting behaviour change through incentivisation and gamification. Key drivers of success identified during the discussions included collaborative governance, supportive stakeholders, and the facilitation of user-driven behaviour change. A focus on human factors emerged as essential, with participants stressing the importance of passive encouragement, personal decision-making, and individual benefits like cost savings and improved well-being. Figure 4 provides a summary of integrated steps that have the potential to drive sustainable behaviour change considering both user and other stakeholder perspectives.

	End-users	Stakeholders
Increase awareness…	…of available services and infrastructure	…of the success of existing initiatives
Improve understanding…	…of individual, community and societal benefits	…of community wants and needs
Alter perceptions…	…of what I can do and how easy it is to do it	…of what can be achieved by well supported and funded initiatives
Modify attitudes…	…of how it suits / even benefits my lifestyle	…to the priority given to PT and AT (and EVs and Hybrids)
Optimise experience…	…of using PT and AT (and EVs and Hybrids)	…of the impact of AT and PT (and EVs and Hybrids) on reducing emissions
Change behaviour…	…so, use of PT and AT (and EVs and Hybrids) is sustainably increased	…so, support and funding of AT and PT (and EVs and Hybrids) is sustained

Figure 4. Steps to fostering behaviour change for sustainable transport

Barriers to implementation were found to be multifaceted. User-related barriers included limited awareness, convenience challenges, and entrenched cultural norms favouring car use. Leadership-related barriers involved insufficient policy support, financial constraints, and infrastructure gaps. Fragmented initiatives, inadequate data, and competition among transport modes further hindered progress. The discussions also revealed the complexity of behaviour change, driven more by emotional than rational factors, necessitating holistic, context-specific interventions.

To overcome these challenges, participants emphasised capacity-building strategies focused on upskilling, supportive leadership, and securing funding. Upskilling stakeholders was seen as essential for enabling effective implementation and adaptation of interventions, even in the absence of comprehensive data. Supportive leadership emerged as a critical enabler, fostering collaboration across government, businesses, and communities to improve infrastructure, address last-mile connectivity, and promote inclusive transport solutions. Strengthening the evidence base through credible advocacy was identified as a key step to gaining government and private sector support.

In conclusion, the findings underscore the need for integrated, multi-faceted approaches to achieving sustainable transport behaviour change as illustrated in Figure 4. By addressing barriers at the user, leadership, and systemic levels, and focusing on enabling factors such as education, collaboration, and evidence-based strategies, meaningful progress can be made. It was felt that success lies in creating interventions that are not only physically feasible and accessible but also psychologically rewarding and socially normalised. In the future, a combination of incremental improvements and scalable solutions, supported by strong leadership and capacity-building, will be vital to fostering long-term, impactful shifts towards sustainable transport modes.

4.2 Analytical insights

This section summarises the results of the analysis and discusses the key themes that emerged from the roundtable discussions, categorising them under relevant theoretical constructs to show how they shape travel behaviour change within the given context. Comprehensive details of the analytical approach and the development of themes, together with supporting evidence from participants across all roundtable discussions, are documented in Kandanaarachchi et al. (2025a) (See Appendix 3).

Attitudes

Travel experience, raising awareness, providing incentives and perceived benefits emerged as the key themes that shape travel attitudes. Participants agreed that people adopt and sustain new travel habits when they are perceived as enjoyable, convenient, safe, and aligned with personal or collective goals. Positive travel experience, such as reliable transport and safe, well-designed walking and cycling routes that strengthen intrinsic satisfaction, emerged as a key driver of lasting change. Raising awareness and perceived benefits were also seen as critical in shaping attitudes. For example, initiatives like Queensland's 10,000 Steps programme, UK Prescription Bikes, and Melbourne's workplace cycling schemes normalised sustainable travel by linking it to health and convenience. Providing incentives has consistently proven important in encouraging behavioural change, particularly when these incentives offer direct, immediate benefits. While health and environmental concerns play a role, financial incentives, convenience, and time savings are often more persuasive. This aligns with the propositions of the SEM, which suggests that interventions operating across multiple levels, such as individual, interpersonal, and societal, are more effective than those focused on a single level.

Subjective norms

The RTDs underscored the importance of social and institutional influences in driving behaviour change. Participants emphasised that collective transformation, overarching policies and goals, and employer led initiatives play significant roles in shaping what is considered "normal" or desirable travel behaviour. Consistent and overarching policy direction at the national, state, and local levels was deemed essential to embed shared values and ensure continuity across initiatives. Effective partnerships such as public–private collaborations, inter-agency cooperation, and cross-sectoral initiatives such as integrating with non-mobility service providers, were described as essential for scaling up sustainable transport interventions. Employers, in particular, were highlighted as key agents of change: workplace initiatives such as public-transport subsidies, flexible hours, and end-of-trip facilities encourage employees to choose low-carbon commuting.

Perceived behaviour control

Perceived behavioural control was tied to physical, digital, and institutional conditions shaping travel choices. Participants highlighted modal integration to create connected networks, enabled by appropriate land use planning and funding, including mixed-use, higher-density

development near transport hubs to cut car dependency. Data accessibility underpins digital integration, empowering apps and journey panning platforms, where gamification boosts uptake. Progress depends on building capacity (physical and institutional), including infrastructure delivery, leadership, skills, and inter-organisational coordination, which drives durable systemic alignment. Initiatives like ODIN PASS and Walk My Street show how open data and incentives strengthen engagement. Finally, windows of change are crucial for developing effective interventions via targeted programs and market segmentation; for example, when a new rapid-transit line opens, target new residents and first-year students with free trial passes, onboarding, and short gamified challenges to cement sustainable habits.

Intention

The integration of attitudes, norms, and perceived control determines the strength of behavioural intention. Participants highlighted that interventions must combine personal motivation with institutional support to sustain commitment. Regular evaluation, transparent communication, and visible progress indicators such as reductions in car use or increases in active-mode share are necessary for reinforcing positive behaviour. Workplace travel programmes and social recognition schemes were cited as effective tools for maintaining long-term engagement. When sustainable transport aligns with convenience, enjoyment, and collective values, it transitions from a choice to a habit.

Figure 5 illustrates these themes under the four key constructs namely, attitudes, subjective norms and perceived behaviour and the resulting intention, showing their interrelationships and indicating the need for action across individual, social, and systemic levels. Sustainable mobility arises when interventions align motivation, context, situation (windows of change) and system design within a shared policy vision. Positive attitudes, supportive environments, and intrinsic satisfaction underpin lasting engagement, while awareness campaigns and incentives normalise sustainable choices. Enhancing perceived behavioural control through infrastructure, digital tools, and institutional capacity empowers individuals to act on intentions. Overall, Figure 5 underscores that sustainable behaviour change requires an evidence-based ecosystem where aligned policies, responsive institutions, and positive experiences reinforce one another to achieve sustainable mobility.

This framework shows how attitudes, subjective norms, perceived behavioural control, and intention interact across individual, social, and system levels. Lasting change requires

coordinated packages: positive travel experiences and salient benefits; normative support through policy coherence, partnerships, and employer programs; and enhanced control via modal integration, land-use coordination, open data accessibility powering MaaS and other apps and platforms, and capacity-building across institutions. The timing of interventions is critical, and "windows of change" targeted through segmentation can convert trial into habit when paired with incentives and clear progress indicators. While priorities differed across RTDs, participants converged on voluntary, informed change backed by consistent funding and robust evaluation the framework offers practical guidance for cross-sector design and delivery.

The framework derived from the RTD discussions suggests that enduring change requires coordinated and mutually reinforcing action packages:

- **Individual-level interventions that offer positive travel experiences and highlight tangible benefits such as wellbeing, convenience, and cost savings.**
- **Social-level mechanisms that foster normative support through policy coherence, public–private partnerships, and employer engagement.**
- **System-level measures that enhance user control and trust through integrated modes, coordinated land use, open data for MaaS platforms, and institutional capacity-building.**
- **It was also evident that targeting WoC through behavioural segmentation can convert temporary trials into enduring habits, particularly when supported by clear progress indicators and reinforcing incentives.**

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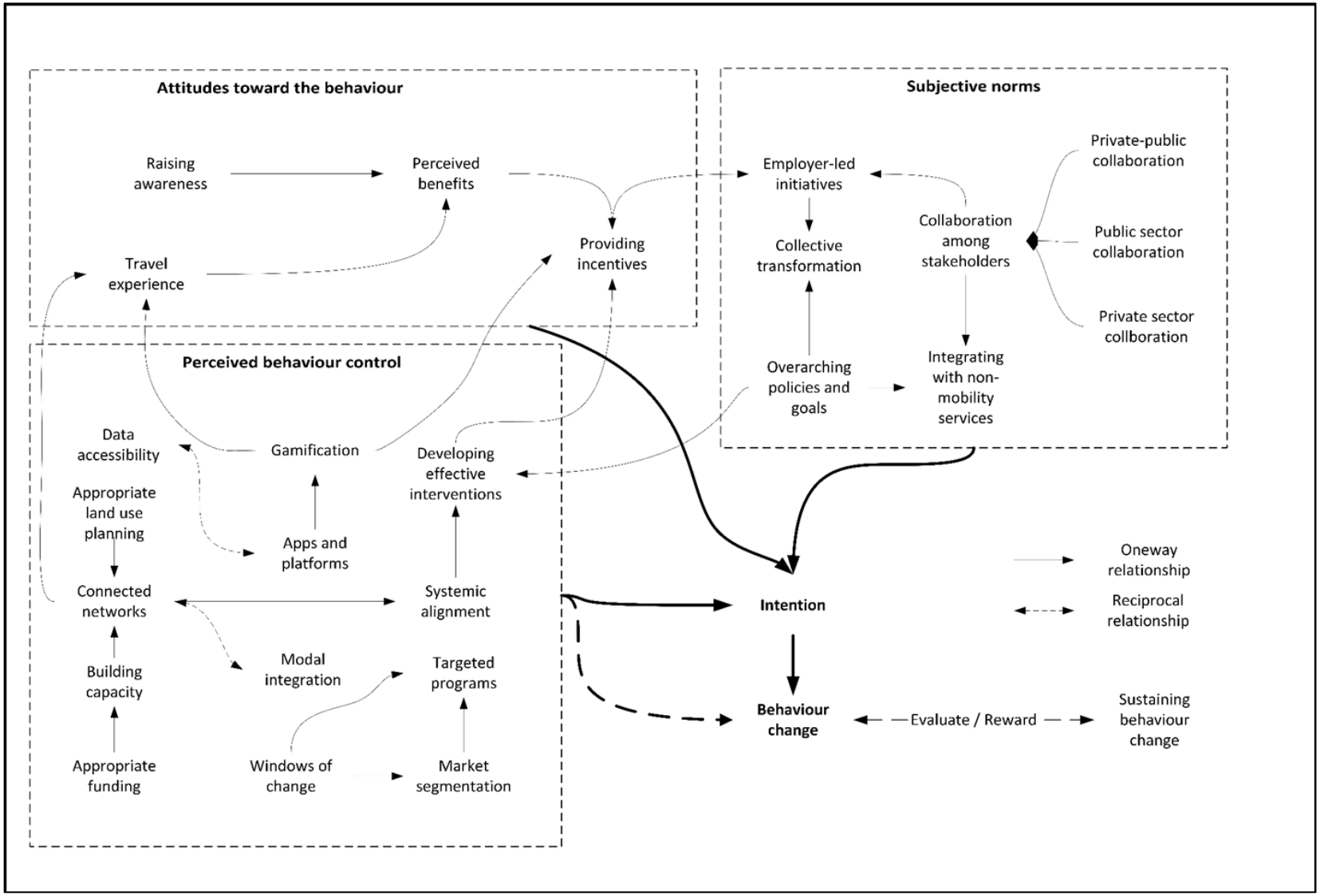


Figure 5. Conceptual illustration of the constructs that leads to travel behaviour change

5 Findings from the online user survey

In this section, we summarise the key analyses derived from the international online user survey, presenting key results in the main text with detailed tables and figures to the Appendix. We follow the project's analytical logic. Section 5.1 profiles the incidence and salience of windows of change (WoC) and summarises their reported effects on travel behaviour since 2023. Section 5.2 introduces a Sustainability Index that aggregates directional changes across modes to identify influences most closely associated with more sustainable travel and to motivate a shortlist of actionable policy initiatives. Section 5.3 explores the impact of socio-demographics and WoC on the uptake of fifty different transport-influencing initiatives. Section 5.4 applies latent class analysis to segment respondents into "Urban Strivers", "Settled Simplifiers", and "Dynamic Jugglers" and compares support for specific initiatives across these groups. Section 5.5 examines the conditions under which road user charging attracts support and uses generalised ordered logit models to relate positive, neutral, and negative impact assessments to WoC contexts, socio-demographics, and travel patterns.

5.1 Descriptive Profile: Windows of Change (WoC) and how they have affected Travel Behaviour since 2023

From the full list of 71 potential WoC influences associated with changing travel behaviour from 2023 to today (June 2025), we categorised them into the four classes of Lifestyle and household, Work and commuting; Transport and mobility; and Social and environmental, and in each class, a respondent was asked to choose up to three that were the most relevant in impacting travel behaviour change. With four classes, each respondent selected a maximum of 12 relevant influences, although they were able to select fewer, if appropriate. Table 4, for the entire sample across all countries, shows the average number of WoC influences chosen as relevant. The context given to participants in this section was the following: "People change their travel behaviour for many reasons such as changes in lifestyle, work, transport access, or personal circumstances. We would like to understand what changes have influenced your household's travel habits since 2023". We see the average number of WoC responses varies between 1.52 for two classes (i.e., Lifestyle and household changes and Transport and mobility changes), 1.16 for working and commuting, and 1.31 for social and environmental considerations. Importantly, given that a maximum of three WoC influences were allowed per class, and that most participants chose fewer (except in the first class, where 55% chose 3

options, but on average they chose 1.52 options), we can confidently conclude that there is no behavioural bias when comparing responses between classes.

Table 4. Summary of the number of WoC responses provided by the respondents: entire sample

Number of Influences	Lifestyle and household	Work and commuting	Transport and mobility	Social and environmental
Mean changes selected	1.52	1.16	1.52	1.31
Maximum	3	3	3	3
Minimum	0	0	0	0
How many selected 3	55%	16%	30%	22%
How many selected 2	16%	13%	17%	18%
How many selected 1	16%	42%	28%	29%
How many selected 0	12%	29%	25%	31%

Table 5 summarises the incidence of each WoC influence across the sample, with the influences ranked from least to most cited. We present the all-country findings in Table 5, with country-specific findings illustrated in Appendix 4. The most cited influence is "I am now more conscious of the environmental impact of my travel choices" (37.9% of the sample), with the least cited being "I use e-bike/e-scooter more because other household members use the car" (0.5% of the sample). The majority of WoC influences mentioned by the sample are in the range between 4% and 12% which is enough to suggest that many of the influences are likely to have a positive or negative influence on changes in travel behaviour.

Table 5. The incidence of selection of a WoC influence across the entire sample

Windows of Change on Travel Habits after 2023	Incidence of Change	Windows of Change on Travel Habits after 2023	Incidence of Change
I use e-bike/e-scooter more because other household members use the car	0.5%	I changed marital status	6.5%
My partner started or re-entered the workforce	0.7%	Replaced a petrol/diesel car with an electric (hybrid or fully electric) car	6.6%
I increased my use of e-bikes or e-scooters	0.7%	Public campaigns or government policies	6.6%
My partner moved to more flexible working hours	0.8%	Purchased a regular bicycle	6.6%
My partner retired	1.5%	Improved public transport routes saved me travel time	7.1%
My partner changed jobs	1.6%	Bought a car (previously did not own one)	7.4%
I walk/cycle more because other household members use the car	1.9%	Household size decreased (e.g., children moved out)	8.0%
We now have more cars than adults in the household	2.0%	I reduced car use for commuting	8.3%
Due to industrial action, I shifted from public transport to driving	2.4%	Improved accessibility of public transport in my area	8.7%
Peer groups and social norms	2.5%	Upsized to a larger home	9.1%
I use public transport more because other household members use the car	2.8%	I have reduced online shopping spending	9.2%
We now have fewer cars than adults in the household	3.1%	Household size increased (e.g., new family members)	9.5%
I was temporarily not working	3.3%	Reduced car use due to high costs	9.9%
Perks for using public transport, carpooling, cycling, or e-scooters (e.g., coffee vouchers, preferential parking)	3.5%	Free parking	10.4%
Replaced a petrol/diesel car with a less fuel-efficient petrol/diesel car	3.6%	I am now less concerned about the environmental impact of my travel choices	10.6%
Purchased an e-scooter	3.7%	I had health concerns that affected my travel	10.9%
I no longer have a dog	4.0%	I recently had to work in the main office/work location more at the request of the employer	11.1%
I retired from the workforce	4.0%	I tend to use car over active travel on wet days	12.0%
Charging facilities for electric cars	4.4%	My financial situation improved	12.1%
Free on-site health & wellness facilities (e.g., gym, yoga)	4.6%	I changed jobs but stayed in the same residential area	12.4%
I now rely more on home delivery	4.7%	I walk or cycle more	13.1%
I changed jobs and moved to a new residential area	5.0%	I reduced overall car use	13.3%
Showers for walking/cycling commuters	5.1%	I was looking for a job during this period	13.5%
I started using click-and-collect more often	5.3%	I increased online shopping to reduce personal travel	13.7%
I started or increased caregiving responsibilities (e.g., caring for children, elderly, or people with disabilities)	5.4%	Friends influenced my travel decisions	14.0%
I increased overall car use	5.4%	I have adjusted my lifestyle to prioritise saving money	15.3%
I started using public transport more for commuting	5.5%	My health improved	16.7%
I no longer own a car	5.8%	I tend to use car over public transport on wet days	17.2%
I take children to/from daycare or school on the way to/from work/home	5.9%	Moved to a new area	17.7%
Increased the number of cars in the household	5.9%	I moved to flexible working hours and days	20.2%
Public transport quality has worsened	5.9%	My financial situation became tighter, affecting my spending/travel choices	21.0%
I acquired a dog	6.0%	I started walking/exercising more for health reasons	22.5%
Downsized to a smaller home (apartment/townhouse)	6.1%	I was not in the workforce during this period	26.1%
Replaced a petrol/diesel car with a more fuel-efficient petrol/diesel car	6.2%	Family influenced my travel decisions	27.5%
Public transport is less crowded since COVID-19	6.3%	I am now more conscious of the environmental impact of my travel choices	37.9%
Purchased an e-bike	6.3%		

5.2 Windows of Change and actionable policy initiatives

To compare the findings across all four classes of WoCs (Table 6), we propose a sustainability index where the direction indicates a sustainable gain or loss, and converts to what we might call a directional initiative to achieve sustainable outcomes. For each influence we might look at an index which has net change in public transport (PT) and Active travel and compare to car use.

5.2.1 Sustainability Index

The formula used is follows,

Defining 1: Dsi= Decreased significantly, 2:Dsl=Decreased slightly, 3:NC= No change, 4:ISl= Increased slightly, 5: Isi=Increased significantly

=PTUse (2*Isi+Isl-Dsl-2*Dsi) + Active Use (2*Isi+Isl-Dsl-2*Dsi) - Car Use (2*Isi+Isl-Dsl-2*Dsi)/Total number of times a WoC is chosen

Because we divide by the base, it is equivalent that we have adjusted weights. Hence, we can compare items from different classes, because each item has been adjusted by its own occurrence base.

In summary, there are five benefits in formulating the Sustainability Index using this approach:

1. The sign of + or – will reflect overall the sustainable trips – non-sustainable trips (for all modes)

2. The range should be within -3 to +3, with 0 neutral. For example, if the No change on three modes is small and for the remaining changes, the positive and negative offset each other, then we have 0, but the denominator will not be 0. However, it should be rare to see numbers above +1 or below -1, taking into account the trip offsets and the sizes of “no change”.

3. It takes into account the “no change” size, because for index scores closing to 0, it can only mean, the amount of “no change” is too big, or trip offsets such as an increase in both sustainable trips and non-sustainable trips.

4. The index is a ratio scale so it can be compared directly for the items carrying the same sign. For example, an item with an index of 0.5 is two times sustainable compared to another item with an index of 0.25.

5. The index is weighted by each item's occurrence base, so items from the four different classes can be put together to compare.

This index is intuitive and plausible, noting that the top ranked WoC influences relate to greater use of PT for commuting, increased walking and cycling and use of e-bikes and e-scooters, improved accessibility of PT in my area, reduced car use overall and exercising for health reasons, reduced car use due to cost, and started using click and collect more often.

Table 6. The list of Windows of Change potential influences

Lifestyle and household changes	**Transport and Mobility Changes**
Moved to a new area	Bought a car (previously did not own one)
Upsized to a larger home	Increased the number of cars in the household
Downsized to a smaller home (apartment/townhouse)	Replaced a petrol/diesel car with an electric (hybrid or fully electric) car
Household size increased (e.g., new family members)	Replaced a petrol/diesel car with a more fuel-efficient petrol/diesel car
Household size decreased (e.g., children moved out)	Replaced a petrol/diesel car with a less fuel-efficient petrol/diesel car
I changed marital status	Reduced car use due to high costs
I started or increased caregiving responsibilities (e.g., caring for children, elderly)	We now have more cars than adults in the household
My health improved	We now have fewer cars than adults in the household
I had health concerns that affected my travel	I no longer own a car
I started walking/exercising more for health reasons	Purchased an e-scooter
My financial situation improved	Purchased an e-bike
My financial situation became tighter, affecting my spending/travel choices	Purchased a regular bicycle
I have adjusted my lifestyle to prioritise saving money	Improved accessibility of public transport in my area
I increased online shopping to reduce personal travel	Improved public transport routes saved me travel time
I have reduced online shopping spending	Public transport is less crowded since COVID-19
I started using click-and-collect more often	Public transport quality has worsened
I now rely more on home delivery	I reduced car use for commuting

Lifestyle and household changes	**Transport and Mobility Changes**
I acquired a dog	I started using public transport more for commuting
I no longer have a dog	I reduced overall car use
I retired from the workforce	I increased overall car use
I was temporarily not working	I walk or cycle more
My partner retired	I increased my use of e-bikes or e-scooters
My partner changed jobs	I take children to/from daycare or school on the way to/from work/home
My partner started or re-entered the workforce	I use public transport more because other household members use the car
My partner moved to more flexible working hours	I walk/cycle more because other household members use the car
Work and commuting changes	I use e-bike/e-scooter more because other household members use the car
I was not in the workforce during this period	**Environmental and Social considerations**
I was looking for a job during this period	I am now more conscious of the environmental impact of my travel choices
I changed jobs but stayed in the same residential area	I am now less concerned about the environmental impact of my travel choices
I changed jobs and moved to a new residential area	Friends influenced my decision making
I moved to flexible working hours and days	Family influenced my decision making
I recently had to work in the main office/work location more at the request of employer	Public campaigns or government policies
My employer introduced free parking	Peer groups and social norms
My employer introduced charging facilities for electric cars	I tend to use car over public transport on wet days
My employer introduced showers for walking/cycling commuters	I tend to use car over active travel on wet days
My employer introduced free on-site health & wellness facilities (e.g., gym, yoga)	Due to industrial action, I shifted from public transport to driving
My employer introduced perks for using public transport, carpooling, cycling, or e-scooters (e.g., coffee vouchers, preferential parking)	

5.2.2 Sustainability Index calculated on preserving all 5 levels of travel behaviour responses: All countries

The sustainability index for each change is calculated in Table 7 and illustrated in Figure 6. Accordingly, the most significant positive contributors to the Sustainability Index include starting to use public transport for commuting more (1.558), walking or cycling more (1.073), and improved accessibility of public transport (1.028). These changes reduce car dependency and promote alternative modes of travel. Notably, greater use of e-bikes or e-scooters (0.933), and the influence of peer groups and social norms (0.733) also rank highly. Meanwhile, behavioural shifts like using click-and-collect more (0.681) and receiving perks for sustainable travel (0.514) point to the potential of incentive-based approaches. Conversely, worsened public transport quality (-0.053) is associated with a drop in sustainability, highlighting the system's sensitivity to service reliability. At the other end, increased overall car use (-0.924) and a tighter financial situation (-0.714) were among the strongest negative contributors. Other significant changes included increased caregiving-related travel such as taking children to/from school (-0.358) and shifting from public transport to driving during industrial action (-0.278). These findings suggest that while systemic improvements and incentives can drive more sustainable behaviour, practical constraints like financial pressure, caregiving responsibilities, and service disruptions continue to push individuals toward less sustainable options. Tailored policy responses that address both structural enablers and individual life circumstances will be essential.

In summary, the evidence suggests that we have identified a number of WoC influences that we should take into account in any formal model analysis and that these influences should be explicitly accounted for in the development of future strategic plans since they might contribute to ensuring that policy initiatives align with achievable sustainability goals.

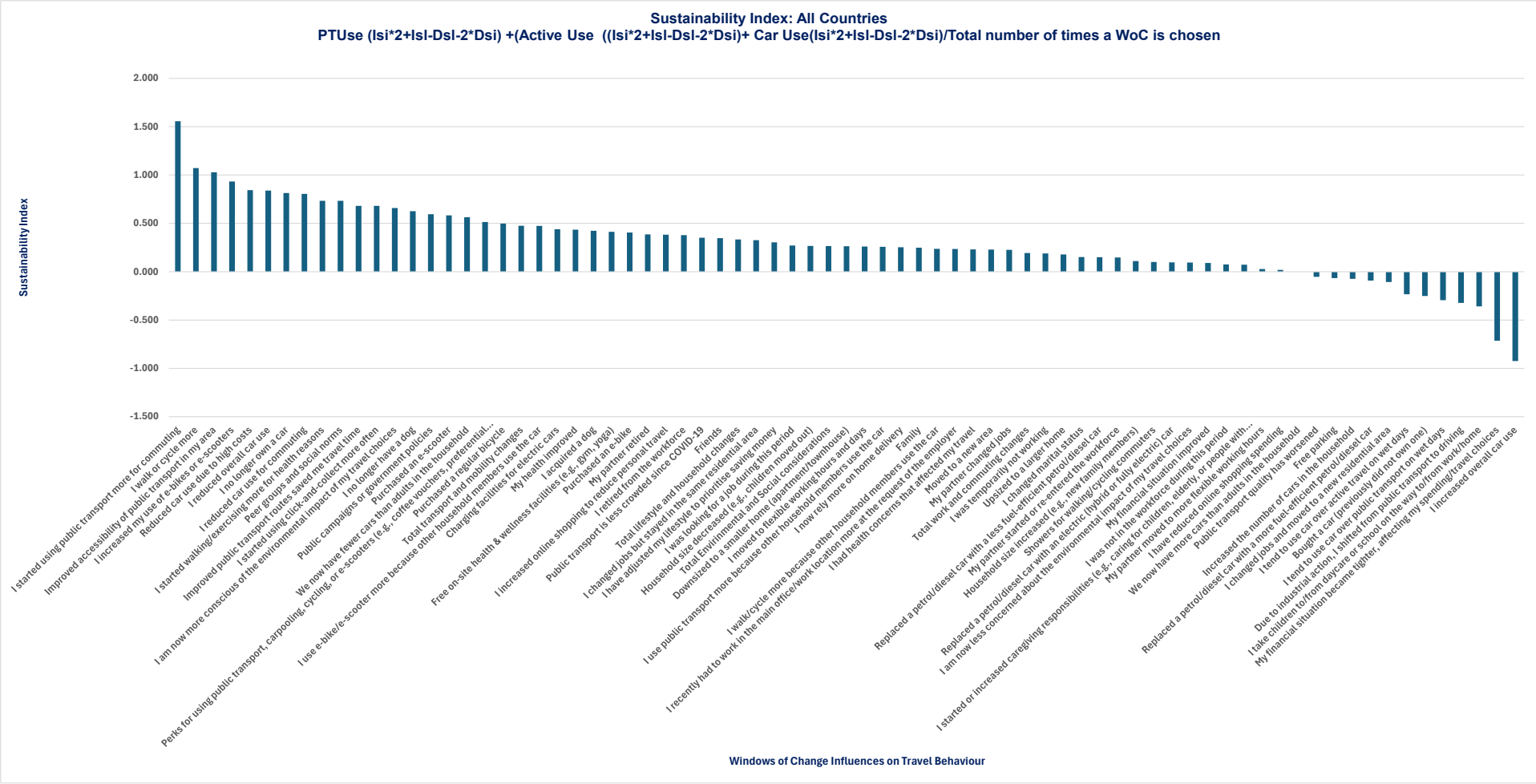


Figure 6. Sustainability index related to each WoC

Table 7. The sustainability Index associated with each WoC, preserving all 5 levels of travel behaviour response: All countries

Sorted new sustainability Index	**Sust. Index**		
I started using public transport more for commuting	1.558	Downsized to a smaller home (apartment/townhouse)	0.264
I walk or cycle more	1.073	I moved to flexible working hours and days	0.260
Improved accessibility of public transport in my area	1.028	I use public transport more because other household members use the car	0.258
I increased my use of e-bikes or e-scooters	0.933	I now rely more on home delivery	0.252
Reduced car use due to high costs	0.844	Family	0.248
I reduced overall car use	0.839	I walk/cycle more because other household members use the car	0.237
I no longer own a car	0.814	I recently had to work in the main office/work location more at the request of the employer	0.236
I reduced car use for commuting	0.805	I had health concerns that affected my travel	0.230
I started walking/exercising more for health reasons	0.733	Moved to a new area	0.229
Peer groups and social norms	0.733	My partner changed jobs	0.226
Improved public transport routes saved me travel time	0.682	**Total work and commuting changes**	0.193
I started using click-and-collect more often	0.681	I was temporarily not working	0.189
I am now more conscious of the environmental impact of my travel choices	0.658	Upsized to a larger home	0.178
I no longer have a dog	0.626	I changed marital status	0.151
Public campaigns or government policies	0.595	Replaced a petrol/diesel car with a less fuel-efficient petrol/diesel car	0.150
Purchased an e-scooter	0.583	My partner started or re-entered the workforce	0.147
We now have fewer cars than adults in the household	0.563	Household size increased (e.g., new family members)	0.110
Perks for using public transport, carpooling, cycling, or e-scooters (e.g., coffee vouchers, preferential parking)	0.514	Showers for walking/cycling commuters	0.100
Purchased a regular bicycle	0.498	Replaced a petrol/diesel car with an electric (hybrid or fully electric) car	0.097
Total transport and mobility changes	0.475	I am now less concerned about the environmental impact of my travel choices	0.094
I use e-bike/e-scooter more because other household members use the car	0.474	My financial situation improved	0.091
Charging facilities for electric cars	0.439	I was not in the workforce during this period	0.075
My health improved	0.434	I started or increased caregiving responsibilities (e.g., caring for children, elderly, or people with disabilities)	0.073
I acquired a dog	0.423	My partner moved to more flexible working hours	0.027
Free on-site health & wellness facilities (e.g., gym, yoga)	0.413	I have reduced online shopping spending	0.019
Purchased an e-bike	0.405	We now have more cars than adults in the household	0.000
My partner retired	0.385	Public transport quality has worsened	-0.053
I increased online shopping to reduce personal travel	0.383	Free parking	-0.066
I retired from the workforce	0.379	Increased the number of cars in the household	-0.074
Public transport is less crowded since COVID-19	0.352	Replaced a petrol/diesel car with a more fuel-efficient petrol/diesel car	-0.091
Friends	0.347	I changed jobs and moved to a new residential area	-0.107
Total lifestyle and household changes	0.333	I tend to use car over active travel on wet days	-0.233
I changed jobs but stayed in the same residential area	0.325	Bought a car (previously did not own one)	-0.252
I have adjusted my lifestyle to prioritise saving money	0.304	I tend to use car over public transport on wet days	-0.294
I was looking for a job during this period	0.270	Due to industrial action, I shifted from public transport to driving	-0.323
Household size decreased (e.g., children moved out)	0.267	I take children to/from daycare or school on the way to/from work/home	-0.358
Total Envirinmental and Social considerations	0.266	My financial situation became tighter, affecting my spending/travel choices	-0.714
		I increased overall car use	-0.923

5.2.3 Making sense of the evidence to promote actional policy initiatives

Whereas these descriptive profiles are of interest, and the sustainability index suggests that the influence incidence is comparable across all seven countries, they do not necessarily reflect the key WoC drivers influencing the frequency of modal travel in 2025. Some of the influences, such as 'improved health' and 'started using click and collect more often', mean nothing in isolation from identifying what modal activity change resulted. Hence, we turned to the Negative Binomial (NegBin) count models to investigate, for the full sample, the relationship between weekly one-way modal trip frequency and the WoC influences, in addition to contextual and socioeconomic variables. The model estimates and corresponding arc-elasticity estimates are provided in Hensher et al. (2025a) (see Appendix 5), which details the modelling approach and results which have identified a rich array of windows of change influences that have translated into impacts on the frequency of weekly one-way trips by each of the available modes.

Despite many such influences being statistically significant, it is unlikely that all WoCs offer evidence to prescribe an action plan that can achieve growth in sustainable mobility outcomes. For example, change in marital status, residential and workplace changes, clearly influence modal activity change, but we are unable to manipulate these influences to achieve sustainability-aligned mobility impacts. This is despite the recognition, in the broader literature reviewed, that specific lifecycle events and stages had unique impacts within predefined segments, emphasising the need for tailored, targeted policy interventions based on segment characteristics and lifecycle contexts. The challenge now is to distil from the 71 WoC influences, which ones can be used to promote actionable change, given their association with each of the mode trip frequency models. This study identifies parenthood as a key life stage during which individuals tend to shift away from more sustainable transport modes, such as public transport and walking, towards increased car use. These caregiving trips, which are predominantly undertaken by women and often involve trip chaining, present distinct mobility needs that are not currently well supported. Addressing these needs represents a critical area of action for transport authorities seeking to promote equitable and sustainable mobility.

We have identified 25 WoC influences out of the 71 considered, shown in Table 8, that were found to have a statistically significant influence on changes in travel behaviour, and which we suggest are ***Actionable Change Initiatives*** **(ACIs),** some of which have resulted in changes aligned with improved sustainable mobility, and some having the opposite effect. Table 8

includes the mean direct and arc elasticities; however, it must be noted that the absolute change in the average number of one-way weekly trips will also be dependent on the average number of mode-specific trips. The numbers in red indicate changes that have an impact of more than 0.5 trips per week. For example, while the ACI associated with an increased use of an e-bike or e-scooter, shows a weekly average of 0.285 trips, this translates into a small increase of 0.20 active mode trips per week. Employer-provided free parking results in an increased number of car driver weekly trips of 1.66 weekly trips. Analysts and policy advisers can use columns 3-7 of Table 8 to identify what ACIs can have the greatest desired impact in delivering on a sustainable mobility agenda. We have highlighted 20 behavioural responses that, when enacted, change weekly one-way trips by more than an average of 0.6. The greatest trip frequency response is associated with increases in car driving, with the switch from an ICE to an electric car having the greatest significant impact (averaging 1.7 extra weekly car driving trips). This should be a concern for increased traffic congestion, even where emissions at the tailpipe are reduced, and hence, it is a questionable sustainable mobility ACI.

Online shopping tends on balance to increase car driving trips overall with some additional walking trip activity, but some trips would be replaced by light commercial delivery vehicles (and are not captured in this study), which on balance may turn out to be a negative sustainable outcome. Limiting the assessment to passenger mobility, it appears that there is an increase in car-based trips associated with click and collect. The actionable change initiative is to ensure that the growth in car use compared to light vehicle growth is, on balance, a desirable outcome in terms of emissions and congestion. We conclude that this is not known and needs close assessment.

Employers can play a strong positive role in supporting mobility activity aligned with achieving sustainability goals, and indeed, this can play well into the social licence obligation or desires of employers. Removing free parking but providing parking for electric cars and on-site health and wellbeing facilities (typically applicable to active travel, although they can have positive health effects regardless of what modes are used to commute) are ACIs that can be influenced by an employer. It may be that some employers offered free parking as a return to the office incentive post-COVID-19 restrictions. Offering perks to employees when they use PT or carpool or use active modes are obvious and desirable ACIs that also accord well with social licence objectives, as does the provision of shower facilities for those who walk and bike. This evidence suggests a greater role for non-mobility service providers (NMSPs) in supporting a remixing of modal activity for the commute in particular, within a Mobility as a Feature (MaaF)

ecosystem (Hensher and Hietanen, 2023), but even more generally for all modal activity of employees (see (Kandanaarachchi et al., 2025b).

The challenge for government, in particular, is to offer incentives to replace less fuel-efficient ICE cars with more fuel-efficient ICEs and preferably electric cars, but the evidence suggests that this results in an increase in car use – this is an important finding. However, individuals who have replaced an ICE with a less fuel-efficient ICE car appear to moderate their car trips, presumably due to fuel costs and some concern for the environment and see some increased trips by PT. This is where a road pricing reform program can have a desirable effect. This clearly places decision making and incentives in a quandary with a focus today on electrification of cars and purchasing more fuel-efficient cars, which only serves to exacerbate traffic congestion (since an electric car is still a car), but, in its favour, there is some switch to public transport to save on car use costs.

It is encouraging to confirm yet again that improvements in PT can deliver desirable sustainable mobility outcomes and are clear ACIs. Improved network coverage to achieve greater frequency, connectivity, and visibility is a clear ACI. These are all measures that can be directly influenced by a public transport authority and operator. Some attention to service quality is also required since there is a switch out of PT into car as a passenger and walking, which may, on balance, be a positive sustainability outcome although it is not clear, hence -,+ in Table 8.

The active modes will require incentives, be they financial or non-financial, to encourage the purchase and use of regular bikes and e-modes such as e-bikes and e-scooters, although we can see a positive uptake since 2023. There are health benefits which should be promoted, especially for walking and regular bikes, and so we have some clear ACIs, although it is acknowledged that e-micromobility is associated with reduced physical activity. It is encouraging to see that additional walking and cycling trips (1.47+0.21) offsetting car driver trips -1.13. The role of communication strategies is clearly a very important ACI and one that has perhaps been neglected in the past, although the elasticity response in increasing weekly trips by non-car as driver modes is small compared to some of the other ACIs (hence a lower ranking in Table 8). Public campaigns in particular are associated with changing travel in favour of a growth in PT, walking, active modes, and car passenger travel, but having no effect at all, as far as we can find, on car driver activity. The elasticities suggest, on average, that public campaigns that impacted on a WoC increased the average number of weekly trips by

0.26 for car as passenger, 0.42 trips for public transport, 0.36 walking trips and 0.032 active modal trips.

Although work location activity is aligned with the employer, we have separated it out since it has become a successful broad-based societal policy initiative (forced on us initially by COVID-19; see Hensher et al. (2026), which has been shown to have a positive outcome in terms of reduced travel, which in itself can deliver positive sustainable mobility outcomes. The model evidence suggests that "I recently had to work in the main office/work location" had a positive impact on the amount of active mode activity (and was not an influence on other modes), but that "my partner moved to more flexible working hours" resulted in a reduction of walking trips. What we cannot discern from this evidence is the impact this has had on other modal activity, despite finding no evidence that the specific WoC changed the frequency of other modal activity.

Finally, the change in the total number of one-way weekly trips shown in the last column of Table 8 summarises the overall change in the number of trips, with some significant increases above the average, notably more than one extra one-way trip on average per week due to starting to use click and collect more often, replacing a petrol/diesel car with an electric car, increasing use of public transport for commuting, family decisions influencing travel behaviour, the role of public campaigns or government policies, and the use of an e-bike or e-scooter because the car is being used by other family members. The evidence shows which ACIs will result in positive switching out of the car as a driver to alternative, more sustainable mobility options; however, we see not just modal substitution but growth and decline in overall weekly trips, which should also be recognised where it has positive or negative impacts on the sustainability mobility agenda. The greatest concern is one we have always known about, and that is the ownership and use of the car as a driver; however, what our research has revealed is that the switch to cleaner energy cars, including improved fuel efficiency of ICEs, exacerbates the growth of the car in undesirable ways.

The most effective ACIs identified in the WoC analysis include:

- **Employer incentives that promote sustainable commuting, such as public transport reimbursements, end-of-trip facilities, and flexible work policies.**
- **Public transport network improvements, including service frequency, last-mile connectivity, and integration with micromobility options, which directly enhance perceived convenience and reliability.**
- **Marketing and education campaigns that increase awareness of the environmental, health, and wellbeing benefits of sustainable travel, encouraging social norms that reinforce positive choices.**

Table 8. Identified potentially actionable policy initiatives by Windows of Change

CD=car driver, CP=car passenger, PT=public transport, WK=walk, ACT=active modes *Net impact sign: - = reduces sustainable mobility, + = increases sustainable mobility*	**Elasticity**	**Impact on # weekly one-way trips:**					**Net weekly One-way trip change**
		Car driver	**Car passenger**	**PT**	**Walk**	**Active Modes**	
Online Shopping Effects							
I started using click-and-collect more often	0.174 (CD)	**1.69**					*1.69*
I increased online shopping to reduce personal travel	0.134 (CP), -0.08 (PT), -0.061 (ACT)		0.24	-0.20		-0.06	-0.02
I now rely more on home delivery	0.210 (WK)				**0.67**		0.67
Employer-linked incentives							0.00
Free parking	0.171 (CD), -0.216 (CP), -0.349 (PT), -0.159 (WK)	**1.66**	-0.39	**-0.89**	-0.51		-0.12
Free on-site health & wellness facilities	0.090 (ACT)					0.09	0.09
Perks for using public transport, carpooling, cycling, or e-scooters	0.175 (WK)				0.56		0.56
Showers for walking/cycling commuters	-0.162 (WK)				-0.52		-0.52
Charging facilities for electric cars	0.255 (CP)		0.47				0.47
Car Related							0.00
Replaced a petrol/diesel car with an electric (hybrid or fully electric) car	0.175 (CD), 0.099 (CP), -0.164 (WK)	**1.70**	0.18		-0.52		*1.36*
Replaced a petrol/diesel car with a more fuel-efficient petrol/diesel car	0.154 (CD), -0.168 (CP), -0.145 (WK)	**1.50**	-0.31		-0.46		0.73
Replaced a petrol/diesel car with a less fuel-efficient petrol/diesel car	-0.125 (CD), 0.121 (PT), 0.165 (ACT)	**-1.22**		0.31		0.16	-0.75
Public Transport							0.00
Improved accessibility of public transport in my area	-0.102 (CD), 0.410 (PT), 0.183 (WK)	**-0.99**		**1.04**	0.58		0.63
Improved public transport routes saved me travel time	-0.120 (CD), 0.289 (PT)	**-1.17**		0.73			-0.43
I started using public transport more for commuting	-0.109 (CD), 0.322 (CP), 0.607 (PT), 0.159 (WK)	**-1.06**	0.59	**1.54**	0.51		*1.57*
Public transport quality has worsened	0.131 (CP), 0.200 (WK)		0.24		**0.64**		0.88
Active and micro-mobility modes							0.00

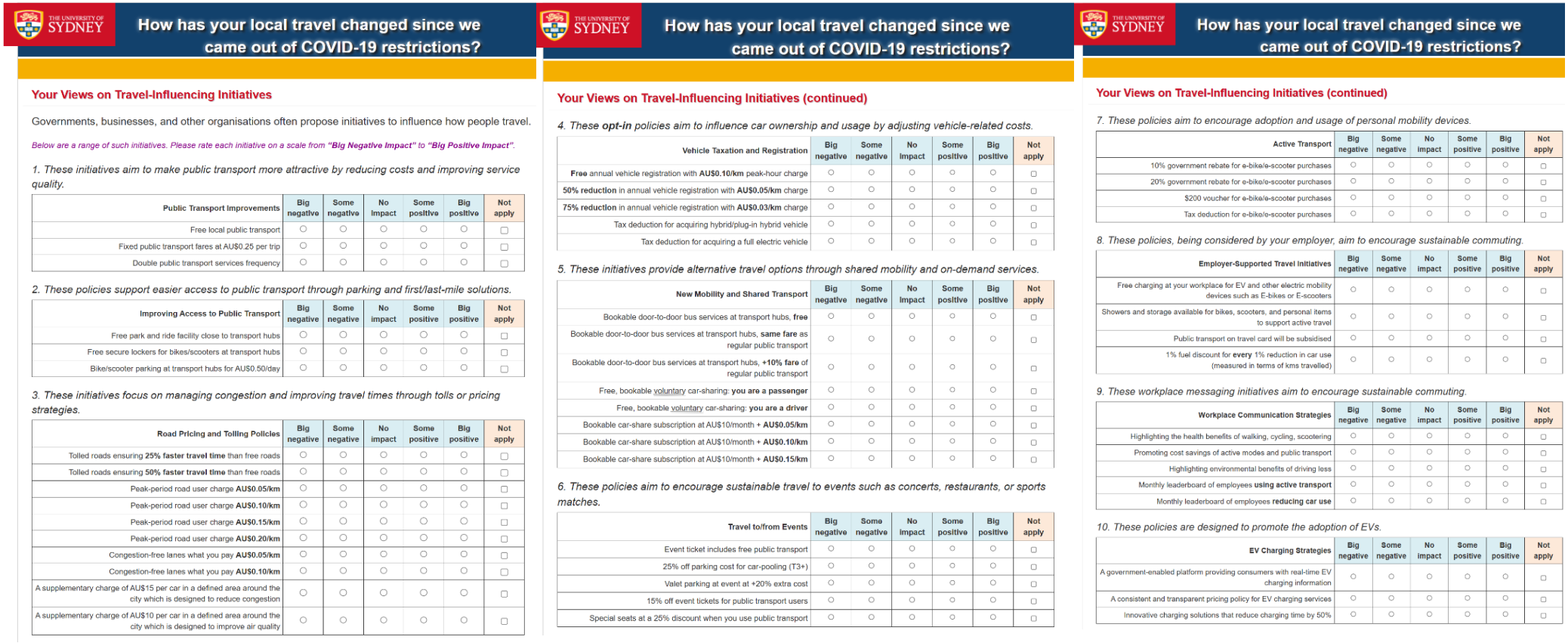
Purchased a regular bicycle	-0.086 (CD), 0.099 (PT), 0.089 (WK), 0.412 (ACT)	**-0.84**		0.25	0.28	0.40	0.10
I walk or cycle more	-0.116 (CD), 0.460 (WK), 0.217 (ACT)	**-1.13**			**1.47**	0.21	0.55
I use e-bike/e-scooter more because other household members use the car	0.262 (CP), 0.624 (ACT)		0.48			**0.61**	*1.08*
Purchased an e-scooter	0.570 (ACT)					0.55	0.55
I increased my use of e-bikes or e-scooters	0.716 (ACT)					**0.69**	0.69
Social and environmental promotion							0.00
I am now less concerned about the environmental impact of my travel choices	-0.144 (CP), -0.130 (PT), -0.077 (WK), -0.076 (ACT)		-0.26	-0.33	-0.25	-0.07	-0.91
Public campaigns or government policies	0.139 (CP), 0.166 (PT), 0.114 (WK), 0.111 (ACT)		0.25	0.42	0.36	0.11	*1.15*
Family influences my travel decisions	0.116 (CD), 0.120 (CP)	**1.13**	0.22				*1.35*
Flexi-time and Flexi-place work							0.00
I recently had to work in the main office/work location more	0.066 (WK), 0.063 (ACT)				0.21	0.06	0.27
My partner moved to more flexible working hours	-0.269 (WK)				**-0.86**		-0.86

5.3 Interventions for accelerating sustainable transport use in Australia.

Participants were asked to evaluate various initiatives proposed or implemented by governments, businesses, and other organizations (see Figure 7). They rated each initiative on a five-point scale ranging from big negative impact to big positive impact. The response options included: big negative impact, some negative impact, no impact, some positive impact, and big positive impact. An additional response option of not applicable was provided for initiatives that did not pertain to the respondent.

Figure 8 and Figure 9 provide a summary of public sentiment toward each of the proposed transport initiatives. Figure 8 presents the data as a stacked bar chart, showing the distribution of responses across three categories: positive impact, no impact, and negative impact for each initiative. In contrast, Figure 9 uses a line graph to depict how the share of each sentiment category changes as the initiatives are ranked from most to least positively received.

Public support is highest for measures that improve the affordability and accessibility of public transport, including free local services, fare discounts, and rewards for frequent users. These initiatives typically receive approval levels around 60 to 70 % with very little opposition, likely because they are seen as equitable, convenient, and broadly beneficial. By contrast, policies that introduce financial disincentives or restrictions on private car use, such as congestion charges, peak hour road pricing, and distance-based vehicle fees, attract much higher negative sentiment. Although some people acknowledge potential benefits like reduced congestion and cleaner air, these measures are often viewed as punitive, especially by those who rely on cars, resulting in more polarised opinions. Overall, the figures indicate a preference for supportive, incentive-driven approaches rather than cost-imposing restrictions.



How has your local travel changed since we came out of COVID-19 restrictions?

Your Views on Travel-Influencing Initiatives

Governments, businesses, and other organisations often propose initiatives to influence how people travel.

*Below are a range of such initiatives. Please rate each initiative on a scale from **"Big Negative Impact"** to **"Big Positive Impact"**.*

1. These initiatives aim to make public transport more attractive by reducing costs and improving service quality.

Public Transport Improvements	Big negative	Some negative	No impact	Some positive	Big positive	Not apply
Free local public transport	○	○	○	○	○	▢
Fixed public transport fares at AU$0.25 per trip	○	○	○	○	○	▢
Double public transport services frequency	○	○	○	○	○	▢

2. These policies support easier access to public transport through parking and first/last-mile solutions.

Improving Access to Public Transport	Big negative	Some negative	No impact	Some positive	Big positive	Not apply
Free park and ride facility close to transport hubs	○	○	○	○	○	▢
Free secure lockers for bikes/scooters at transport hubs	○	○	○	○	○	▢
Bike/scooter parking at transport hubs for AU$0.50/day	○	○	○	○	○	▢

3. These initiatives focus on managing congestion and improving travel times through tolls or pricing strategies.

Road Pricing and Tolling Policies	Big negative	Some negative	No impact	Some positive	Big positive	Not apply
Tolled roads ensuring **25% faster travel time** than free roads	○	○	○	○	○	▢
Tolled roads ensuring **50% faster travel time** than free roads	○	○	○	○	○	▢
Peak-period road user charge **AU$0.05/km**	○	○	○	○	○	▢
Peak-period road user charge **AU$0.10/km**	○	○	○	○	○	▢
Peak-period road user charge **AU$0.15/km**	○	○	○	○	○	▢
Peak-period road user charge **AU$0.20/km**	○	○	○	○	○	▢
Congestion-free lanes what you pay **AU$0.05/km**	○	○	○	○	○	▢
Congestion-free lanes what you pay **AU$0.10/km**	○	○	○	○	○	▢
A supplementary charge of AU$15 per car in a defined area around the city which is designed to reduce congestion	○	○	○	○	○	▢
A supplementary charge of AU$10 per car in a defined area around the city which is designed to improve air quality	○	○	○	○	○	▢

How has your local travel changed since we came out of COVID-19 restrictions?

Your Views on Travel-Influencing Initiatives (continued)

*4. These **opt-in** policies aim to influence car ownership and usage by adjusting vehicle-related costs.*

Vehicle Taxation and Registration	Big negative	Some negative	No impact	Some positive	Big positive	Not apply
Free annual vehicle registration with **AU$0.10/km** peak-hour charge	○	○	○	○	○	▢
50% reduction in annual vehicle registration with **AU$0.05/km** charge	○	○	○	○	○	▢
75% reduction in annual vehicle registration with **AU$0.03/km** charge	○	○	○	○	○	▢
Tax deduction for acquiring hybrid/plug-in hybrid vehicle	○	○	○	○	○	▢
Tax deduction for acquiring a full electric vehicle	○	○	○	○	○	▢

5. These initiatives provide alternative travel options through shared mobility and on-demand services.

New Mobility and Shared Transport	Big negative	Some negative	No impact	Some positive	Big positive	Not apply
Bookable door-to-door bus services at transport hubs, **free**	○	○	○	○	○	▢
Bookable door-to-door bus services at transport hubs, **same fare** as regular public transport	○	○	○	○	○	▢
Bookable door-to-door bus services at transport hubs, **+10% fare** of regular public transport	○	○	○	○	○	▢
Free, bookable voluntary car-sharing: **you are a passenger**	○	○	○	○	○	▢
Free, bookable voluntary car-sharing: **you are a driver**	○	○	○	○	○	▢
Bookable car-share subscription at AU$10/month + **AU$0.05/km**	○	○	○	○	○	▢
Bookable car-share subscription at AU$10/month + **AU$0.10/km**	○	○	○	○	○	▢
Bookable car-share subscription at AU$10/month + **AU$0.15/km**	○	○	○	○	○	▢

6. These policies aim to encourage sustainable travel to events such as concerts, restaurants, or sports matches.

Travel to/from Events	Big negative	Some negative	No impact	Some positive	Big positive	Not apply
Event ticket includes free public transport	○	○	○	○	○	▢
25% off parking cost for car-pooling (T3+)	○	○	○	○	○	▢
Valet parking at event at +20% extra cost	○	○	○	○	○	▢
15% off event tickets for public transport users	○	○	○	○	○	▢
Special seats at a 25% discount when you use public transport	○	○	○	○	○	▢

How has your local travel changed since we came out of COVID-19 restrictions?

Your Views on Travel-Influencing Initiatives (continued)

7. These policies aim to encourage adoption and usage of personal mobility devices.

Active Transport	Big negative	Some negative	No impact	Some positive	Big positive	Not apply
10% government rebate for e-bike/e-scooter purchases	○	○	○	○	○	▢
20% government rebate for e-bike/e-scooter purchases	○	○	○	○	○	▢
$200 voucher for e-bike/e-scooter purchases	○	○	○	○	○	▢
Tax deduction for e-bike/e-scooter purchases	○	○	○	○	○	▢

8. These policies, being considered by your employer, aim to encourage sustainable commuting.

Employer-Supported Travel Initiatives	Big negative	Some negative	No impact	Some positive	Big positive	Not apply
Free charging at your workplace for EV and other electric mobility devices such as E-bikes or E-scooters	○	○	○	○	○	▢
Showers and storage available for bikes, scooters, and personal items to support active travel	○	○	○	○	○	▢
Public transport on travel card will be subsidised	○	○	○	○	○	▢
1% fuel discount for **every** 1% reduction in car use (measured in terms of kms travelled)	○	○	○	○	○	▢

9. These workplace messaging initiatives aim to encourage sustainable commuting.

Workplace Communication Strategies	Big negative	Some negative	No impact	Some positive	Big positive	Not apply
Highlighting the health benefits of walking, cycling, scootering	○	○	○	○	○	▢
Promoting cost savings of active modes and public transport	○	○	○	○	○	▢
Highlighting environmental benefits of driving less	○	○	○	○	○	▢
Monthly leaderboard of employees **using active transport**	○	○	○	○	○	▢
Monthly leaderboard of employees **reducing car use**	○	○	○	○	○	▢

10. These policies are designed to promote the adoption of EVs.

EV Charging Strategies	Big negative	Some negative	No impact	Some positive	Big positive	Not apply
A government-enabled platform providing consumers with real-time EV charging information	○	○	○	○	○	▢
A consistent and transparent pricing policy for EV charging services	○	○	○	○	○	▢
Innovative charging solutions that reduce charging time by 50%	○	○	○	○	○	▢

Figure 7. Screenshot of the initiatives influencing travel behaviour

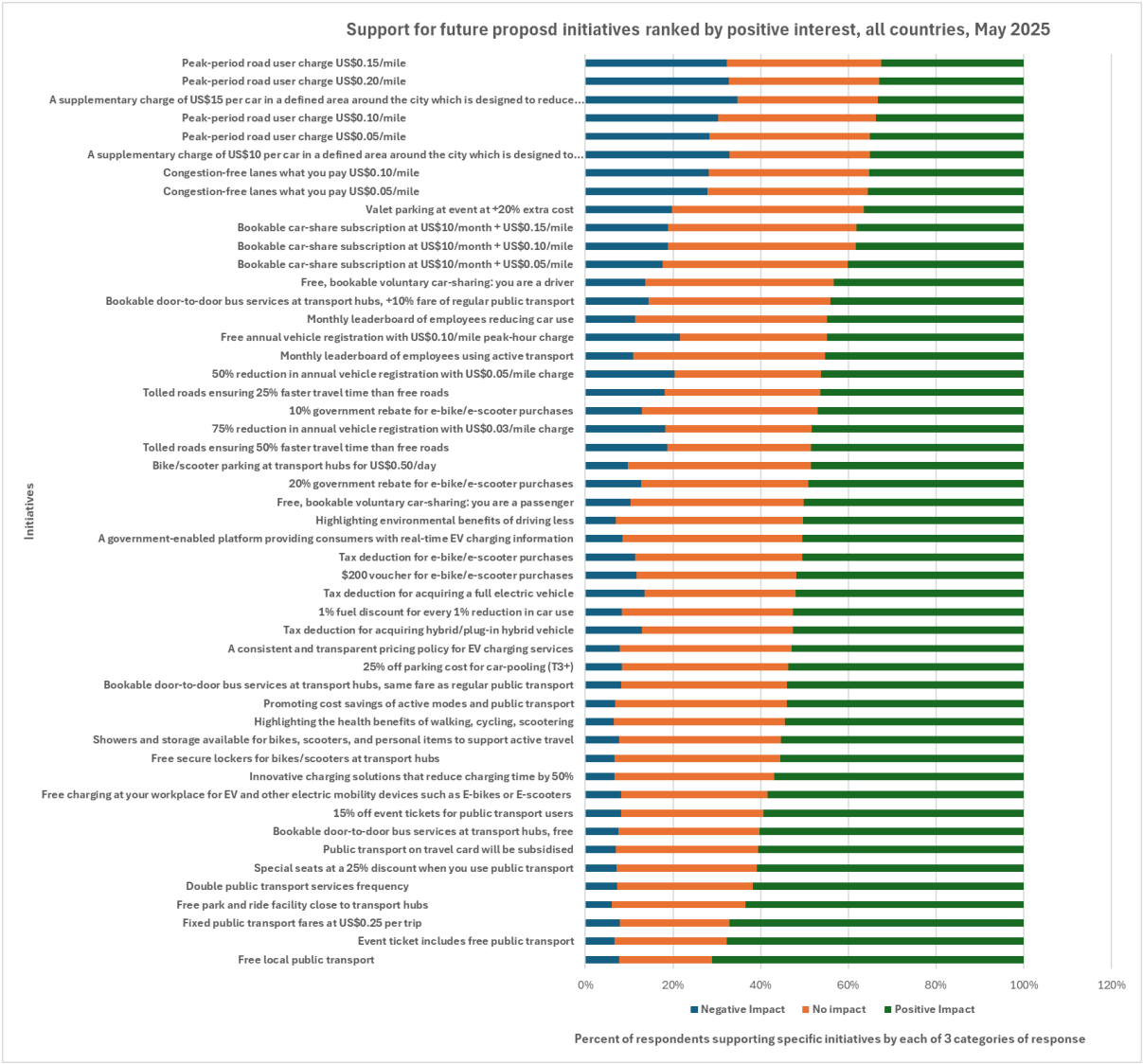


Figure 8. Breakdown of Public Sentiment for Future Transport Initiatives

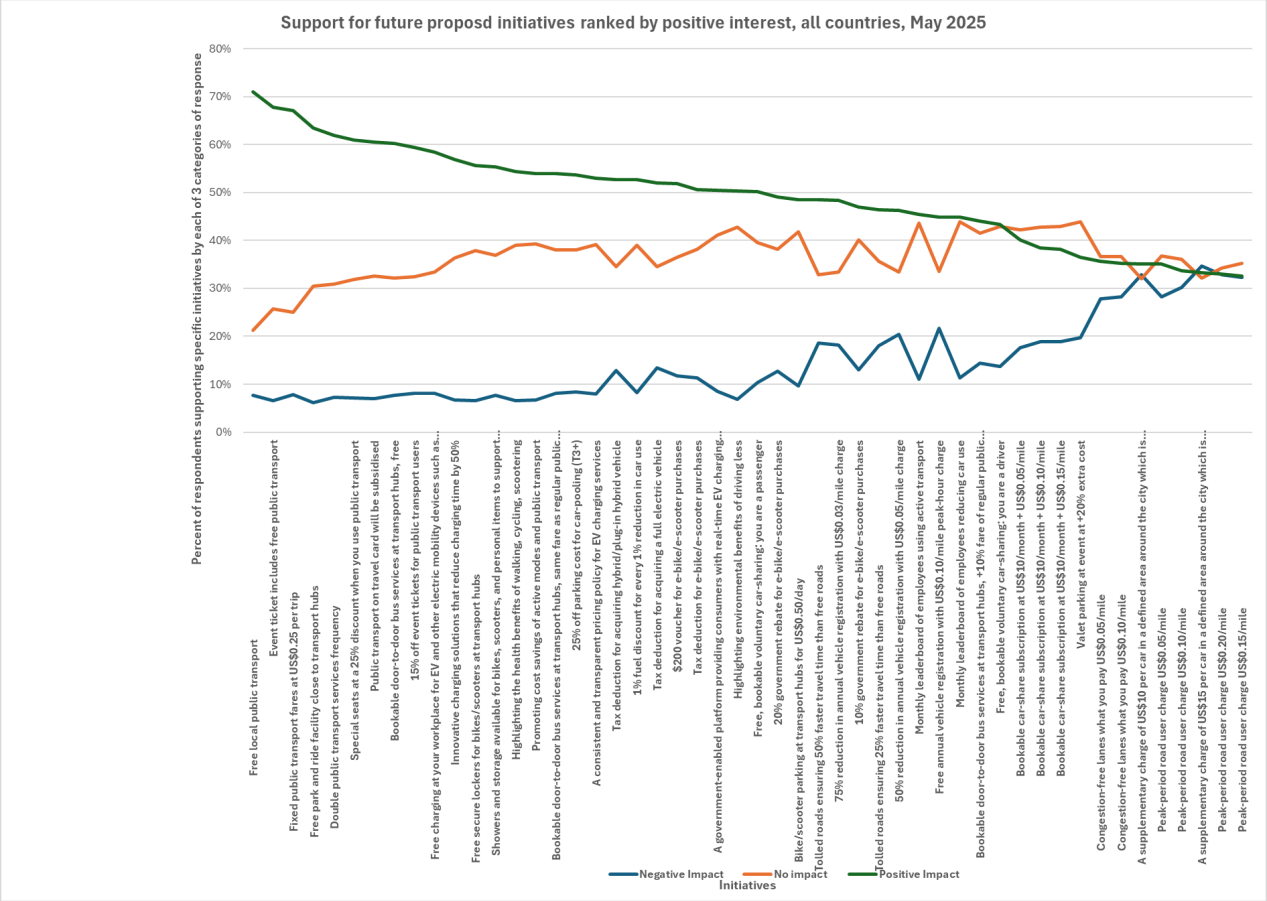


Figure 9. Variation in Public Sentiment Toward Proposed Transport Policies

To enhance practical relevance, we extended the analysis to a country-specific level and conducted a focused examination of Australia, explicitly considering socio-demographic factors when assessing the effectiveness and public acceptability of sustainable transport initiatives. For the modelling, we conducted a factor analysis (oblimin) which yielded 8 optimal factors We next estimated a pooled ordered probit (OP) model across all initiatives. Explanatory variables comprise socio-economic characteristics namely, age, gender, household income, family composition, number of children, occupation, employment status, number of cars (by type), number of active travel modes, disability status, annual car kilometres, and the proportion of hours worked from home or remotely as well as travel behaviour measures (See Appendix 6 for detailed results).

For example, Figure 10 presents the semi-elasticities for the binary variables interacting with the initiatives' categories. Results show that people who have one electric bike or scooter are 97.4% more likely to perceive active travel initiatives as having a big positive impact compared to people who do not. Those who own at least one electric or hybrid car are 81.9% more likely to perceive car initiatives that explicitly refer to reducing externalities (congestion or improving

air quality) as having a big positive impact relative to those who do not, and those who have an e-bike or e-scooter are 63.3% more likely to perceive them as having a big positive impact. Those who have electric cars, bikes or scooters seem to be more positive towards all initiatives except public transport ones, for which there is no statistically significant difference with those who do not own these vehicles. Female participants seem to be 15% more likely to perceive car registration initiatives and 11.7% to perceive public transport initiatives as having a big positive impact (relative to their male counterparts); while 10.3% less likely to perceive on-demand transport initiatives as having a big positive impact (and 12.9% to perceive them as having a big negative impact). Those who have a paid job are 16.9% more likely to perceive on-demand and car pricing initiatives as having a big positive impact, while 39.0% more likely to perceive public transport initiatives as having a big negative impact. Elasticities for continuous variables are illustrated in detail in Appendix 6.

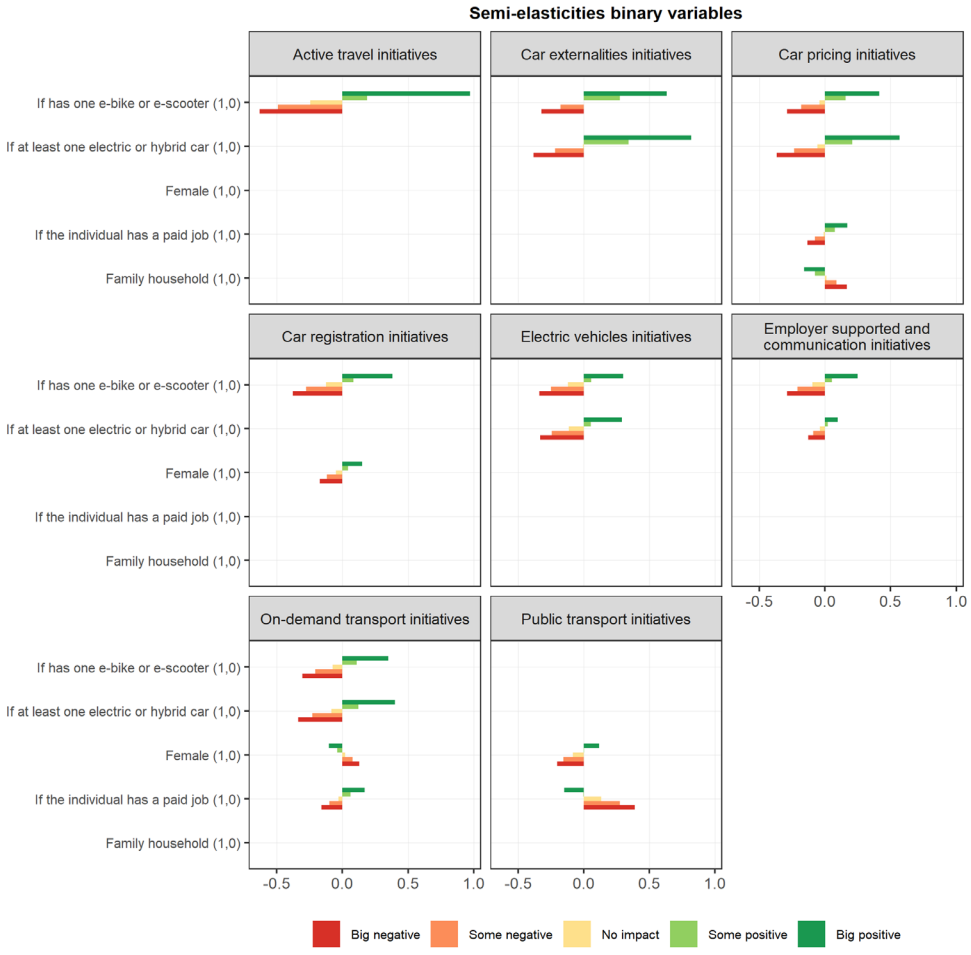


Figure 10. Semi-elasticities for binary explanatory variables

5.4 Establishing the level of support for transport Initiatives which make a positive impact on travel behaviour

The insights drawn from both the literature and the RTDs strongly recommend the importance of segmenting the population for targeted incentives. Building on these insights, we investigated whether there is a difference in the respondent's behaviour based on contextual factors. For this purpose, we used a Latent Class analysis (LCA) to identify clear patterns from the respondents about their attitudes as reflected in their responses towards the transport-influencing initiatives questions (introduced in the previous section) on the 5-point Likert scale from "strongly negative impact" to "strongly positive impact". This analysis also includes many exogenous variables, including respondents' socio-demographic characteristics, changes that occurred in their lives and other aspects from 2023 to the present. By including both response and exogenous variables in the LCA, the resulting latent classes can be profiled, allowing for actionable insights into potential future transport initiatives. The details of the model and respective parameter estimates are provided in Hensher et al. (2025c) (see Appendix 7) and in this section we have highlighted the key findings of the analysis.

5.4.1 A Summary of the Three-Class LCA Model

We compared different class solutions by running 3, 4 and 5 latent classes using the same variables included in the LCA (i.e., 50 initiative variables, 36 WoC variables and 41 standard demographic variables). The 5-class LCA failed to converge. Out of the 3-class and 4-class solutions, the 3-class solution yields a better class separation with a higher entropy. In comparing the demographic profiles, the 3-class solution also gives more clearly defined class profiles. The final resulting LCA is a 3-class solution and shows that all the demographic and WoC variables are statistically significant (refer to Appendix 7) and the majority of the initiative parameters are highly statistically significant. Out of the total 4,088 respondents from the seven countries, there are 33% in Class 1, 29% in Class 2, and 37% in Class 3, based on predicted posterior class probabilities.

To represent the characteristics of the three classes we labelled the three classes as follows:

- Class 1 ("US"): *Urban Strivers* (characterised noticeably by people in full-time employment);
- Class 2 ("SS"): *Settled Simplifiers* (in addition to retirees, this includes homemakers and other "not working"); and

- Class 3 ("DJ"): *Dynamic Jugglers* (including part-time and flexible workers).

Table 9 shows the socio-demographic profiles of the three classes. A summary of the characteristics for each latent class is as follows. Class 1 ("Urban Strivers") are comprised of 56.4% males, with an average age of 44 years old. Households have an average of 2.7 members, with 48% from a couple family with/without children; 20% are family households. They have the highest level of education among the three classes and the highest level of household income in Australia, Singapore, the UK, and the USA. Urban Strivers work an average of 34.8 hours per week of which 11.3 are either remotely at home or other locations. Urban Strivers make an average of 19.4 trips per week, with 66% of them car trips. Their households have an average of 1.48 cars per household.

Class 3 ("Dynamic Jugglers") are quite close to Class 1 in many aspects; the main difference being working status. There are 53% males, with an average age of 43. Households have an average of 2.8 members, with 48% from a couple family with/without children. Compared to Class 1, this class has a lower proportion of couple families with children and just 1% fewer members with a university education (62% vs. 63% in Class 1). Approximately 78% of Dynamic Jugglers are employed in paid work, with an average of 26.4 working hours per week. They also work an average of 8.6 hours per week remotely. They make an average of 21.4 trips per week, with 60% of them car trips. Households have an average of 1.39 cars per household.

Class 2 ("Settled Simplifiers") are distinctly different to the other two classes. There are about 55% females, with an average age of 58 (compared to 44 and 43 of class 1 and 3). The predominant work status (59.1%) is retired or non-working people, or those who are retired but still engage in some casual work. However, many are at younger ages. The average household size is only 2.2, compared to 2.7 and 2.8 for Urban Strivers and Dynamic Jugglers, respectively. The personal and household income levels of Settled Simplifiers are significantly lower than those of Urban Strivers and Dynamic Jugglers in all seven countries. Class 2 members only work an average of 0.6 hours per week, with 0.4 hours working remotely. With respect to transport, Settled Simplifiers travel less with an average of 12.9 weekly trips (compared to 19.4 and 21.4 trips per week by Urban Strivers and Dynamic Jugglers, respectively). Among all trips, 64% are car trips. They have an average of 1.18 cars.

Table 9. Socio-demographic profiles of the three classes

	Urban Strivers	Settled Simplifiers	Dynamic Jugglers
Gender			
Females	43.4%	54.7%	46.6%
Males	56.4%	44.7%	53.0%
Nonbinary/Prefer not to say	0.2%	0.6%	0.4%
Age			
Average age	44	58	43
Household size			
Average number of members	2.7	2.2	2.8
Household type			
Family household	20%	12%	22%
Couple family with no children	25%	35%	20%
Couple family with children	23%	9%	28%
One parent family	6%	4%	5%
Other family	1%	2%	1%
Single person household	18%	32%	18%
Group household (i.e., shared)	5%	3%	4%
Prefer not to answer	1%	2%	2%
Highest education			
Postgraduate degrees and graduate diploma/certificate	26%	18%	29%
Bachelor's degree	37%	20%	33%
Total university degrees	63%	38%	62%
Below bachelor's degree	35%	58%	36%
Prefer not to answer	2%	4%	2%
Average annual personal income (local currency)			
Australia	AUD 93,100	AUD 40,100	AUD 83,100
Finland	43,600 €	28,600 €	46,600 €
New Zealand	NZD 82,900	NZD 40,500	NZD 80,100
Singapore	SGD 78,500	SGD 34,100	SGD 75,000
Sweden	SEK 548,400	SEK 333,600	SEK 580,500
UK	£42,900	£24,000	£40,400
USA	USD 67,100	USD 37,900	USD 66,700
Average annual household income (local currency)			
Australia	AUD 143,200	AUD 68,800	AUD 132,200
Finland	86,400 €	57,400 €	90,800 €
New Zealand	NZD 123,900	NZD 68,900	NZD 127,100
Singapore	SGD 121,700	SGD 64,700	SGD 116,600
Sweden	SEK 859,400	SEK 393,800	SEK 992,500
UK	£62,500	£36,200	£60,500
USA	USD 97,400	USD 59,600	USD 94,100
Work status			
Paid job	97.6%	1.8%	77.8%
No paid job and looking for work	0.4%	17.3%	4.9%
Student	0.5%	5.0%	3.9%
Homemaker	0.2%	15.4%	4.1%
Retired and not working	0.0%	56.3%	6.3%
Unpaid job / Volunteer	0.5%	1.3%	0.9%

Retired and doing casual work	0.7%	2.8%	2.0%
Occupation of workers			
Manager	21%	1%	28%
Professional	24%	19%	23%
Technicians and trades	8%	6%	8%
Community and personal services	7%	3%	6%
Clerical and administration	16%	11%	13%
Sales	8%	11%	6%
Machine operators / drivers	3%	6%	4%
Labourer	7%	17%	7%
Other	5%	26%	5%
Average working hours per week			
Weekly working hours in main office/location	22.2	0.2	16.7
Weekend working hours in main office/location	1.2	0.0	1.1
Weekly working hours at home	8.1	0.1	5.6
Weekend working hours at home	0.8	0.0	0.7
Weekly working hours at other locations	2.0	0.1	1.9
Weekend working hours at other locations	0.4	0.0	0.5
Total number of weekly working hours	34.8	0.6	26.4
Total number of weekly remote working hours	11.3	0.4	8.6
Weekly trips			
Total number of weekly trips	19.4	12.9	21.4
Total number of weekly trips by car	12.9	8.2	12.9
Percentage of car trips (as drivers or passengers)	66%	64%	60%
Total weekly car kilometres as a driver or passenger (km)	77.3	41.9	76.3
Average distance of car trips (km)	5.9	5.1	6.9
Numbers of trips for each purpose			
To / from work	6.0	0.2	5.0
To / from the shops	3.5	4.0	4.1
Visiting friends and relatives	2.1	2.1	2.6
Care trips	2.1	1.5	2.5
Personal business	2.2	2.0	2.5
Recreational activities	2.6	2.5	3.2
Education/Training for students	0.9	0.7	1.4
Mode shares (%)			
Car as Driver	59%	50%	50%
Car as Passenger, incl taxi, Uber	7%	14%	10%
Train, Tram, Bus, Ferry	14%	11%	16%
Walk	15%	21%	18%
Regular Bicycle	3%	3%	4%
E-Scooter, e-Bike	1%	1%	2%
Average number of vehicles			
ICE cars	1.22	1.07	1.06
EV cars	0.12	0.03	0.15
Hybrid cars	0.14	0.08	0.18
Total number of cars	1.48	1.18	1.39
Push bikes	0.76	0.41	0.70
E-bikes	0.15	0.06	0.19
E-scooters	0.12	0.05	0.14
Total number of active travel devices	1.02	0.53	1.03

5.4.2 The level of support for transport initiatives in making a positive impact on travel behaviour

Over 50 transport-influencing initiatives, the percentages of class members nominating the negative impact (points 1 and 2), no/neutral impact (3) and positive impact (points 4 and 5) demonstrate very different patterns. Among *Urban Strivers*, the dominant choices of impact are neutral (57%), followed by positive (24%), and negative (19%). This means that, even though the level of support for initiatives is low among them (at 24%), the level of non-support is also low (19%). Most members may either feel indifferent to the initiatives or lack adequate information to assign either positive or negative impact ratings. As mentioned in Section 4.1, the only significant difference in socio-demographics between *Urban Strivers* and *Dynamic Jugglers* is related to their work status (where the lower number of paid hours / week is an important difference) and occupation. Even though *Dynamic Jugglers* are quite similar to *Urban Strivers* in many ways, they have shown unambiguous support for transport initiatives, at a rate as high as 80%. Moreover, the average level of non-support is as low as 6%. More distinct from *Dynamic Jugglers* than *Urban Strivers*, *Settled Simplifiers* have demonstrated a higher level of average support for transport initiatives at 30%. They also show a lower-level selection of no / neutral impact at 49%. As will be further discussed next, this implies that they may be more certain about the transport initiatives that they would like to support (see Figure 11).

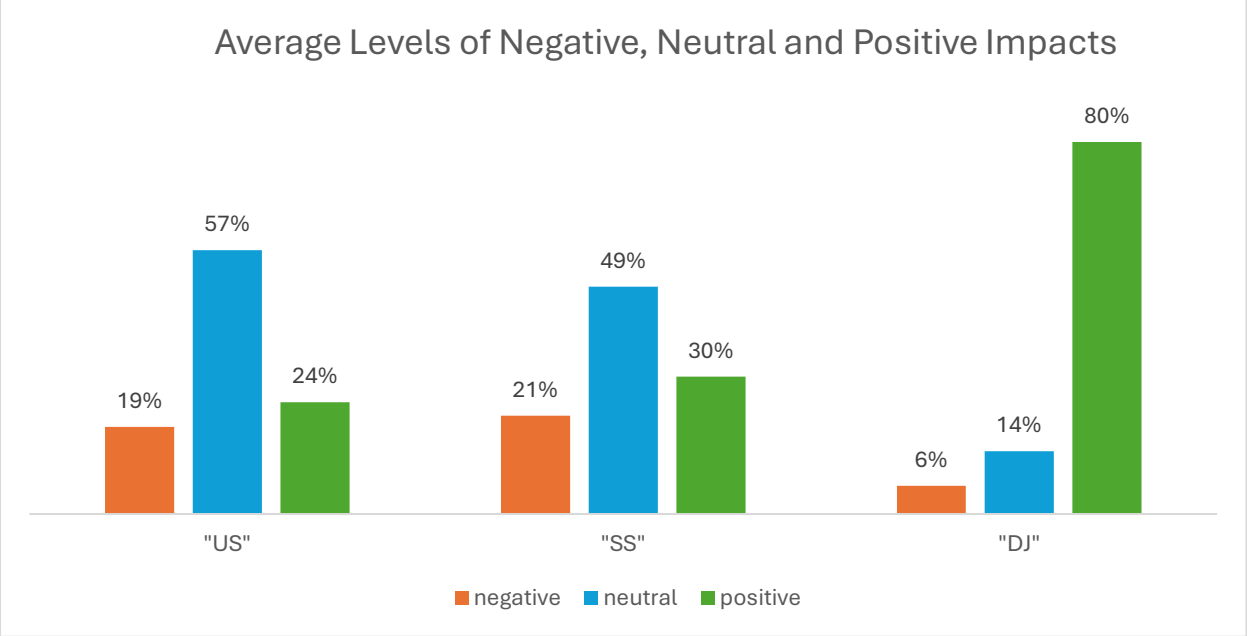


Figure 11. The average levels of negative (1/2), neutral (3) and positive impacts (4/5) to transport-influencing initiatives by latent classes

Table 10 highlights the significant differences among the three classes and the initiatives they support. As highlighted in red, the only initiative that has gained over 50% level of support by *Urban Strivers* is "Free local public transport" (54%) which may appeal to people whose journey to work is by public transport. The few other initiatives that gained between 40% to 49% levels of support are either public transport-related or parking-related. Overall, *Urban Strivers* support low- or free public transport and free parking near transport hubs (which of course are opposites in terms of contribution to sustainability). It is noticeable that levels of support for road pricing-related initiatives are the lowest among all initiatives, ranging from 10% to 15%. Considering the relevance to *Urban Strivers* and the approximately 24 hours per week spent in the main offices, it is expected that their higher support will be for more affordable and efficient public transport services for commuting purposes, which could also be to other locations. The common initiatives that have gained the highest levels of support across all three classes are those related to public transport fares and services.

In contrast to *Urban Strivers*, *Dynamic Jugglers* have demonstrated a strong level of support to almost all initiatives (i.e., all above 60%). Their support levels for initiatives relating to improving public transport and active transport are very high, at 80% to 90% levels. Their support for road pricing and car-related initiatives is relatively lower but still above the 60% level. *Settled Simplifiers* have selective support for transport initiatives related to their background (e.g., retired, students, or looking for work), such as supporting public transport more, the health benefits of active travel, cost savings, free services, and environmental benefits. They have given over 50% of support. However, their negative attitudes towards transport initiatives that are likely to increase the costs of travel are undeniable. For example, they have the lowest levels of support among the three classes on all road pricing initiatives, at levels all below 10%, perhaps reflective of their lower levels of household income compared to the other two classes.

Table 10. Percentages of support for transport-influencing initiatives

Initiatives	**"US"**	**"SS"**	**"DJ"**
Free local public transport	54%	66%	92%
Fixed public transport fares at US$0.25 per trip	48%	59%	91%
Double public transport services frequency	43%	53%	86%
Free park and ride facility close to transport hubs	42%	56%	88%
Free secure lockers for bikes/scooters at transport hubs	31%	38%	86%
Bike/scooter parking at transport hubs for US$0.50/day	23%	29%	79%
Tolled roads ensuring 25% faster travel time than free roads	24%	24%	79%

Tolled roads ensuring 50% faster travel time than free roads	26%	27%	80%
Peak-period road user charge US$0.05/mile	12%	8%	69%
Peak-period road user charge US$0.10/mile	11%	7%	67%
Peak-period road user charge US$0.15/mile	12%	6%	64%
Peak-period road user charge US$0.20/mile	13%	6%	63%
Congestion-free lanes what you pay US$0.05/mile	11%	7%	71%
Congestion-free lanes what you pay US$0.10/mile	12%	8%	68%
A supplementary charge of US$15 per car in a defined area around the city which is designed to reduce congestion	12%	8%	64%
A supplementary charge of US$10 per car in a defined area around the city which is designed to improve air quality	12%	8%	67%
Free annual vehicle registration with US$0.10/mile peak-hour charge	18%	25%	79%
50% reduction in annual vehicle registration with US$0.05/mile charge	19%	27%	80%
75% reduction in annual vehicle registration with US$0.03/mile charge	23%	31%	82%
Tax deduction for acquiring hybrid/plug-in hybrid vehicle	28%	33%	85%
Tax deduction for acquiring a full electric vehicle	27%	32%	85%
Bookable door-to-door bus services at transport hubs, free	33%	49%	91%
Bookable door-to-door bus services at transport hubs, same fare as regular public transport	27%	40%	85%
Bookable door-to-door bus services at transport hubs, +10% fare of regular public transport	18%	23%	77%
Free, bookable voluntary car-sharing: you are a passenger	25%	29%	84%
Free, bookable voluntary car-sharing: you are a driver	18%	17%	78%
Bookable car-share subscription at US$10/month + US$0.05/mile	13%	12%	77%
Bookable car-share subscription at US$10/month + US$0.10/mile	12%	11%	74%
Bookable car-share subscription at US$10/month + US$0.15/mile	13%	10%	73%
Event ticket includes free public transport	46%	60%	93%
25% off parking cost for car-pooling (T3+)	26%	40%	86%
Valet parking at event at +20% extra cost	14%	14%	66%
15% off event tickets for public transport users	34%	48%	88%
Special seats at a 25% discount when you use public transport	36%	48%	89%
10% government rebate for e-bike/e-scooter purchases	21%	21%	81%
20% government rebate for e-bike/e-scooter purchases	23%	25%	83%
$200 voucher for e-bike/e-scooter purchases	26%	30%	85%
Tax deduction for e-bike/e-scooter purchases	24%	27%	83%
Free charging at your workplace for EV and other electric mobility devices such as E-bikes or E-scooters	29%	45%	89%
Showers and storage available for bikes, scooters, and personal items to support active travel	28%	44%	85%

Public transport on travel card will be subsidised	36%	62%	87%
1% fuel discount for every 1% reduction in car use	24%	50%	84%
Highlighting the health benefits of walking, cycling, scootering	26%	62%	84%
Promoting cost savings of active modes and public transport	25%	55%	85%
Highlighting environmental benefits of driving less	21%	61%	81%
Monthly leaderboard of employees using active transport	16%	36%	75%
Monthly leaderboard of employees reducing car use	16%	42%	75%
A government-enabled platform providing consumers with real-time EV charging information	21%	35%	83%
A consistent and transparent pricing policy for EV charging services	24%	38%	84%
Innovative charging solutions that reduce charging time by 50%	30%	42%	87%

5.4.3 Summary Profiles of the Three Latent Classes

We considered the top 15 changes in lifestyle and work conditions for the three classes. For *Urban Strivers*, the top 5 changes they experienced since 2023 include 1) moved to flexible working hours and days; 2) tighter financial situation; 3) started walking/exercising more for health reasons; 4) moved to a new area; and 5) improved health. These top changes are all consistent with the changes in the working environment during and post-pandemic. With saved travel time and WFH popularity, people have more time to spend on walking/exercising to gain better health and work-life balance. *Dynamic Jugglers* have the same top 5 changes as *Urban Strivers*, with only order differences. However, the top change or the central theme of their lifestyle change is also "moved to flexible working hours and days". *Dynamic Jugglers* appear to experience less financial stress compared to *Urban Strivers*, with a lower ranking of cost-of-living-related changes among them. On the other hand, the top 5 changes for *Settled Simplifiers* have a different central theme. The top 5 changes in their lives are: 1) was not in the workforce during the period; 2) started walking/exercising more for health reasons; 3) a tighter financial situation; 4) I have adjusted my lifestyle to prioritise saving money; and 5) I had health concerns that affected my travel. These top changes have fully characterised what is typically faced by retired/or non-working individuals.

An important aspect of this study has been to establish the level of support for transport initiatives which make a positive impact on travel behaviour and to appreciate where travel initiatives might be directed. In summary, of the three latent classes *Dynamic Jugglers* have lifestyles which are characterised by more flexible working patterns They report the move to more flexible work arrangements as their top WoC in the last three years and they make larger numbers of recreational and shopping trips. Their positive attitudes towards transport-

influencing initiatives (see Table 7) imply that they are open to trying options that will give them flexibility and fit with their lifestyles. *Dynamic Jugglers* are particularly open to public transport initiatives and show an interest in micromobility initiatives (free lockers and modest parking charges at transport hubs) and tolled roads which offer a higher travel time. They exhibit a better wellbeing status than their counterparts in *Urban Strivers* which is also consistent with a more relaxed lifestyle. They would be responsive to event ticketing including public transport and to receiving discounts on events when using public transport. Of all three classes, they express the greatest interest in the environmental benefits of driving less.

By contrast the *Urban Strivers*, since they are noticeably dominated by people in full-time employment, are likely to be experiencing a higher tax burden and tighter financial situation which makes them less responsive to transport influencing initiatives (other than free local public transport which could be attractive for journeys to work). They report less experience of walking and cycling for health reasons as a WoC than either of the other classes. This class shows little interest in most of the transport-influencing initiatives (they either feel indifferent to the initiatives or lack adequate information or interest to assign either positive or negative impact ratings). It is arguable that they would benefit from greater information about the transport-influencing initiatives and associated benefits that could be available to them. The *Settled Simplifiers*, who mostly comprise retirees, homemakers and other "not working" population are more focussed on retirement and leisure, arguably might have been expected to show more interest in the transport-influencing initiatives. They cite walking/exercising more for health reasons as a key WoC. They have demonstrated support for free public transport and would likely appreciate the cost savings associated with active modes and public transport. The implications for transport initiatives may be a need to integrate these initiatives into their existing programs. They are unlikely to be the primary population segment to support the implementation of challenging transport initiatives, such as road pricing schemes.

Overall, our findings demonstrate that when aligned with the concept of windows of change, segmentation offers a powerful framework for identifying when and how to intervene most effectively. This implies that policy design should not only target the moments (or “windows”) when individuals are most receptive to change, but also tailor strategies to the specific needs, motivations, and contexts of different traveller groups. We suggest that the WoC analysis explains what happened in the lives of respondents far more effectively than a focus on standard demographics.

The three-class segmentation re-emphasised the importance of segmentation when designing and developing targeted interventions. Suggested packages derived for each class are as follows:

Urban Strivers are comprised of 56.4% males, with an average age of 44 years and an average household size of 2.7 members. Urban Strivers work an average of 34.8 hours per week of which 11.3 are either remotely at home or other locations. They make an average of 19.4 trips per week, 66% of them car trips.

Package of initiatives **(push and pull) to achieve sustainable behaviour changes:**

- **Improved public transport with reduced/lower fares to commuting journeys.**
- **Incentivise the use of EV/Hybrid vehicles considering the household size and usage.**
- **Packaging public transport with event tickets, utilities etc (i.e. MaaF).**
- **On demand transport and park and ride options based on geographic location.**
- **Co-ordinating with the respective employers to offer incentives for sustainable travel options (i.e. salary packaging, leaderboards etc).**

Compared to Urban Strivers, Dynamic Jugglers work fewer hours per week on average (≈28 vs 34), have more kids (median 2 vs 1), and tend to live in larger, more affordable suburban homes. Their days are a string of school drop-offs, activities, errands and work trips, the last often orbital rather than radial.

Package of initiatives **(push and pull) to achieve sustainable behavioural changes:**

- **Expand park and ride at suburban hubs aligned to orbital bus/metro corridors.**
- **Ready-made public transport services (10–15 min all-day frequencies) on key orbital routes, timed transfers at hubs.**
- **Peak-period bus-priority and transit lanes on orbital corridors.**
- **Priced parking at suburban centres and CBD to encourage short visits (e.g., shoppers) and discourage long stay (i.e., car commuters)**
- **Parking cash-out at workplaces: employees who forgo a space receive a travel credit (preferably from their employer).**

Settled Simplifiers are distinctly different to the other two classes. There are about 55% females, with an average age of 58 (compared to 44 and 43 in class 1 and 3). The predominant work status (59.1%) is retired or non-working people (including students), or those who are retired but still engage in some casual work. The majority of this class are couples with no children or single person households. They are keen on measures that reduce the cost of travel but are likely to be less time sensitive on their travelling. However, they still tend to own cars and make significant journeys by car.

Package of initiatives **(push and pull) to achieve sustainable behavioural changes:**

- **50% discount on public transport fares between 09:00am and 4:30pm on weekdays while maintaining 'good' PT frequencies**
- **Reward points for PT users to redeem for free trips. Points can be accumulated as individual or shared within a group.**
- **Price parking at local centres to discourage car-based travel.**
- **Public information campaign highlighting the health benefits of the active travel aspects of PT use.**

5.5 Identifying circumstances in which the introduction of road user charge regimes garner support

This section focuses on road user charging initiatives, a topic that remains at the centre of policy debates on sustainable transport and equitable mobility. Given the ongoing discussions surrounding their feasibility and public acceptance, examining the factors that influence support for these initiatives is crucial. In this section, we draw on data items related to eight pricing initiatives Figure 12, and "windows of change" (WoC) influences listed in Table 6, which represent key moments where travel behaviour might be more susceptible to change. We also include the socioeconomic variables in the inquiry. We ran a generalised ordered logit model (Greene and Hensher, 2010) to identify what contextual variables influence the probability of an initiative being associated with a positive impact, a negative impact, or no impact. We are especially interested in understanding how prior "windows of change" associated with lifestyle, mobility, work, commuting, and environmental preferences condition support or otherwise for each road pricing reform initiative. The findings provide suggestions on the extent to which each of the eight initiatives assessed can deliver support or otherwise for road pricing reforms from individuals whose recent past is associated with one or more of the 70 windows of change investigated.

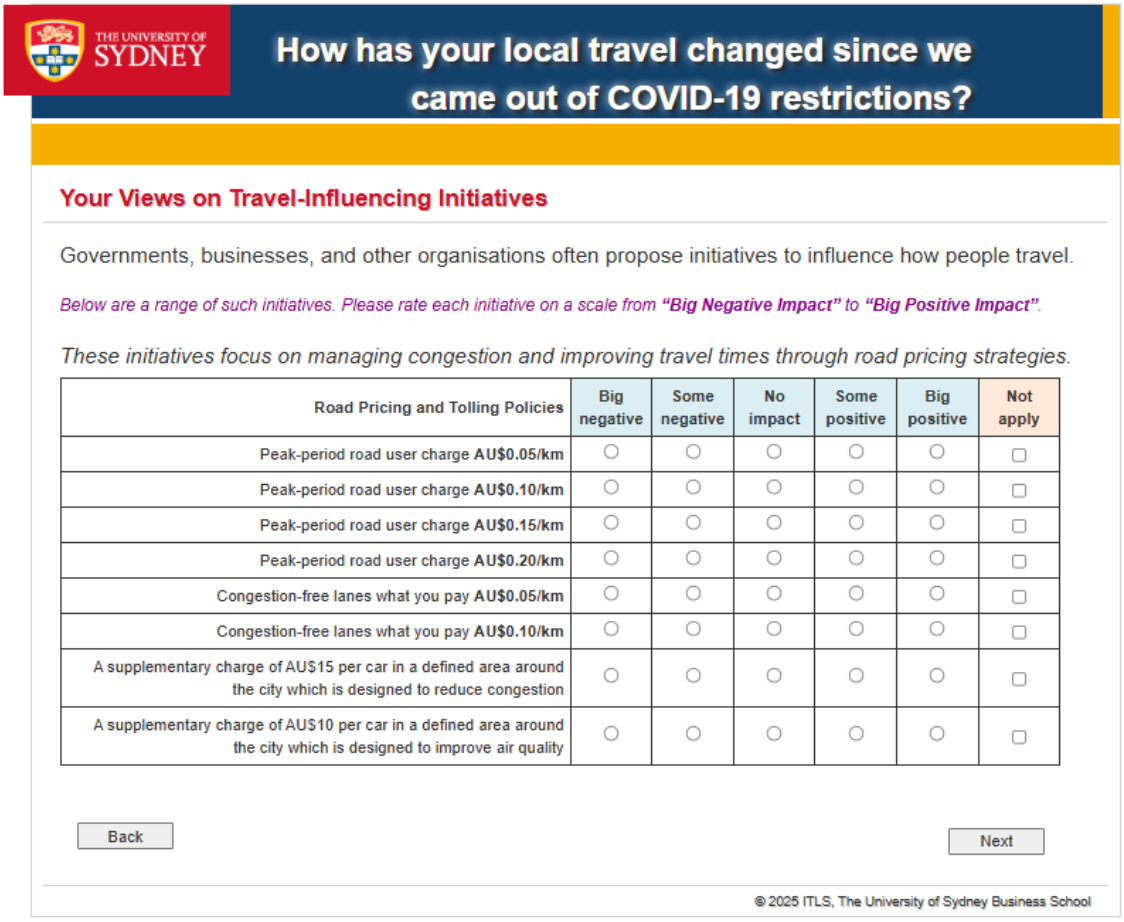


Figure 12. The series of questions on road pricing initiatives

The ordered response scale shown in Figure 12 has been aggregated into three levels – negative impact, no impact and positive impact. This decision was taken to ensure we have enough responses for each level of the generalised ordered logit model. Table 11 assigns an acronym to each pricing initiative, which is used in Table 12 and Figure 13 to profile the incidence of response for each impact level. We can see, for example, that as the peak period distance-based charge (DBC) increases from 5c/km to 20c/km, the positive support declines (i.e., getting too expensive), and the negative impact increases for the same logical reason. We find a high correlation in general between the positive and negative impacts. Hensher et al. (2025b) (See Appendix 8) provides example applicable to all initiatives, such that after estimation of the Generalised Ordered Logit (GoL) model for all three impact levels, we focus on reporting and discussing only the positive impact evidence, through elasticity estimates.

A positive impact for an initiative has to be carefully interpreted. Although the meaning can vary depending on the initiative, for the introduction of a new pricing regime, if an initiative has a positive impact, it can mean that it has some support, which can vary and will be dependent on knowing what variables (including the WoC influences) are influencing the

direction of positive support. A negative parameter and associated elasticity, for example, suggest that an increase in the level of a particular statistically significant influence, such as car use, ceteris paribus, supports reduced (positive) support for a specific pricing initiative, increasing as car kilometres increase.

Table 11. The eight pricing initiatives and codes

Road Pricing Schemes	**Acronyms**
Congestion-free lanes what you pay $0.05/km	ICFL05
Congestion-free lanes what you pay $0.10/km	ICFL10
A supplementary charge of $10 per car in a defined area around the city	CH10CR
A supplementary charge of $15 per car in a defined area around the city	CH15CR
Peak-period road user charge US$0.05/km (Distance-Based Charge)	DBC05
Peak-period road user charge US$0.10/km (Distance-Based Charge)	DBC10
Peak-period road user charge US$0.15/km (Distance-Based Charge)	DBC15
Peak-period road user charge US$0.20/km (Distance-Based Charge)	DBC20

Note: The initiatives were expressed in the currency of each of the seven countries, but we list the $US in the table. Respondents saw the language of a peak period road user charge (RUC) which we refer to also as a distance-based charge (DBC).

Table 12. The distribution of impact for each initiative

	DBC05	**DBC10**	**DBC15**	**DBC20**	**ICFL05**	**ICFL10**	**CH10CR**	**CH15CR**
Negative Impact	28.2%	30.2%	32.6%	33.5%	28.3%	28.6%	34.0%	35.5%
No Impact	38.0%	37.2%	35.9%	34.9%	37.3%	37.6%	32.8%	32.6%
Positive Impact	33.8%	32.6%	31.5%	31.6%	34.4%	33.8%	33.2%	32.0%
Base	3090	3087	3087	3078	3085	3091	3087	3107

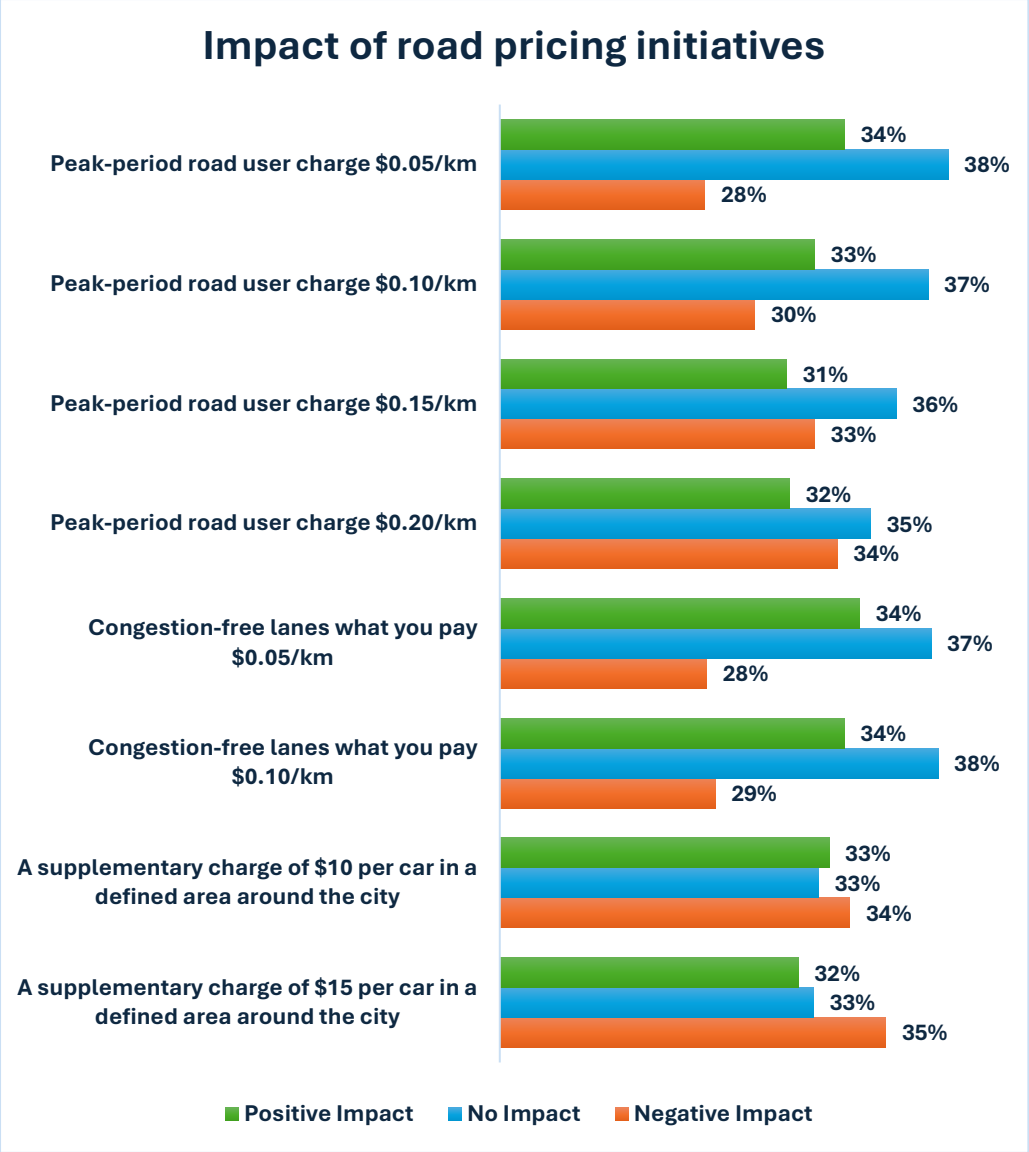


Figure 13. The overall incidence of impact of each pricing initiative

5.5.1 Model Estimation Results

The influence of each WoC varies across the eight road pricing regimes, with a significant number not having a statistically significant influence. For example, age is statistically significant in all eight models, whereas personal income is only statistically significant for a $15 cordon-based charge. The sign has to be interpreted mindful of the three-point scale, and because of the possibility of a change in sign when moving between a positive and negative impact, an elasticity estimate associated with each level is behaviourally more informative. The negative sign for age in all models, however, suggests, *ceteris paribus*, that there is an overall net support decrease as age increases. In contrast, the sign of personal income suggests greater support for a cordon-based $15 charge as income increases (they can afford it and presumably see a benefit through reduced traffic).

The country-specific dummy variables are very informative, with evidence that residents of Finland (where congestion charges have never been introduced), and the UK have a significant negative parameter for all eight pricing regimes, but for Australia and New Zealand the statistically significant negative impact is found only for the $15 cordon-based charge. Swedish residents, however, show a positive significant effect for a $10 cordon-based charge, presumably because of experience with the schemes in Stockholm and Gothenburg, and a negative sign for a 5c/km congestion-free lane[1]. After controlling for WoCs and a few socioeconomic effects, we can see that the influence of each pricing regime varies across countries, as expected.

There are five WoC influences that have a statistically significant influence on all eight pricing regimes, namely 'My financial situation became tighter' (negative parameter), 'I have adjusted my lifestyle to prioritise saving money' (negative parameter), 'My employer introduced charging facilities for electric cars' (positive parameter), 'Public transport quality has worsened' (negative parameter), and 'I am now more conscious of the environmental impact of my travel choices' (positive parameter). The signs all make good sense, suggesting that financial constraints (exacerbated by the current cost-of-living crisis being experienced in many countries) make the pricing reforms less desirable, as does the worsening quality of public transport, which makes any switch from car less desirable. Then we see that the employer introducing charging facilities for electric cars at the workplace is sufficiently attractive to support road pricing reforms, which might appear to be an attractive way of improving travel times to work, and in many countries, electric car owners generally have higher personal incomes and a tendency to drive more once they have switched to an EV. Recent evidence from Norway which has taken up electric cars more than any other country shows a 10-20% increase in car use and a sizeable shift away from public transport use, cycling and walking (Green and Østli, 2025). Finally, we see positive support from individuals who are now more environmentally conscious. The behavioural richness of the evidence is greater when we present the elasticity estimates which we have summarised in the next section.

5.5.2 Elasticity Evidence

The mean direct elasticities associated with a negative and a positive impact are summarised in Appendix 8. The interpretation of a negative and a positive impact needs to be explained,

[1] Note that we had a fairly even split of metro (212) v regional (177) respondents in Sweden suggesting that regional residents are also responding positively.

and the direction of change will depend on the sign of the elasticity estimate. Taking the positive impact first (P column), an elasticity with a positive parameter estimate suggests, *ceteris paribus*, that a participant who experienced that WoC relative to one that did not, or those who have a higher value in the level of a continuous variable (e.g., are older) are more likely to perceive a positive impact, which can be interpreted as greater support for that particular pricing reform. On the contrary, a negative elasticity associated with a positive impact (P column) response suggests, *ceteris paribus,* that these participants are less likely to perceive a positive impact. That is, people could still support the reform, but not as strongly as those in the first category (who have experienced that WoC or are older in the example above).

In contrast, if there is a positive elasticity estimate for the negative impact (N column), this means participants who have experienced that WoC or have a higher value in the continuous variable (i.e., older), are, *ceteris paribus,* more likely to perceive this reform as having a negative impact. We can interpret this as a much greater negative support for that particular road pricing reform. Whereas a negative elasticity in the negative impact column (N column), suggests a reduced, but still negative, support for the reform. We focus on discussing the positive impacts, noting that there appears to be strong symmetry between the negative and positive impacts, albeit a negative correlation.

To take an example, for the 'total number of public transport trips' explanatory variable, we have a small positive elasticity for all levels of the peak-period road user charges (DBC) (0.050, 0.039, 0.037), which suggests*, ceteris paribus*, that as the number of public transport trips increases by 10%, the probability of supporting a DBC at any level increases by 0.37% to 0.5%. The elasticities associated with congestion-free lanes are 0.048 and 0.036 respectively for AUD 5c/km and AUD 10 c/km, with 0.023 for a cordon-based charge of $10 per day (not being significant for $15 per day). The smaller relative elasticity for a cordon-based charge is expected since it is limited to a smaller geographical setting than the DBC and hence it impacts far fewer residents, but interestingly, the congestion-free lane charge has a similar estimate to a DBC, partly linked to the typical length beyond the city centre. For all road pricing reforms (RPR) in Table 5, we have a small percentage impact of the number of public transport trips, varying from 0.23% to 0.5% for a 10% increase in the number of PT trips. Clearly PT users are 'happy' for car users to be charged, possibly benefitting bus where it shares the road with cars or some view that car users do not pay for the congestion they cause.

By contrast, as the number of ICE cars (i.e., petrol/diesel cars) in a household increase, the probability of a positive impact of a DBC decreases and much more than the PT increase (-0.167 to -0.228), which means that a household with one ICE car relative to zero would be between 16.7% to 22.8% more likely to support the DBC. A negative elasticity always suggests a less desirable outcome (i.e., suggesting less support for the schemes) when a variable is relevant in the case of WoCs. For example, where a worker has been offered free parking at the office, the introduction of a DBC has a positive elasticity (0.022 to 0.033) suggesting that there is greater positive impact of the DBC. This suggests that commuters who drive to work and benefit from the free parking at work, believe that a DBC is likely to make a positive impact to their routine commuting possibly because it may ease traffic and congestion and clearly have a reduced financial impost in the presence of free parking. This is an interesting result, indicating that individuals as commuters are positive in supporting road pricing reform but tempered, in this case, by end of trip facilities which can be influenced by an employer. In contrast, where an individual increased their car use, they have a negative elasticity response (-0.011 to -0.019) for only the DBC reforms of $0.15/km and $0.20/km. This suggests that those who have increased their car use are between 1.1% to 1.9%, *ceteris paribus*, less likely to perceive a positive impact of the $0.15-0.20/km DBC reforms, and do not have a statistically significant different perception when it comes to the $0.05-0.10/km DBC reforms.

The largest behavioural elasticity response associated with the WoCs is for a greater consciousness of the environmental impact of an individual's travel choices (who are between 11.7% to 16.1% more likely to perceive a positive impact), followed by a person's financial situation becoming tighter (who are between 5.1% to 8.0% less likely to perceive a positive impact), and in both influences, it applies across all eight road pricing reforms. Again, it should be remembered that this relates to experiences within the last 3 years when a certain amount of lifestyle reprioritisation may have taken place following the impact of COVID-19. The majority of the other mean direct elasticities are typically at the 1% to 3% level, and as dummy variables, this is interpreted for a situation where an influence moves from being influential (1) or not (0).

The country-specific elasticities are interesting, with the statistical significance of the parameters associated with each explanatory variable varying across the eight pricing regimes. Finland is the only country where we have a significant negative relative elasticity response for positive impact across all eight pricing regimes, varying from 1.34% for a cordon-based charge of $10 to 3.65% for congestion-free lanes priced at 5 c/km. Where there is a country-specific

negative effect on a positive impact, the levels vary from a high of -7.4% for Australia (cordon-based charge of $15) to a low of -1.6% in Sweden (for congestion-free lanes priced at 5 c/km).

A comparison across all pricing regimes where we calculate the ratio of the DBC over each of the other two pricing regimes Figure 14 can provide a useful way of understanding the different behavioural responses to the pricing regimes. The evidence suggests a much higher elasticity response for a DBC, with a few exceptions, and this is expected given that a DBC is areawide, and therefore more visible, in contrast to the narrower geographical context of the other two pricing regimes. The ratio varies from a high of 6.92 for 'free parking at work' for the ratio of a DBC to cordon-based charging and 5.56 relative to a congested free pricing lane, to a low of -0.63 for "my financial situation became tighter" for the ratio of a DBC to congested free priced lanes. This negative ratio reinforces the greater lack of support for a DBC.

5.5.3 Contrasts between the eight initiatives: what are the policy suggestions to carry forward and change action initiatives?

The evidence suggests a number of key drivers that work to provide greater support for specific pricing reforms, and which may be used in a policy setting to promote buy-in for road pricing reforms or which are barriers to achieving a likely future buy-in agenda. The dominating influences are many, but *free parking provided by an employer has an interesting strong positive support.* We find that individuals with such free parking tend to be associated with a higher probability of supporting a road user charging regime by kilometre (i.e., distance-based charge, DBC) with a higher probability as the cost per kilometre increases. What this suggests is that since such individuals have free parking, *ceteris paribus*, they are far less sensitive to the DBC, and we conjecture this is because they see improved travel times for them, given that they are committed to car use. This presents an interesting policy dilemma since free parking at work is a strong inducement to travel by car and a disincentive to switch to more environmentally friendly modes. Households that have more cars have negative elasticities which suggests, *ceteris paribus*, that they have a higher probability of not supporting a DBC. Individuals with more consciousness now of the environmental impact of their travel choices tend to support a DBC with a slightly greater support probability as the charge increases per kilometre.

It is important to recognise that a DBC charge applies in peak periods throughout a geographical jurisdiction, whereas a cordon-based charge focuses on a smaller area and applies throughout the day, and a congestion-free lane charge is limited to a specific road or corridor.

Overall, we see a greater elasticity response (i.e., sensitivity) to a DBC charge compared to the other pricing regimes (Figure 14) when specific windows of change influences come into play.

The most important *actionable change initiatives* that can garner positive support for one or more of the eight re-pricing regimes is one that involves promoting environmental consciousness through the many media and other channels available and given the evidence of elasticities influences as an individual ages, the need to especially focus on the younger generation comes through very clearly. We can see that most WoC influences result in a 1%-3% change in the probability of positive support for a road pricing regime, and while this is statistically significant, the impact on overall traveller behaviour is negligible. What we can observe, however, is that for the presence of ICE (i.e., petrol/diesel) cars in a household, for each one-car increase, we see a 11.77% to 22.8% reduction in the positive probability of support for the re-pricing regime proposals. In contrast, as public transport trips increase by 10%, the opposite occurs with a smaller but significant increase in the probability of positive support of 0.26% to 0.51%. Clearly, owning cars will always garner much lower support, and the challenge remains to establish if we have enough evidence to suggest that a majority of car owners do have some positive support for road pricing reform.

Finally, we see that a move to flexible working hours and days which is a strong feature of the last three years, results in a 2.8% to 5.13% increase in the probability of positive support for the road pricing regimes, which aligns well with the evidence from other studies (see Hensher et al. (2026) for a summary) that working from home (WFH) reduces the sensitivity to cost and time in using the car for travel, especially commuting. Hence, we can expect that we get some significant change in support for road pricing reform given the implied assumption that it benefits existing car users through improved travel times and with increased WFH, one is outlaying less money on car trips even under a proposed re-pricing model.

Overall, the evidence suggests that we have some *actionable change initiatives* that can potentially be effective in securing effective buy-in from the public, but they are few in number. Hensher et al. (2025a) identified a number of WoC influences that have resulted in a statistically significant change in the number of trips by car, public transport and active modes, but very few of these WoC influences align with positive support for re-pricing of car use. Where they do align, they tend to go against the objective of encouraging a switch to more sustainable transport modes, namely free parking at work (‘the gorilla in the room’), replacing an ICE car with an electric car, and charging facilities at the office for electric cars

The evidence suggests that lasting support for road pricing reform requires a focused set of mutually reinforcing policy actions:

- **Reform employer-provided parking incentives: Gradually reduce or price employer-provided free parking to discourage excessive car use, as it strongly increases support for distance-based charging but undermines sustainable mode shifts.**
- **Promote environmental awareness campaigns: Invest in broad-based communication strategies (especially targeting younger populations) to raise environmental consciousness, which modestly increases support for road pricing reforms.**
- **Encourage flexible work arrangements: Support policies that sustain and expand flexible or hybrid work options, since working from home (WFH) increases positive attitudes toward road pricing and reduces car dependency.**
- **Link EV and charging policies with broader mobility goals: Manage incentives for electric vehicles and workplace charging carefully so they complement, rather than conflict with, efforts to reduce overall car use and promote mode shift to public transport or active travel.**

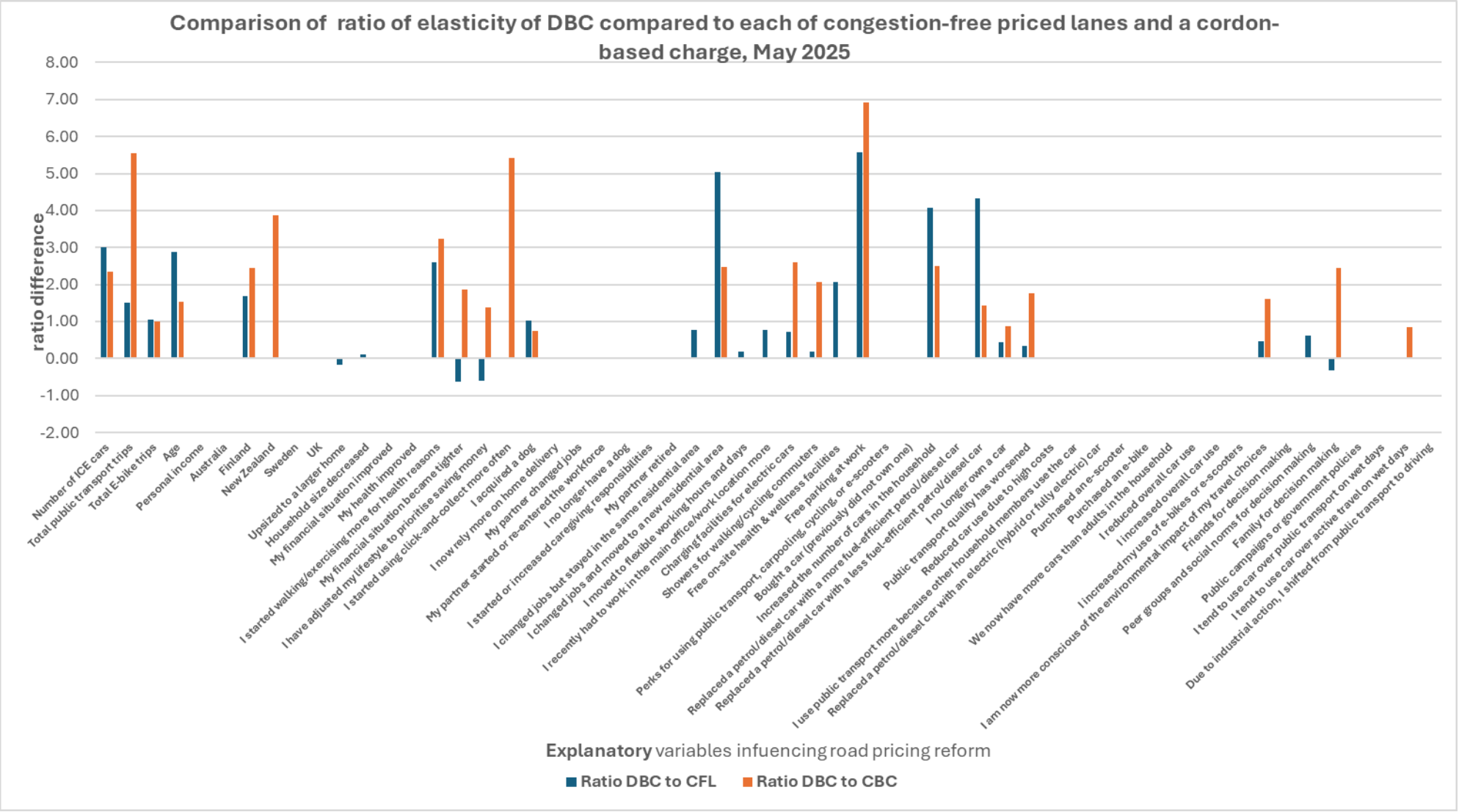


Figure 14. Comparisons of the ratio of a DBC and each of congested free priced lanes and cordon-based charging

6 Way Forward and recommendations

This study highlights that effective transport policy must address not only infrastructure and economics but also the behavioural, social, and temporal dimensions that shape how people travel. Sustainable mobility outcomes depend on aligning motivation, context, and system design at the moments when individuals are most open to change, known as windows of change (WoC). Policies that respond to these moments and are sensitive to diverse social and institutional contexts can achieve greater acceptance and longer-lasting impact. The following recommendations synthesise insights from the primary data collection to guide the design of more responsive and effective transport interventions.

6.1 Recommendations

1. Capture learnings from current experience

The RTDs provided valuable insight into how attitudes, subjective norms, perceived behavioural control, and behavioural intention interact across individual, social, and systemic levels to shape sustainable mobility outcomes. Figure 5 illustrates these key constructs and their interrelationships, highlighting the need for coordinated action across all three levels. Participants emphasised that sustainable mobility emerges when motivation, context, timing (i.e. WoC), and system design align within a coherent and shared policy vision. Positive attitudes, supportive environments, and intrinsic satisfaction underpin sustained engagement, while awareness campaigns and incentives help normalise sustainable choices. Enhancing perceived behavioural control through improved infrastructure, digital tools, and institutional capacity empowers individuals to act on their intentions and translate pro-sustainability attitudes into behaviour. Together, these findings underscore that sustainable mobility is not simply the outcome of individual choice, but of a carefully aligned ecosystem in which personal motivations, social influences, and systemic structures reinforce one another over time. In practice, this means that lasting change will depend on integrated strategies that simultaneously nurture pro-sustainability attitudes, remove contextual barriers, and build the capacities needed for people to confidently choose and maintain sustainable ways of moving.

2. Integrate behavioural timing associated with WoC into policy design

Behavioural change is a dynamic concept that is typically conditioned on what people have done in the past, and how decisions in the past have determined current travel habits and behaviour. Transport planning should systematically incorporate behavioural timing (WoC) as

a design principle. Identifying when individuals are most open to change, such as during life transitions related to employment, relocation, or health, provides valuable opportunities for targeted interventions. We have identified the incidence of a particular WoC being stated as having an influence on subsequent travel behaviour, and when these influences are mapped into a negative binomial count model to establish a statistical significant influence on weekly modal trip frequency or not, we have been able to identify a number of past influences that we should work with as a set of future actionable change initiatives, or ACIs (see Table 8 and point 5 below). Compared with static demographic indicators, temporal and contextual factors offer a more robust basis for anticipating behavioural shifts and designing responsive policy instruments. This approach moves beyond simply identifying who might change behaviour, to understanding when and why that change becomes possible.

3. Develop targeted strategies for traveller segments

The latent class analysis identified three distinctive traveller segments namely, "Urban Strivers", "Dynamic Jugglers", and "Settled Simplifiers" each characterised by specific life circumstances, economic situations, and degrees of openness to behavioural change. A nuanced understanding of these groups allows for more precise targeting of interventions and avoids one-size-fits-all approaches that tend to dilute policy impact.

Dynamic Jugglers represent the most promising target group for early policy engagement. With their flexible working patterns, relatively high income, and openness to technology and new experiences, they are receptive to multimodal solutions and innovative mobility programs. Policy measures that leverage digital platforms, such as integrated transport apps or mobility-as-a-feature (MaaF) systems, can appeal strongly to this group. They are also more responsive to initiatives that link personal wellbeing and environmental responsibility, such as workplace travel challenges, carbon reduction incentives, or loyalty schemes tied to public transport and micromobility use. Local governments and operators could further engage this group through pilot programs that showcase time-saving and lifestyle-enhancing benefits, reinforcing behaviour through positive reinforcement rather than restriction.

Urban Strivers, by contrast, tend to be financially constrained, time-poor, and more dependent on cars for daily commuting. Behavioural inertia is strong within this group, driven by economic pressures and the perceived convenience of private vehicle use. Effective strategies for this segment must focus on addressing cost and accessibility barriers. Subsidised public transport passes, tax-deductible commuter benefits, and targeted fare integration across modes

can improve the relative attractiveness of sustainable options. Communication campaigns highlighting the personal utility of sustainable travel—such as stress reduction, savings, and productivity gains—are more likely to resonate than messages focused solely on environmental benefits. Employers can be instrumental partners in reaching this group through flexible work hours, travel reimbursements, and access to corporate mobility programs.

Settled Simplifiers include retirees and individuals with limited labour-force participation who prioritise comfort, safety, and health. They respond positively to interventions that enhance wellbeing and community connection, such as walkable neighbourhoods, safe pedestrian infrastructure, and accessible local transport. Policy measures could link mobility initiatives to social programs, such as community exercise or volunteer transport schemes, ensuring that mobility contributes to both physical and social wellbeing. This group is also sensitive to financial incentives, so free or off-peak travel benefits can maintain social participation and reduce isolation while supporting broader sustainability goals.

4. Encourage employer-led mobility initiatives

Employers are a critical actor in the transition toward sustainable transport, given their influence on commuting patterns, work arrangements, and incentives that shape daily travel decisions. The study findings reaffirm that employer-provided incentives such as free parking, vehicle allowances, or subsidised fuel reinforce car dependence and run counter to sustainability objectives. However, workplaces also represent one of the most direct and effective channels for influencing travel behaviour through structured incentives and cultural change. Policies should therefore encourage employers (and other non-mobility service providers such as retailers and event managers) to adopt a suite of measures that promote active and shared mobility. These may include carpooling or ride-share rewards, public transport subsidies, provision of end-of-trip facilities, and infrastructure that supports cycling and walking. Encouraging flexible working hours and remote work arrangements can also help distribute travel demand, reduce peak congestion, and improve work–life balance. Furthermore, governments could consider formal recognition schemes or tax incentives for organisations that demonstrate measurable progress in sustainable commuting practices. Partnerships between government, business councils, and transport authorities can facilitate the sharing of best practices and the integration of employer-led programs into broader urban mobility strategies.

5. Identifying and scaling effective actionable change initiatives (ACIs)

Among the 71 potential past influences examined, 25 demonstrated significant potential as actionable change initiatives (ACIs). These ACIs (refer to Table 8) provide an evidence-based foundation for translating observed behavioural trends into policy and practice. Importantly, the study shows that the success of these initiatives often depends on their cumulative and interactive effects rather than the strength of any single measure. To scale these ACIs effectively, policy design should incorporate adaptive implementation and ongoing evaluation. Pilot programs in selected urban areas can test combinations of incentives, allowing governments to refine interventions before full-scale rollout. Collaboration with local authorities, employers, and community organisations can amplify the impact of ACIs through cross-sector partnerships. Data collected from digital mobility platforms, travel surveys, and behavioural tracking tools can support iterative learning, helping policymakers identify which interventions generate the strongest long-term mode shift. Equity considerations should also guide implementation, ensuring that low-income, regional, and mobility-impaired populations can access and benefit from ACIs. Consistent funding, interagency coordination, and institutional learning mechanisms are crucial to maintaining program momentum and avoiding short-termism in sustainable transport reform.

6. Revisiting the role of road pricing reform

Public acceptability remains a decisive factor in road pricing reform. Although the individual elasticities identified in this study are modest, their combined effects such as spanning lifestyle, work, and environmental contexts can meaningfully influence support levels. Policymakers should recognise the tension between employer-driven car incentives and sustainability objectives. Successful implementation will depend on transparent communication, equitable design, and the reinvestment of revenues into public and active transport improvements.

6.2 Generating Impact

This report presents the key findings of iMOVE 3-039: Behaviour Change for Sustainable Transport, with the aim of providing actionable recommendations for policymakers on the design, development, and implementation of initiatives that lead to sustainable travel behaviour change. This section presents the key highlights extracted from the RTDs and online user survey analysis that can assist policymakers in designing necessary, targeted interventions. It translates the evidence into practical action packages across individual, social, and system

levels, providing clear guidance on how to support enduring behaviour change and implement effective sustainable mobility and road pricing reforms.

Drawing on the insights received from literature review, we conducted RTDs with participants from government, industry, service providers, academia, and international experts (Section 4). These discussions shaped the development of the online user survey instrument and clarified the role of attitudes, subjective norms, perceived behavioural control, and intention across individual, social, and system levels, guiding the packaging of mutually reinforcing interventions.

The framework derived from the RTD discussions suggests that enduring change requires coordinated and mutually reinforcing action packages:

- **Individual-level interventions that offer positive travel experiences and highlight tangible benefits such as wellbeing, convenience, and cost savings.**
- **Social-level mechanisms that foster normative support through policy coherence, public–private partnerships, and employer engagement.**
- **System-level measures that enhance user control and trust through integrated modes, coordinated land use, open data for MaaS platforms, and institutional capacity-building.**
- **It was also evident that targeting WoC through behavioural segmentation can convert temporary trials into enduring habits, particularly when supported by clear progress indicators and reinforcing incentives.**

The user survey provided the quantitative backbone of the study, with 4,088 valid responses across seven countries, and was analysed from multiple angles to inform a practical way forward. The development of a Sustainability Index to translate directional changes across modes into an interpretable metric of sustainable impact (Section 5.2) was followed by negative binomial count models linking WoC and context to weekly trips by mode and purpose. A set of WoC influences were identified that had a statistically significant effect on changes in travel behaviour, which we propose as Actionable Change Initiatives (ACIs). Some of these have led to changes consistent with improved sustainable mobility, while others have had the opposite effect. In summary, the twenty-five ACIs were identified (Table 8), with the strongest positive signals are associated with employer-supported measures, enhancements to public transport networks, and well-designed communication and education campaigns. By contrast, workplace policies that subsidise car commuting, such as free parking and electric-vehicle amenities, appear to entrench car use even when vehicles are cleaner.

The most effective ACIs identified in the WoC analysis include:

- **Employer incentives that promote sustainable commuting, such as public transport reimbursements, end-of-trip facilities, and flexible work policies.**
- **Public transport network improvements, including service frequency, last-mile connectivity, and integration with micromobility options, which directly enhance perceived convenience and reliability.**
- **Marketing and education campaigns that increase awareness of the environmental, health, and wellbeing benefits of sustainable travel, encouraging social norms that reinforce positive choices.**

Section 5.4 explores whether there are underlying patterns of behaviour across different groups in response to sustainable travel initiatives. We employed latent class analysis to segment travellers into three distinct groups: Urban Strivers, Settled Simplifiers, and Dynamic Jugglers. This segmentation provides a nuanced understanding of how different traveller types respond to, and engage with, sustainable mobility options, thereby enabling more targeted and effective policy design and intervention. The traveller segments indicate distinct pathways for the implementation of transport-influencing initiatives. Urban Strivers respond to affordability measures and targeted public transport improvements; Settled Simplifiers prioritise comfort, access, and cost savings with minimal disruption; Dynamic Jugglers are broadly receptive to public transport, micromobility, and incentive packages, including tolled time savings when reliability is guaranteed.

The three-class segmentation re-emphasised the importance of segmentation when designing and developing targeted interventions. Suggested packages derived for each class are as follows:

Urban Strivers are comprised of 56.4% males, with an average age of 44 years and an average household size of 2.7 members. Urban Strivers work an average of 34.8 hours per week of which 11.3 are either remotely at home or other locations. They make an average of 19.4 trips per week, 66% of them car trips.

***Package of initiatives* (push and pull) to achieve sustainable behaviour changes:**

- **Improved public transport with reduced/lower fares to commuting journeys.**
- **Incentivise the use of EV/Hybrid vehicles considering the household size and usage.**
- **Packaging public transport with event tickets, utilities etc (i.e. MaaF).**
- **On demand transport and park and ride options based on geographic location.**
- **Co-ordinating with the respective employers to offer incentives for sustainable travel options (i.e. salary packaging, leaderboards etc).**

Compared to Urban Strivers, Dynamic Jugglers work fewer hours per week on average (≈28 vs 34), have more kids (median 2 vs 1), and tend to live in larger, more affordable suburban homes. Their days are a string of school drop-offs, activities, errands and work trips, the last often orbital rather than radial.

***Package of initiatives* (push and pull) to achieve sustainable behavioural changes:**

- **Expand park and ride at suburban hubs aligned to orbital bus/metro corridors.**
- **Ready-made public transport services (10–15 min all-day frequencies) on key orbital routes, timed transfers at hubs.**
- **Peak-period bus-priority and transit lanes on orbital corridors.**
- **Priced parking at suburban centres and CBD to encourage short visits (e.g., shoppers) and discourage long stay (i.e., car commuters)**
- **Parking cash-out at workplaces: employees who forgo a space receive a travel credit (preferably from their employer).**

Settled Simplifiers are distinctly different to the other two classes. There are about 55% females, with an average age of 58 (compared to 44 and 43 in class 1 and 3). The predominant work status (59.1%) is retired or non-working people (including students), or those who are retired but still engage in some casual work. The majority of this class are couples with no children or single person households. They are keen on measures that reduce the cost of travel but are likely to be less time sensitive on their travelling. However, they still tend to own cars and make significant journeys by car.

***Package of initiatives* (push and pull) to achieve sustainable behavioural changes:**

- **50% discount on public transport fares between 09:00am and 4:30pm on weekdays while maintaining 'good' PT frequencies**
- **Reward points for PT users to redeem for free trips. Points can be accumulated as individual or shared within a group.**
- **Price parking at local centres to discourage car-based travel.**
- **Public information campaign highlighting the health benefits of the active travel aspects of PT use.**

Finally, we examined the conditions under which road user charging garners support (Section 5.5). Support for road pricing is contingent on perceived service quality, equity considerations, and transparent reinvestment, and varies meaningfully across countries and traveller types.

Taken together, these findings highlight the need for policymakers to move beyond isolated, one-off measures and instead design integrated packages of interventions that operate across individual, social, and system levels. The effectiveness of any single ACI depends not only on its own design, but also on how it aligns with the needs of different traveller segments and the broader policy environment, including road pricing and investment decisions. Coordinating employer initiatives, public transport improvements, communication campaigns, and road user charging within a coherent reform strategy can create mutually reinforcing effects, amplifying sustainable behaviour change and reducing the risk of unintended consequences such as locking in car dependence. A holistic approach that recognises these interdependencies is therefore essential for delivering durable, equitable, and politically viable transitions towards more sustainable mobility systems.

Appendices

Appendix 1

Towards a new conceptual framework of hard and soft behaviour change interventions in sustainable transport (Nelson et al., 2025)

Appendix 2

Screenshots of the online survey questionnaire

Appendix 3

Achieving the desired sustainable travel behaviour change – Insights from practitioners (Kandanaarachchi et al., 2025a)

Appendix 4

Country-specific travel behaviour change associated with each WoC - Detailed graphs

Appendix 5

Windows of change as precursors to changing travel behaviour aligned with sustainable mobility (Hensher et al., 2025a)

Appendix 6

Transport Initiatives: Outcomes from the factor analysis and categorisation

Appendix 7

Establishing the Level of Support for Transport Initiatives which make a Positive Impact on Travel Behaviour (Hensher et al., 2025c)

Appendix 8

Identifying circumstances in which the introduction of distance-based, cordon-based, and congestion-free lane road user charge regimes garner support (Hensher et al., 2025b)

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