# The role of fairness in transport decarbonisation

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# Intellectual property and publications

I confirm that the work submitted is my own, except where work which has formed part of jointly authored publications has been included. My contribution and the other authors to this work has been explicitly indicated below. I confirm that appropriate credit has been given within the thesis where reference has been made to the work of others.

I also confirm that no use of generative AI has been made at any stage of the writing and research process.

Research conducted in the context of this thesis has led to two publications. Regardless, this thesis is presented in the standard format, as this allows to discuss the work undertaken here in a more coherent way, honouring the complexity of the research topic. Where this thesis draws from these publications, this is highlighted at the start of each chapter, and referenced appropriately throughout.

Below, the publications are referenced, and the contributions of co-authors and myself are described.

**Ternes, V., Marsden, G. and Harrison, G. 2024.** A just transition or just a transition? The understanding and relevance of fairness in planning for a decarbonised transport system. Energy Research & Social Science. 113, p.103549.

This paper forms the basis of chapter 5. I have identified the research questions, developed the research project, conducted the data collection, analysed the findings and wrote the manuscript. My co-authors Greg Marsden and Gillian Harrison have provided feedback on the research plan and data analysis, and shared editorial comments on the manuscript.

**Ternes, V. 2025.** "It's fair once you're in it" – Public perceptions on Zero Emission Vehicle policy Submitted to and presented at: UTSG Conference Dublin.

This conference paper forms the basis of chapter 6. It has been presented at the 2025 UTSG conference, where it was awarded the Smeed Prize. I have identified the research questions, developed the research project, conducted the data collection, analysed the findings and wrote

the manuscript. My supervisors Greg Marsden and Simon Shepherd have provided feedback on the research plan and data analysis, and shared editorial comments on the manuscript. In spring 2026, I will submit an extended version of this paper to the journal Sustainable Cities. This paper will be co-authored with my supervisors Greg Marsden and Simon Shepherd, who will contribute feedback on the data analysis and presentation of the manuscript.

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# Abstract

This thesis sits on the intersection of transport decarbonisation and fairness. Given progressing climate change and the UK's goal to reach Net Zero by 2050, all sectors need to decarbonise quickly. For transport, this marks a stark change from decades of near-constant emissions. At the same time, already now the benefits and negative effects of transport are distributed unevenly across people and places. Decarbonisation policy risks exacerbating these differences but can also be an opportunity to bring about fairer outcomes. Fairness is thus an important consideration in the context of transport decarbonisation.

The Just Transition approach with its three main tenets of recognition, procedural and distribution justice is used as a lens to study the role of fairness in transport planning as well as the perceptions of the public. It has in the past been used to study a range of complex questions around climate change and society. However, it has not previously been applied to study fairness in transport decarbonisation. Particular research gaps exist around the perspectives of the transport planners who will bring about the decarbonisation transition, and of the public whose daily lives will be affected by policy changes.

Two studies are conducted to address the research gaps: Study 1 seeks to understand the role of fairness in transport planning, through interviews with planners and document analysis of transport strategies. Study 2 explores the perceptions of the public around fair transport decarbonisation, through system-thinking based public workshops where the case study of the Zero Emission Vehicle Mandate is discussed.

The findings indicate a difference in how fairness is considered between the planners and the public. Mapping this back onto the Just Transition tenets illustrates these gaps:

Regarding recognition justice, transport planning has not yet understood the strong ties between climate change and justice implications. This brings a risk that any fairness themes might be forgotten within decarbonisation policies. In contrast, the public is well aware of how decarbonisation policies can bring unfair outcomes.

Around procedural justice, gaps are revealed on who gets to shape the transition. There are limited opportunities for the public to participate in actually meaningful consultations which have the power to shape outcomes. This risks that policies will not speak to the lived realities of many. While some of the transport planners are also aware of this, a lack of time and resources is often cited as a reason for limited engagement.

These gaps contribute to uneven distributional outcomes. Failing to recognise the fairness implications of transport decarbonisation and failing to adequately incorporate diverse perspectives and lived experiences in the development of decarbonisation polices will risk bringing about policies that are less impactful and that perpetuate existing injustices.

This thesis joins emerging conversations on just transitions particularly in the transport space. It makes novel contributions by understanding the views on and considerations of fairness by both transport planners and the public. It also builds onto systems thinking approaches to develop a new approach for studying the views of the public. In doing so, this thesis identifies gaps around the current state of fairness in transport, but also points towards ways of improving fairness.

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# Glossary

| | |
|---|---|
| AT | Active travel |
| CBA | Cost Benefit Analysis |
| CLD | Causal Loop Diagram |
| COP | Conference of Parties |
| DfT | Department for Transport |
| EV | Electric Vehicle |
| IPCC | Intergovernmental Panel on Climate Change |
| LTP | Local Transport Plan |
| PT | Public Transport |
| STB | Subnational Transport Body |
| TfN | Transport for the North |
| TRSE | Transport Related Social Exclusion |
| UNFCCC | United Nations Framework Convention on Climate Change |
| ZEV | Zero Emission Vehicle |

# 1 Introduction

This thesis addresses the intersection of two themes which have both shaped transport research in recent years: Climate change and fairness. The climate emergency necessitates a quick transition away from using fossil fuels and towards a decarbonised transport system. At the same time, both access to and opportunities provided by transport are distributed unevenly across people and places. While some are able to travel abundantly, others lack the transport needed to live a fulfilling life. Decarbonisation policies will interact with these inequalities. Depending on the approach taken, transport decarbonisation may widen or reduce the current inequalities.

This makes a discussion on fairness important. While inequalities describe objective, observable differences between entities, fairness entails a subjective moral judgement of a situation. Many different views on and definitions of fairness exist in parallel. As the literature review will show, the majority of research on fairness has so far taken a theory-led approach. This leaves gaps around the views of both transport practitioners and the public on fairness, which will be addressed in this thesis. Specifically, this thesis will study the views on fairness held by transport planners (who develop decarbonisation strategies), and by the public (who engage with and use the transport system).

The literature also reveals a related methodological gap. Gathering meaningful data from participants is important to understand their fairness concerns, and later chapters argue that systems thinking is a suitable approach to study the views of the public in relation to the research questions. However, existing approaches for developing causal loop diagrams with the public usually require significant training of participants, reducing the number of people able to take part. This research project will thus develop and apply a novel method for developing causal loop diagrams with lay participants.

This introduction will continue as follows: Firstly, both transport decarbonisation and fairness are described further to illustrate the importance of both topics. Resulting from this, several research needs around fairness are set out. The Just Transition concept is introduced as a theoretical lens for this study that meets the research needs. A brief explanation of systems thinking methods highlights the methodological gap addressed in this thesis. The research questions are presented. The introduction concludes with an overview of the remainder of the thesis.

## 1.1 Climate change and transport decarbonisation

Phasing out fossil fuels and thereby minimising greenhouse gas emissions is essential in order to address the climate crisis. This is referred to as decarbonisation. Internationally, efforts to mitigate and adapt to climate change are led by the United Nations Framework Convention on Climate Change (UNFCCC), which convenes national and international leader at annual Conference of Parties (COP) meetings. At these COPs, commitments towards climate change mitigation and adaptation are negotiated. COP21, taking place in Paris in 2015, was at the time seen as a milestone as it resulted in the Paris Agreement, formalising countries' commitments to reduce greenhouse gas emissions and keep global warming to well below 2ºC (UNFCCC, n.d.). In response to this and to widespread public attention on and campaigns around climate change, the UK in 2018 committed to reaching net zero emissions by 2050 (UK Government, 2019). It was thus the first country to set a net zero target, with both lower levels of governance within the UK and other countries following this. However, more recently it was observed that the UK is weakening its climate ambitions and political commitments again (Marsden and Schwanen, 2024). Thus, the UK makes an interesting case for studying decarbonisation policies.

To reach net zero, all sectors have to decarbonise. In the UK, the surface transport sector is the highest emitting sector, contributing 29% of all emissions in 2023. From 1990 to 2023, UK surface transport emissions have reduced by 13% (Department for Energy Security & Net Zero, 2023). As the Climate Change Committee points out, this means that transport has so far contributed only little to the UK's emission reduction efforts. Larger emission reductions from the transport sector need to be seen in the coming years for the UK to reach its climate targets (Climate Change Committee, 2025a). Transport is however seen as hard to decarbonise: Many modes of transport are directly powered by fossil fuels, and transport depends strongly on infrastructure where changes are slow and costly to make (Gota et al., 2019). This illustrates that the transport sector has to undergo a large transformation in a short amount of time in order to decarbonise.

Cars alone account for 60% of UK surface transport emissions in 2024 (Climate Change Committee, 2025a). Here, efficiency increases have been outweighed by a trend towards larger vehicles and more vehicle kilometres (Department for Energy Security & Net Zero, 2023; Climate Change Committee, 2025a). Both the UK Government and the Climate Change Committee thus emphasises the role of electric vehicles (EVs) in the transition (Department for

Transport, 2021c; Climate Change Committee, 2025a). In 2024, EVs had a market share of 19.6% (Climate Change Committee, 2025a). This indicates that car transport in the UK provides a challenge to transport decarbonisation, but is also seen as a large leverage point for emission reduction.

## 1.2 Transport inequalities

Transport is currently highly uneven, with different people, different modes and different places experiencing vastly different levels of access, benefits and disadvantages. Transport is essential to most people's lives as it provides access to places and services. While there are different views on what qualifies as "essential" travel needs, scholars agree that most people require some amount of travel to meet their needs and travel to places of e.g. work, education or socialising (Mattioli, 2016; Arnz et al., 2025). Thus, inequalities in transport will materialise as differences in people's lives. For example, work on transport poverty highlights that some people face barriers that hinder them from accessing the transport required to access essential locations and services (Lucas, Mattioli, et al., 2016). Others have to make sacrifices in other areas of their lives in order to afford a car for essential journeys (Mattioli et al., 2020). At the same time, those in the highest income quintile travel twice as far by surface travel modes than those in the lowest quintile (Massey-Chase et al., 2025), indicating that people on higher incomes have not only more access to transport, but also more access to the opportunities and services one can reach via transport.

Decarbonisation efforts thus risk widening these inequalities, but they also bring an opportunity to improve the situation of those currently facing challenges around transport. This is the most significant mobility transition since mass motorisation. How it is enacted therefore raises significant questions of fairness.

## 1.3 A Just Transition

Integrating fairness in transport decarbonisation is a challenge that spans environmental and societal concerns. As the literature review will illustrate, the term 'fairness' has been used to describe a wide range of theories, definitions and viewpoints. As to give room to this multiplicity of definitions, 'fairness' is here defined broadly to refer to a favourable moral evaluation of a situation, process or outcome.

Increasingly, attention is shifted on considering the environmental and societal challenges simultaneously, in order to provide a 'Just Transition'. The Just Transition approach emerged from US trade unions in the 1970s (Wang and Lo, 2021). They campaigned for a consideration of people and communities after large changes in the oil industry led to job losses. Since then, a Just Transition approach has been used to study complex challenges, including those involving climate change (Abram et al., 2022). Drawing from energy and environmental justice, a Just Transition is commonly characterised through three tenets: Recognition justice considers which themes are recognised as important, and which ones are omitted. Procedural justice looks at how and with which people and whose knowledge decisions are made. Distribution justice considers the outcomes of these decisions, looking at what goods are distributed between whom and in which way (Wang and Lo, 2021). The Just Transition does not presume a specific view of what is fair, but rather it poses questions to assess the justice implications of a transition. This makes the Just Transition concept a useful theoretical lens for guiding this research.

## 1.4 Methodology gap

Both transport and fairness are complex themes, and decarbonisation will further add complexity here. The literature review will introduce systems thinking methods as a useful tool for studying this complexity. Particularly causal loop diagrams (CLDs) are suitable, as a range of established approaches exist for developing CLDs with the input of stakeholders. However, current approaches for developing CLDs with stakeholders are tailored towards expert participants, who join in their professional capacity and are thus more likely to be familiar with sharing their views in a group conversation. Approaches for building CLDs with laypeople tend to involve significant methods training for participants, requiring time and willingness to learn. As the thesis will argue, neither of these fit the research needs of this project. Thus, a new approach for developing CLDs with laypeople was developed. The thesis will describe the approach and its application to a series of workshops with the public, before reflecting on the approach and its positives and drawbacks.

## 1.5 Research needs around fairness

Through the literature review, this thesis will argue that philosophical work around fairness is largely theory driven, seeking to either provide new or apply existing definitions of fairness.

Erden (2021) however argues that a lack of diversity in the philosophical community leads to bias, and to philosophical theories that tend to preserve the status quo. However, as outlined above, decarbonising transport fairly involves a large transition away from the status quo, both in terms of transport emissions and inequalities faced by people. Therefore, I argue that philosophical theory should not be used as a starting point to this research. Rather, the research questions should be approached openly, giving room also to views currently not represented in philosophy.

The literature review further found that research on transport justice has focused on studying distributional impacts extensively. This work has for example considered the role of gender (Hail and McQuaid, 2021), rurality (Flipo et al., 2023) or travel costs (Brown, 2018). This stands in contrast with recent calls from academia for more consideration of recognition and procedural concerns. This thesis will therefore investigate a fair transport decarbonisation along all three tenets. It will employ participatory and qualitative methods, which in itself contribute to recognition and procedural justice by giving the research participants space to share their views openly.

Narrowing down on the question of which particular research gaps to address, the literature review points to two gaps that are particularly important:

**Fairness in transport decarbonisation planning**

Firstly, in reviewing the governance structures around transport in the UK, the literature review illustrates a complex landscape in which planning and policy responsibilities are distributed across a wide range of actors and bodies of governance. Therein however, the central role of transport plans and strategies stands out. These documents illustrate the vision and summarise the policy objectives regarding transport in a geographic area. However, aside from work by Linovski et al. (2018), there is little research on how fairness is addressed in strategic transport planning. By investigating how UK transport planning at different levels of governance addresses fairness in decarbonisation, this is the first research gap addressed in the thesis.

**Public perceptions of fair transport decarbonisation**

Secondly, the literature points to the importance of fairness perceptions. It notes that policies that receive public support are more successful, and the public is more likely to support policies they perceive as fair (Upham et al., 2023; Mehdizadeh et al., 2024). There is however a specific research gap around how different policies are perceived by the public (Mehdizadeh et al., 2024). By exploring a case study around Zero Emission Vehicle policy, this is the second research gap addressed in this thesis.

## 1.6 Research questions

The research questions arise from both the Just Transition tenets (section 1.3) and from the research gaps described in section 1.5. Table 1 illustrates which research questions map onto which tenets and research gaps.

**Recognition justice**

Current research into transport justice focuses on fairness definitions and recognition that originates from academic research. The goal here is therefore to understand the extent to which fairness is recognised as an issue related to transport, both by those responsible for setting the direction towards decarbonised transport and by those who experience and live the transport system on a daily basis. This relates to procedural justice, which is discussed below.

*RQ1: How is fairness understood by the transport planning sector?*

*RQ2: How does the public perceive the role of fairness in transport decarbonisation?*

**Procedural justice**

Procedural justice means that a process must be fair in order for the outcome to also be fair. This includes the need to involve a diverse set of voices in decision making (Delina and Sovacool, 2018). Therefore, a second objective of this PhD project will be to understand which knowledge and whose voices are included in transport planning and which ones are not sufficiently represented.

*RQ3: How are fairness concerns incorporated in transport decarbonisation planning?*

*RQ4: How and to what extent are different voices and different knowledge used in the transport planning process?*

**Distributive justice**

In this part of the research, it will be assessed how different groups and places are affected by transport decarbonisation measures. As transport decarbonisation will bring large changes, it is crucial to understand how these changes affect different parts of the population and who the winners and losers are.

*RQ5: How and to what extent are distributional impacts addressed by current plans to decarbonise transport?*

*RQ6: How does the public perceive the distributional impacts of transport decarbonisation?*

| | **Recognition justice** | **Procedural justice** | **Distribution justice** |
|---|---|---|---|
| **Fairness in transport decarbonisation planning** | RQ1 | RQ3 | RQ5 |
| **Public perceptions of fair transport decarbonisation** | RQ2 | RQ4 | RQ6 |

Table 1 - Mapping out how the research questions connect to research needs and Just Transition tenets

## 1.7 Outline of thesis

The rest of this thesis will proceed as follows:

Chapter 2 describes the wider context to this research project. With the research gaps emerging out of a timely juxtaposition of transport inequalities and urgent decarbonisation needs, the wider context of the research is important. This chapter provides details around climate and transport governance arrangements, and it describes social and political themes that influenced public debate at the time when this research was designed.

Chapter 3 explores academic literature relevant to the research question. It firstly adds an academic perspective to the context laid out in chapter 2. Then the Just Transition concept is described further. Academic literature around fairness is explored, also laying out the current gaps therein and the need to study different perspectives on fairness. Systems Thinking and its use in transport are discussed. It concludes with a recap of the research questions that this PhD seeks to answer.

Chapter 4 starts by outlining the parameters for methods selection that arise from the literature and research gaps identified. Based on this, key method decisions are described. Then, methods used for the two research projects undertaken as part of this PhD are presented in detail.

Chapter 5 presents findings from research on the transport planning sector. Drawing from semi-structured interviews with transport planners and document analysis of transport strategies, it explores the role of fairness within UK transport planning.

Chapter 6 describes findings from a series of systems thinking workshops with members of the public. Focusing on the Zero Emission Vehicle Mandate as a case study, this chapter explores how the public perceives fairness in the context of transport.

Chapter 7 synthesises the findings from the two studies in order to answer the research questions. It contains also recommendations to policy makers based on the research findings, and outlines interesting future research areas emerging from this research.

# 2 Context

Transport decarbonisation is a rapidly changing policy field; thus there's a need to understand the context within which this research was designed. This section discusses the current distribution of responsibilities on climate and transport governance, as well as wider socio-political themes related to the research. Academic perspectives on these topics will be discussed in chapter 3. It also introduces both the Zero Emission Vehicle Mandate and the Public Sector Equality Duty as relevant policies to this research.

Here, developments up to November 2025 are considered. However, it is particularly important to describe the situation and important themes in 2021-2022, when key research decisions for this PhD project were made. Where the context changed after data collection for this research ended, this is reflected upon in the discussion chapter.

## 2.1 Climate ambition across scales

Climate change is affecting human lives and ecosystems across the planet. It is caused by an increased burning of fossil fuels, which release carbon dioxide and other greenhouse gases into the atmosphere. To mitigate against a further warming climate and the harm it brings, it is seen as essential to move away from burning fossil fuels. This is called decarbonisation (IPCC, 2022).

Scientific understanding of climate change is collated by the Intergovernmental Panel on Climate Change (IPCC). Established in 1988, it brings together scientific evidence around climate change, and is seen as the "most authoritative voice of climate science" (Asayama, 2021). Politically, international negotiations around climate change take place under the United Nations Framework Convention on Climate Change (UNFCCC), with governments meeting at annual Conferences of the Parties (COP). Here, commitments to address climate change are negotiated (UNFCCC, n.d.). COP 21 in 2015 was particularly noteworthy as it resulted in the Paris Agreement, committing the participating nations to keep global warming to "well below 2°C" (UNFCCC, n.d.).

The UK has positioned and presented itself as an ambitious leader of decarbonisation. The country's climate targets are enshrined in law in the 2008 UK Climate Change Act. It mandated that the country's greenhouse gas (GHG) emissions must be reduced by 80%, compared to the

baseline of 1990. The policy was tightened in 2019, requiring a 100% reduction of emissions (UK Government, 2019). In doing so, the UK became the first country to establish a "net zero" target, meaning that the balance between GHG emissions and GHG removal has to be zero. This makes the UK an interesting country to study.

The UK Climate Change Act further requires that the UK Government sets carbon budgets, limiting how much GHG can be emitted in a five-year period. The most recent sixth carbon budget covers the years 2033 to 2037 and limits emissions to 965 MtCO2e (UK Government, 2021). Subsequently, emissions are monitored and reported to parliaments in annual statements. The most recent statement lists emissions for 2023 and was released in March 2025 (Department for Energy Security & Net Zero, 2025). The Climate Change Committee (CCC), an independent body established under the Climate Change Act, is tasked with monitoring and advising on progress made towards these climate change targets (Climate Change Committee, n.d.).

2018-19 was also a time of increased public attention on the climate. This followed the 2018 COP21 meeting and Paris Agreement, the abovementioned 2019 Amendment to the UK Climate Change Act, and campaigning by civil society. In the UK, the campaign group Extinction Rebellion gained widespread attention by demanding, among others, the declaration of a climate emergency (Extinction Rebellion, n.d.). Following these calls, over 75% of local authorities declared a climate emergency before the COVID pandemic began (Gudde et al., 2021).

Ambitions to stop climate change and the harm it brings are thus discussed at various levels of governance. As section 1.1 described, transport currently is the highest emitting sector in the UK, thus it needs to decarbonise for the UK to reach its climate targets. Thus, the following section describes how transport governance is structured across different levels of governance in the UK.

## 2.2 UK transport governance

This section describes the formal governance arrangements of transport within the UK. The term 'bodies of governance' is here used to describe the multiple layers of national, regional and local government existing in the UK. This is aligned with work by Marsden and Rye (2010), who describe this hierarchy of government bodies as one type of multi-level governance. More generally, the term 'governance' describes the processes of governing and of making decisions

over policies in a territory (Bryant, 2018). Thus, using the term 'bodies of governance' in this thesis also highlights the research aim of going beyond studying structural arrangements of government (i.e. the formal powers and responsibilities of those in charge of a territory (Bryant, 2018)) and towards examining also the less formalised processes of governing.

In the UK, responsibilities for transport planning and strategy development are distributed across different levels of UK governance. The highest level here is that of the UK government. Under the UK's system of devolution, the UK government is responsible for a policy area by default. It can however grant lower level bodies of governance powers over specific policy areas, which are called 'transferred' policy areas (Torrance, 2024).

The UK government is thus responsible for all areas of transport policy, except for those explicitly transferred to devolved governments (Government Office for Science, 2019). The UK Government's planned steps towards a decarbonised transport system are described in the 2021 Transport Decarbonisation Plan (Department for Transport, 2021c). The plan describes six strategy themes, which are: Mode shift to active travel and public transport, Decarbonisation of road transport, Decarbonising freight transport, Innovation, Place-based approaches and Aviation (Department for Transport, 2021c). It forms part of the data analysed in study 1, and will be further discussed in chapter 5.

The devolved nations of Scotland, Wales and Northern Ireland all hold some legislative and executive powers, meaning that they have the power to set and apply legislation in the policy areas transferred to them. The policy areas transferred differ between the devolved nations (Torrance, 2024). The governments of Scotland, Wales and Northern Ireland have set their own carbon budgets, and have varying degrees of power to create devolved transport policy (Scottish Government, 2020; Welsh Government, 2021; Northern Ireland Department for the Economy, 2021).

Within England, a limited amount of executive power is given to local bodies of governance (Torrance, 2024). A variety of governance arrangements at the local level exist across England. Some places have two tiers of local governance, with a county council and underneath that several district councils. Other places have one tier of local governance, usually referred to as a unitary authority (Benson and Reardon, 2025). Through the thesis, these types of local governance bodies will be collectively referred to as local authorities. In addition, several local authorities can form a combined authority to share responsibilities. These combined authorities are usually granted additional executive powers (Benson and Reardon, 2025).

London has its own unique governance arrangements (Benson and Reardon, 2025). As London is not studied as part of study 1 (see justification for data selection in section 4.4.1), the details of transport governance in London are not discussed here.

Regarding transport, the different types of local authorities hold different levels of responsibility. In addition, differences in devolution agreements mean that different combined authorities also hold different amounts of power over transport. This results in a variety of local transport governance arrangements across England. For each place within the country however, there will be a body of governance responsible for creating a transport strategy (Benson and Reardon, 2025).

A further, transport specific layer of governance exists in England, sitting at the regional level between national and local governments. Within England, and outside of London, seven sub-national transport bodies (STBs) cover the country. They coordinate transport planning efforts regionally and function as a bridge between local and national policymaking. In 2018, the STB Transport for the North was given statutory status and with this the responsibility to create a strategic transport plan (Transport Action Network, n.d.).

Given the complexity of transport planning and the spread of responsibilities across scales, this thesis will thus consider all levels of governance within the UK.

## 2.3 Zero Emission Vehicle Policy

Over half of transport emissions come from road transport (Webb et al., 2025). Thus, a move from vehicles with an internal combustion engine (ICE) to Zero Emission Vehicles (ZEV) is seen as one key way of decarbonising. A ZEV is defined as having no tailpipe emissions, however emissions across the lifecycle still occur. It falls under the 'Improve' category of the avoid-shift-improve framework (further discussed in section 3.1.2).

Discussions around policy on Zero Emission Vehicles can be traced back to the 2010s. In 2011, it was announced that the sale of ICE vehicles would end in 2040 (Department for Environment, Food and Rural Affairs, 2017). This ambition was re-confirmed in the 2017 "UK Plan for Tackling Roadside Nitrogen Dioxide Concentrations". At this time, the main motivation behind these plans was around reducing air pollution (Department for Environment, Food and Rural Affairs, 2017).

In their 6th Carbon Budget, the Climate Change Committee noted that a shift to ZEV will form an important part of decarbonising transport and meeting climate targets (Climate Change Committee, 2020). In 2020, and referencing both the commitment to reach net zero by 2050 and the recommendations from the Climate Change Committee, the UK Government ran a first consultation on "ending the sale of net petrol, diesel and hybrid cars and vans" (Department for Transport, 2021a). Here, along a few guiding questions, general views on such a policy were sought. Based on this, the "Ten point plan for a green industrial revolution" announced that the end date for the sale of ICE vehicles would be brought forward to 2030 (UK Government, 2020).

In 2021, the "Green paper for a new road vehicle regulatory framework in the UK" described the need for and development of ZEV regulation so far. Then, the document invited consultation responses on high level questions around the technical policy design, e.g. on whether it is better to regulate numbers of ZEV or amount of CO2 emitted. This document also mentioned that prior to the UK's exit from the EU, a ban on the sale of ICE vehicles was not possible due to EU laws. As this document starts the process of moving the desired ban on the sale of ICE vehicles from political ambition towards legally binding regulation, it marks the start of data collection for this research.

In response to this a consultation, predominantly with industry, took place here (Department for Transport, 2021b). The outcome and government response was published in 2021 (Department for Transport, 2022a). At the same time, a second consultation was launched, this time seeking input on more detailed technical questions about the policy (Department for Transport, 2022b). In 2023, the outcome and government response were published (Department for Transport, 2023b). A third phase of consultation took place in 2023, here seeking views on now established details of the policy (Department for Transport, 2023a). Alongside, the cost benefit analysis was published for consultation (Department for Transport, 2023f). Results were published later in the year (Department for Transport, 2023e; Department for Transport, 2023d), and the final ZEV mandate policy was formally announced at the beginning of 2024 (Department for Transport, 2024). Through this, the phase out date for ICE vehicles was pushed back to 2035.

Data collection for study 2 of this PhD research (which uses the ZEV mandate as a case study) was completed in autumn 2024. After that, in December 2024, the newly elected labour government launched a new consultation. This looked into whether the phase out date for ICE vehicles should be brought forward to 2030, focusing on the view of industry stakeholders around the feasibility of this potential policy change. The change of date to 2030 was confirmed

in spring 2025, with the stated aim of giving the UK car industry more certainty (Department for Transport, 2025a).

## 2.4 Public Sector Equality Duty in the UK

In the UK, the Equality Act 2010 brought into force the Public Sector Equality Duty, a key piece of legislation against discrimination (UK Government, 2015). It specifies several "relevant protected characteristics" (UK Government, 2015), who are protected from discrimination, including age, disability, race and sexual orientation. Further, equality of opportunity should be provided both to people who do and do not share protected characteristics (Pyper, 2020). Public bodies and those people and organisations performing public functions have to adhere to the Public Sector Equality Duty. One way of demonstrating their adherence is by performing an Equality Impact Assessment. While not required by law, they are seen as a useful tool for demonstrating that protected characteristics were considered in a project or scheme (Pyper, 2020). There is no binding guidance on how to perform an Equality Impact Assessment, and in practise each organisation sets their own processes for this (Audit Wales, 2022). However, collecting sufficient evidence and providing clear documentation are seen as important (EHRC, 2020).

## 2.5 Social and political context to this research

Transport, as a component of most people's everyday life, is influenced by wider social and political circumstances. Policies, including decarbonisation policies, are developed in response to these wider circumstances. Thus, when studying decarbonisation, it is important to consider the context. A number of topics have particularly influenced transport during the time this research was conducted:

The term "levelling up" has been used intermittently in UK policy since the nineteenth century and was initially connected to better funding for education and providing equal opportunities. Under the Johnson government since 2019, its use increased strongly. The term has been connected with post-Brexit policies and the addressing of regional inequalities more generally (Newman, 2021). In early 2022, the UK government released its Levelling Up White Paper, where it sets out its plans to address geographic inequalities in the UK. Policies suggested here address a range of sectors from transport to education and skills training, culture and migration (UK Government, 2022b). In his foreword, prime minister at the time Johnson also states that

regional inequalities in themselves keep people away from opportunities in an unfair way. A diverse set of ideas has since been branded as “levelling up”, ranging from support for research and culture to the introduction of freeports (Tomaney and Pike, 2020). “Levelling up” has thus turned into a slogan used by people who usually stand on different parts of the political spectrum, and for ideas and concepts that disagree with each other (Newman, 2021). Regardless, the connection between levelling up and fairness and the place-based aspects to both levelling up and to this research, mean that debates on levelling up were contextually important.

When this research began in 2021, the effects of the Covid pandemic and associated infection control measures were still influencing transport. A range of research now studies how travel behaviour has changed since the pandemic and researchers explore which changes are permanent and how to learn from the rapid change in behaviour and transport management. While the pandemic had disastrous effects on many, some positives on active travel are observed. In response to reduced car volume and a desire for people to be outside, cities introduced temporary active travel infrastructure, some of which has since been made permanent. Whether or not people were able to work from home made a difference. Those who did work from home during the pandemic were more likely to live in places with good public transport connections, and people in this group were more likely to show a reduction in car use. Conversely that means that those unable to work from home were more likely to live in less well connected places and they were more likely to maintain or increase their car use compared to pre-pandemic levels. So the pandemic served as a dividing force between those who were and weren’t able to work from home (Anable et al., 2022). During the first lockdown in June 2020, Borkowska and Laurence (2021) found that social cohesion, referring to trust in and a sense of connection with people in the neighbourhood, in the UK to be lower than at any other point in time – with the most negative impacts felt by those already vulnerable. As transport is place-based, this lack of trust in the surroundings and its people may affect travel behaviour. Thus, these dynamics and their interactions with transport decarbonisation need to be considered.

At the same time, inflation in the UK increased to its highest level in 30 years, peaking at 11.1% (measured by the Consumer Prices Index) in October 2022 (Office for National Statistics, 2025; Francis-Devine et al., 2025). This was caused, among others, by the consequences of the Covid pandemic and by disrupted supply chains resulting from Russia’s war on Ukraine (Francis-Devine et al., 2025). People felt the impact in sharply rising food, fuel and energy prices (BBC News, 2022; Atkins, 2022). Referred to as the “Cost of living crisis”, people note a reduction in their available budget and financial constraints.

This relates to the research as policies are not implemented in isolation, but rather are influenced by wider societal conditions. While not every detail of these can be considered here, it is important for the research to stay aware to wider conditions in order to interpret and contextualise findings. Section 3.4 will build onto this by exploring inequalities in transport.

# 3 Literature review

To better define the research gap and put this PhD research in context with existing work, this chapter sets out the current state of knowledge related to the research questions. It firstly describes the need for decarbonisation and approaches taken to decarbonise transport, looking across policymaking and planning. Current inequalities in transport are outlined to illustrate areas of potential fairness concern. Then, it explores different strands of thinking around fairness and justice, before discussing the concept of Just Transitions in more detail. Next, this chapter explores the role of public perceptions and framing in fairness debates. Lastly, systems thinking and system dynamics are discussed.

Section 3.5.2 on framing is taken from the already published paper Ternes et al., 2024.

## 3.1 Transport decarbonisation governance

Chapter 2 described the current arrangements for addressing climate change across scales of governance, while chapter 1 already highlighted the need to decarbonise transport. This section explores academic research on transport and climate governance, to both understand where research gaps are and to better situate research findings within existing evidence.

### 3.1.1 Climate governance

Section 2.1 described the increased focus on climate change in the past decade and current decarbonisation ambitions across governance scales. This section summarises ongoing research around climate governance.

The UK, along with other nations and with lower levels of governance in the UK, brought in so called ‘net zero’ targets (section 2.1). Here, two things are worth noting: Firstly, it is not the emissions target that matters for climate change but the total amount of greenhouse gases emitted – the so called ‘area under the curve’ (Asayama, 2021). This is indeed recognised in the UK through the carbon budgets (section 2.1). Secondly, as some GHG emissions are however seen to be unavoidable, this effectively leaves room for carbon capture techniques to balance out remaining carbon emissions. Critics here point to the risks of carbon capture techniques: These technologies have not been tested at large scale yet, their future impacts are contested, and there is a risk that putting too much hope into the future potential of carbon capture techniques delays action on reducing emissions now (Anderson and Peters, 2016; Low and

Schäfer, 2020). (Anderson and Peters, 2016). Indeed, also the emission reduction pathway brought forward by the CCC will require negative emissions, in the form of carbon capture or land use changes, to reach net zero (Marsden and Anable, 2021). This indicates that even the carbon budgets and emission reduction pathways that the UK is currently committed to are built on an expectation that carbon capture techniques will be available in the future. Any further weakening of ambition now will lead to a greater reliance on future carbon capture techniques and therefore greater risk that emission targets are missed.

However, such a weakening of ambition has been observed by academics. Marsden and Schwanen (2024) point out that the UK is not on track for staying within its current carbon budget, all while decarbonisation policies are weakened. Hale et al. (2022) point out that having a net zero target doesn't necessarily mean that adequate policies are in place to achieve this target. When reviewing the net zero targets of bodies of governance and companies globally, they found that only a small share of these targets were underpinned with robust commitments around e.g. timing or governance. Similarly, Gudde et al. (2021) found that among the local authorities declaring a climate emergency, by the end of 2020 80% made some reference to creating an action plan. However, three quarters of local authorities did not describe how they would fund any climate action, casting some doubt over the success of the climate commitments.

Marsden and Anable (2021) point out that in the UK, climate governance is a top down exercise with carbon budgets not broken down beyond the level of devolved governments. While the UK government recognises the important role of local authorities in addressing climate change, they don't have legally defined responsibilities (Gudde et al., 2021). Local authorities do however hold legislative power over various areas of potential GHG reduction (Gudde et al., 2021; Climate Emergency UK, 2025). Analysis by Garvey et al. (2023) found differences in local authorities' climate ambitions and their capabilities to act, indicating that the benefits and burdens of decarbonising are not distributed in a spatially just way. This mismatch of local and national ambitions, the large differences between local authorities and the complex nature of climate governance lead Marsden and Anable (2021) to call for a more coordinated approach to decarbonisation across governance scales.

### 3.1.2 Transport decarbonisation

In the UK, transport is the highest emitting sector. In 2023, it contributed 29% of the UK's greenhouse gas emissions (Department for Energy Security & Net Zero, 2025). While other sectors achieved emission reductions over time, emissions from transport have remained

largely stable. Within transport emissions, cars are the largest single contributor (UK Government, 2024). This makes transport decarbonisation an important theme to study.

Academia uses the avoid-shift-improve framework as a way of categorising different approaches to reduce transport emissions (Creutzig et al., 2018). 'Avoid' refers to emission reduction from avoiding trips and thereby reducing the overall distance travelled. It brings the largest emission savings, thus it is often argued that this approach should be prioritised (Creutzig et al., 2018). However, transport enables visiting also places that are seen as essential for one's life, and as such not every trip can be avoided without harming those individuals affected (Arnz et al., 2025). 'Shift' describes a switch to lower carbon modes such as public transport and active travel. This enables people to continue travelling to important locations while reducing the resulting greenhouse gas emissions. 'Improve' means making technical changes to the currently used modes to increase their energy efficiency and reduce the amount of fossil fuels required to travel a certain distance. To limit global warming, a combination of policy approaches will be necessary (Gota et al., 2019).

Still, transport is commonly referred to as a hard to decarbonise sector. This is due to its reliance on fossil fuels as a direct source of energy (Gota et al., 2019). In addition, transport relies on a complex system of infrastructure, policies and behaviours, all of which are difficult to change and lead to path dependency (Gota et al., 2019; Haarstad et al., 2022). The time lags involved here further highlight the need to start decarbonisation processes urgently.

However, research discussed in section 3.1.1 points out that climate ambitions are weakening, also regarding transport decarbonisation. Brand et al. (2020) find that UK transport decarbonisation has focused on technology change, with less attention on behaviour change. The CCC however points out that also demand reduction must be a part of transport decarbonisation (Climate Change Committee, 2025b). This raises further doubt over the feasibility of meeting climate targets, but also highlights the need for holistic transport decarbonisation policy.

### 3.1.3 Decision making processes in UK transport planning

Under this thesis's focus on fairness, it is important to consider how transport decisions are made. Here, transport strategies are an important place where decarbonisation ambitions can manifest. While the UK Government has previously issued guidance on how local authorities should develop a Local Transport Plan (LTP) (Department for Transport, 2009), this guidance has not been updated in well over a decade. Further, there is currently limited documentation on how transport strategies are developed.

However, these guidance documents do not give input to the initial decisions around which topics are in focus and which questions and problems are considered (Mackie et al., 2014). The process of idea generation and visioning is often undocumented, and there is only little research on the processes and methods that planners use to come up with an idea or identify a problem in the first place (Tennøy et al., 2016). What we do know however is that transport planning links to wider strategy. Here, transport planning traditionally followed a predict-and-provide approach, meaning that future travel volumes were predicted and transport provided accordingly (Lyons et al., 2024). However, scholars note that this does not line up with uncertain transport futures and changing strategic needs under decarbonisation (Marsden and McDonald, 2019). Thus, Lyons et al. suggests a decide-and-provide approach instead, where visions rather than expected demands guide transport planning (Lyons et al., 2024).

Once the strategic direction is decided and several project options are on the table, appraisal tools are used to evaluate them. In the UK, if public funds are used for a project, then the standardised appraisal procedure called Transport Appraisal Guidance (shortened to TAG, formerly called WebTAG) has to be followed. It is a form of multi criteria analysis (MCA) and evaluates proposals through the lens of five business cases that address strategic, economic, commercial, financial and management questions (Mackie et al., 2014). However, within the business cases TAG makes strong use of cost-benefit analyses (CBA), aiming to add monetary values to as many impacts of a scheme as possible (UK Government, n.d.). This approach is seen as best practise in that it gives clear guidance on which aspects to consider in the appraisal (Bueno et al., 2015). Lewis (2021) however argues that a CBA is utilitarian and thus doesn't regard historic context. Thus, she argues that applying CBA in a context of historic inequities is only acceptable if an initial equity assessment has been done. Whether equity concerns are in fact a part of this planning process is one of the questions that this research seeks to address.

The final output of TAG is a set of information on how each proposal scores for each business case. There is however no guidance on how to weigh up the business cases or come to a final judgement (Mackie et al., 2014; Bueno et al., 2015). It is not clear from the guidance to what extent the reasoning behind the final decisions has to be published. Further, the criteria in TAG are national ones so they might not fully represent local goals or targets (Hickman and Dean, 2018).

This section illustrates that the decision making processes in UK transport planning leave open room for value judgements for different views around fairness. This further supports the need to

study the views on fairness held by transport planners, who play an important role in decarbonising transport.

### 3.1.4 Consultations and public engagement

In transport, public consultation was initially seen as a marginal activity with little influence over outcomes (Hodgson 2003). Bickerstaff noted that the motivation for seeking public participation was often instrumental only (2001), and found that a "decide-announce-defend" approach is common in policy making (2002). Since then, consultations have become more common. A review by Elvy (2014) found that the majority of local transport plans studied drew from public consultations. Nowadays, there is a statutory requirement to consult the public in specific contexts (House of Commons Library, 2025b).

Scholars discuss the role of participation and consultation from different angles. The arguments in favour of public participation are often divided into normative, substantive and instrumental arguments: Normative refers to a moral duty to include people's views. Substantive means that public participation brings new and important views to the table. Instrumental means that consulting the public makes the resulting policy better (Delgado et al., 2011; Király and Miskolczi, 2019; Bekius et al., 2025).

The normative argument of a moral duty towards including people's views lines up with several justice theories. Procedural justice (see section 3.2) asks that all views are appropriately considered, which is seen to require participation (Shejale et al., 2025; Hansel et al., 2025). Epistemic justice refers to the production of diverse knowledge beyond established understandings (Schwanen, 2021). Seeking this knowledge requires participation (Barata, 2024). Mobility justice views transport injustices within wider societal injustices, and also includes a specific ask towards participation (Sheller, 2018; Barata, 2024).

However, data shows that some people are less likely to engage with surveys and consultations than others (Lubitow et al., 2021). Those who are less likely to participate, are also more likely to face disadvantages, meaning that the needs of these population groups are less represented (Klaever and Verlinghieri, 2025). Also people with different mobility patterns are represented to different extents (Hansel et al., 2025). Also knowledge plays a role: In a French context, Flipo et al. (2023) note that transport governance is so complex, and responsibility for action is spread so diffusely, that local citizens struggle to take part in decision making. Given the complexity of UK transport governance (section 3.1.2), one may expect similar outcomes in a UK context.

This ties in with questions of power. Mitchell (2005) argues that the public is a stakeholder that often has a legitimate interest in a policy, but no power to change it. Thus, consultations are required to address these power imbalances. However, Arnstein (1969) challenges the idea that more participation automatically redistributes more power to the public. She argues that different participation approaches come with different levels of power given to the public. This is illustrated by a study by Barnett et al. (2012), who interviewed experts on renewable energy and found that engagement was seen in an instrumental way as a tool to provide information and address concern. This means the public was given limited room to actually shape the outcomes of a planning process. Also Klaever and Verlinghieri (2025) find that such spaces of "invited" participation are often instrumentalised. Often, participation maintains existing power dynamics, as opposed to challenging them (Barata, 2024).

These power imbalances lead Bekius et al. (2025) to argue that participation is often tokenistic and unable to bring meaningful change to a plan or process. Elvy (2014) reviewed local transport plans in the UK and observed that while some plans drew from significantly more public engagement work than others, these plans did not include more policies towards addressing social exclusion. Further, the role of conflict matters. Legacy et al. (2017) argue that deliberative processes can only deliver broad and general agreements, and that community resistance may arise if the strategic goals from a wider plan are not translated into justifications for specific schemes.

The literature thus suggests that while the normative, substantive and instrumental arguments for participation may hold true, participation alone is not a guarantee towards justice. Questions of who participates, in which way and under which power structures need to be addressed to make participation meaningful. This research will thus follow Klaever and Verlinghieri (2025), who argue that in invited spaces participation should be broad, open to different outcomes and drawing from a range of methods.

## 3.2 Just Transitions

This section discusses the Just Transition concept, which is increasingly used around decarbonisation. It lines up with the complex demands of fairness in transport decarbonisation. General approaches to Just Transition and its so far limited use in transport are discussed here.

### 3.2.1 The Just Transitions approach

The Just Transitions approach emerged from US labour movements in the 1970s, who worried that the transition away from fossil fuels would lead to job losses and harm the livelihoods of those working in fossil fuel industries (McCauley and Heffron, 2018; Wang and Lo, 2021). Atkins (2022) observes that populist movements in the UK currently make similar arguments by trying to claim that net zero policies are undemocratic and place an unequal burden on vulnerable parts of society. Indeed, scholars argue that the concept of Just Transitions has long broadened out beyond the original theme of workers' rights and that it can help to unite different strands of justice research on e.g. climate, energy and the environment (McCauley and Heffron, 2018; Delina and Sovacool, 2018).

Just Transitions research is commonly viewed through three tenets: *Recognition justice* means that a justice issue needs to be adequately observed before it can even be addressed. *Procedural justice* concerns a fair planning and decision making process in which all relevant inputs were considered. *Distributive justice* looks at how a justice issue affects different population groups differently, often with an eye to focusing mitigating measures to where they're needed (Wang and Lo, 2021). These tenets emerged from the field of environmental justice, where Schlosberg (2004) argued that most work so far had focused on distributional aspects, while omitting important questions on recognition and participation. These claims line up with the shift from transport equity to transport justice discussed in section 3.3 below. These tenets were then brought to energy justice (McCauley et al., 2013), and later applied to the growing conceptual debates around Just Transitions (McCauley and Heffron, 2018). Here, Wood (2023) criticises that energy justice has moved far away from the original deep contextual rooting of environmental justice. He argues that it is important to consider the connections and influences between tenets, and to understand that using tenets is in itself normative.

Based on recent research, additional tenets were proposed to further broaden the discussion. To mention a few: *Restorative justice* is concerned with identifying and making reparations for injustices that occurred in the past (Wang and Lo, 2021). *Cosmopolitan justice* calls to include human rights and needs globally, for example by considering those externalities that apply globally (Sovacool et al., 2019). *Flexibility justice* demands that systems remain flexible and open to all contributors (Dall-Orsoletta et al., 2022). *Epistemic justice* concerns the ability of relevant people and entities to share their views, and the ability of decision making processes to consider these views (Schwanen, 2021).

Recent work here observed a growth in and broadening of Just Transition research: Wang and Lo (2021) noted that the term Just Transition is becoming polysemic, carrying multiple meanings. As Kortetmaeki et al. (2025) note, this risks watering down the concept and opens it up for co-optation. Equally, Abram et al. (2022) observe that the term Just Transition has been used increasingly frequently and in different contexts. They find that often research here remains reductive, focussing focusing on jobs and the economy while leaving unchallenged the underlying systemic structures that gave rise to injustices in the first place. Hence, they note that this reductive approach is unlikely to bring about real change, as it continues to apply the same lenses that brought about many inequalities in the first place. Middlemiss et al. (2023) points out that such siloed and reductive applications of Just Transition frameworks risk overlooking important connections and causing unintended consequences. Future research must address these limitations. Abram et al. (2022) call for a more open use of the Just Transition outside of siloes, to understand justice challenges in a more holistic way. They also point out the value of a Just Transition approach as an analytical concept for making sense of the justice implications of the transitions that lie ahead for us. Kortetmaeki et al. (2025) point out that, while Just Transitions tend to focus on negotiation between those affected by a transition, this risks putting too much focus on the socio-economic aspects of a transition. There are environmental limits that, if crossed, cause irreversible harm to the environment and thus to human life, and these limits cannot be shifted through negotiation. They thus draw from Kate Raworth's donut economics model (see Raworth, 2018) by proposing Just Transition boundaries. These acknowledge the hard limits that need to be respected to avoid irreversible environmental damage, while allowing room for negotiation within the framework set by these boundaries.

Based on these observations, this research will draw from the original three tenets of recognition, procedural and distribution justice. There are two main reasons for this:
Firstly, it helps to reach the depth of findings desired to answer the research questions. As discussed above, Just Transition research has broadened out recently, however in doing so it focused on studying the symptoms at hand in a rather siloed way (Abram et al., 2022; Middlemiss et al., 2023). At the same time, the Just Transition approach is well suited to be used to as an analytical concept to study the transition ahead in a more holistic way (Abram et al., 2022). This however requires a focus on the interconnections between tenets and on the systemic injustices resulting from interactions between the tenets. The original three tenets of recognition, procedural and distribution justice were established in response to a previously distribution-focused body of justice research, thus seeking to broaden the focus and study

interconnections. Using the tenets in this research grounds the work into existing scholarship. Secondly, as Wood (2022) points out, the use of tenets is inherently normative. However, based on this I argue that the more recently proposed tenets are narrower in their normative prescriptions. In contrast, the original three tenets are more broadly applicable and thus more suitable for being used as an analytical lens which allows a multitude of fairness views and conceptualisations to be included. For example: While procedural justice considers how decisions are made, epistemic justice specifically considers people's different abilities in contributing their knowledge. While distributive justice considers the distribution of benefits and burdens generally, cosmopolitan justice specifically addresses the global externalities of a transition. As explored in detail in section 3.3, this research seeks to step away from existing definitions of what should be considered fair to instead focus on the views of participants. Thus, the aim is to reduce the normative views being brought into the research. Using the Just Transition concept as a broad analytical lens to study fairness can thus be best achieved when drawing only from the original three tenets, as they are the least normative ones.

### 3.2.2 Applications to transport

Academic work on just transition tends to look at wider topics around energy and climate (see e.g. Abram et al., 2022; Middlemiss et al., 2023; Kortetmäki et al., 2025), rather than at specific sectors. Research that looks specifically at Just Transitions in transport is rare. Among the existing work here, Dall'Orsoletta et al. (2022) maps the lifecycle of electric vehicles onto just transition tenets, while Sovacool et al. (2019) examine electric transport in Nordic countries. Other work draws from just transition ideas without following a tenet based approach, just as Saarikoski et al. (2023), who ran a citizens jury to discuss ways of reducing transport emissions.

Outside of academia however, Just Transition is an increasingly used concept. The Scottish Government has established a Just Transition Commission and launched a Draft Just Transition Plan for Transport in February 2025 (Transport Scotland, 2025). Also industry bodies and think tanks increasingly discuss Just Transition ideas (IPPR, 2019; CIHT, n.d.).

The Just Transitions approach with its roots in environmental and social transitions is thus a useful tool of approaching conversations around fairness in transport decarbonisation. Its tenets can guide the research without being prescriptive on what should be considered fair. Gaps exist around the application of Just Transitions ideas in transport, which this research can address.

## 3.3 Fairness and justice in transport

This section discusses existing research around fairness in transport. First, the use of terminology throughout this research project is clarified. Then, current work around moral philosophy and its connection to the research aims are discussed. As this research project studies the intersection of decarbonisation and fairness, understanding existing thinking around fairness is important to be able to situate the research.

### 3.3.1 Terminology

It is important to clarify the use of terminology within this research. The first distinction is made around equality. Equality here describes an objective or measurable comparison between two entities. In contrast, terms like equity, fairness and justice includes a judgement on what is morally acceptable (Banister, 2018). Whether an inequality is thus seen as fair or unfair depends on how one defines fairness.

In many academic writings, fairness, equity and justice are used interchangeably (see e.g. Thomopoulos et al., 2009; Pereira et al., 2017). Hay (1995) however points out that these terms might be understood differently by different people. This is supported by research by Whitmarsh (2009), who found that people responded differently to hearing 'global warming' or 'climate change' – two terms that were often used interchangeably at the time this research was conducted. While no work has been found that examines whether people understand the terms equity, fairness and justice differently, it is possible that they are perceived differently.

To mitigate this, some authors suggest the acronym EFJ as a catch-all term to mean equity, fairness and justice (Trinder et al., 1991; Hay, 1995; Banister, 2018). This acronym however is impractical to use outside of academic writing, as it requires explaining to every audience, and as no matching adjective exists.

In addition, recent work in transport studies draws distinctions between the terms equity and justice, arguing that equity focuses on distributional aspects while justice also includes wider questions on e.g. how a decision is made (Karner et al., 2020). These developments will be discussed further below.

Through this dissertation, the term fairness will be used when speaking about moral judgements, particularly when interacting with people outside academia. This is because the term is used widely and speaks to people's intuitions about what is morally right (Walters,

2013). When drawing from existing research and data, the language used in these original sources will be mirrored here.

### 3.3.2 Moral philosophy

Moral philosophy considers which norms should guide our lives. Socrates thus defined morality simply as “how we ought to live” (in Rachels and Rachels, 2015). Rachels and Rachels argue that, in the most general definition, morality should involve using sound reasoning and being impartial towards all those affected by a decision (2015). Harvey (1973, in Martens, 2017) similarly defines fairness as "a just distribution justly arrived at".

This reasoning on which principles should govern a moral life is developed by moral philosophers. Their work has resulted in a plethora of theories and definitions on what should be considered fair. Lewis et al. (2021) categorise these definitions by what is seen as ideal, which resource is distributed, whether the focus is on the means or the ends, and whether the definition is a-historical or draws from context. To illustrate this with some examples of commonly used definitions: Libertarian ideas focus on the role and position of the individuals, who should be able to live according to their free will and with as little constraint as possible (Pereira et al., 2017). It thus focuses on the resource of physical capital and concerns the process in which it is distributed (Lewis et al., 2021). In contrast, Utilitarianism argues that the fairest actions are those bringing most net benefit to society (Pereira et al., 2017). It thus focusses on the resource of welfare, considering the ends or final outcomes of the distribution (Lewis et al., 2021). Lewis et al. (2021) then apply these definitions to transport, illustrating that decisions made based on different definitions will lead to different outcomes.

Others have derived more comprehensive concepts of fairness from these broad ideas. Two concepts here have dominated recent academic explorations of transport fairness:

Rawls’ Theory of Justice focuses on the allocation of goods and public positions in society (the “primary goods”). He argues that inequalities can only be fair if there is equal access to an opportunity and these opportunities work for the least benefitted members of society. He developed this using the “veil of ignorance”, assuming those creating the rules of society don’t know their own position therein (Rawls, 1971).

The Capabilities Approach was developed by Amartya Sen (Sen, 2005). He argues that each person has different resources (the material and immaterial goods we can use) and different abilities to use these resources. Combined, this gives a person’s capabilities, which describe all the things a person can do and be (Randal et al., 2020). The Capabilities Approach is

concerned with setting minimum levels of capability, so it incorporates ideas of Sufficientarianism (Pereira, Schwanen and Banister, 2017; Luz and Portugal, 2021).

Among the plethora of definitions, no single one has been met with universal acceptance. Rather, contestation and deliberation between different thinkers continue to be an essential part of philosophy (Gjesdal, 2021). This even occurs around theories such as that of Rawls, which is seen as widely regarded (Banister, 2018). Divergence takes place not only between philosophers, but within each person. Ryan (2006) argues that at different times or in response to different situations, a person's moral reasoning would fit under different definitions of fairness. Gjesdal thus argues that, instead of continuing to search for agreement, philosophers should accept a degree of plurality (2021).

This contestation and deliberation of moral theories largely occurs within the realms of philosophy. As Bernáth and Tőzsér (2021) argue, philosophical work may be subject to biases. Erden (2021) argues that these biases are, among other factors, caused by a lack of diversity among philosophers. She thus calls to ask not just what philosophy is, but more crucially so who has the power to define philosophy or provide moral theories. Further, Erden (2021) observes a lack of awareness of these biases among philosophers, which she attributes to the overconfident reasoning of philosophers who wrongly assume that they are capable of fully rational thinking. This lines up with Schwanen's (2021) call for more hermeneutic discourses in transport justice. He argues that researchers needs to be aware of their own limited views and thus need to study a wider range of evidence.

I argue that, based on these observations, the use of existing moral theories and definitions of fairness would not align with the Just Transition approach followed in this research. Procedural justice calls for the involvement of different knowledges, but this cannot take place if philosophical theory is developed by a small number of thinkers. Distribution justice considers the distribution of goods across people and places, however the biases held by philosophers might lead to an unfair distribution instead. Further, I argue that the presence of these biases stands in conflict with Rachels and Rachels (2015) view that morality involves impartiality towards all that are affected by a decision.

Gjesdal (2021) finds that if philosophers cannot agree on one definition of fairness, then the public won't do so either. Indeed, Almas et al. (2024) find that people both across and within countries have different views of what is fair and what causes inequality. These findings further support this research project's goal of understanding how the public perceive fairness in transport decarbonisation.

What this means for this research is that existing moral theory, with its focus on providing a definition of what is moral, should not be applied as a "microscope" (Gjesdal, 2021) through which to study a situation (here transport decarbonisation). Rather, I endeavour to follow Erden's (2021) call for more diversity by directly studying the views of some of the stakeholders who are so essential to transport decarbonisation.

The following section explores the use of moral philosophy within transport, to further understand the research gap.

### 3.3.3 Moral philosophy in transport

In the field of transport research, questions around fairness have received increasing attention over the past decades. This section summarises existing research on fairness and justice in transport. It starts with summarising work on developing and applying various definitions and then discusses related concepts.

Two books have strongly influenced recent work on justice. Both have in common that they develop new conceptualisations of justice in relation to transport. In "Transport Justice", Martens (2017) argues that in the light of ongoing injustices in transport, we cannot wait for a perfect definition of justice to work towards, but should rather find one that is good enough to help address the imminent challenges. Drawing from various philosophers, he provides a much-cited definition of fairness by stating that "all members of society should be guaranteed a sufficient level of accessibility under most, but not all, circumstances" (2017, p.228). in "Mobility Justice", Sheller (2018) argues that people's mobility and wider social structures are connected. She highlights that mobility is relational and ever changing, thereby prompting research into the dynamic connections between mobility and society.

One strand of transport research draws from existing philosophical definitions to apply these to current themes or case studies. Among the first were Trinder et al. (1991). They identified ten concepts of 'EFJ' (Equity, Fairness, Justice, see section 3.3.1) in the literature, and then mapped out how they relate to several transport issues. Pereira, Schwanen and Banister (2017) discuss how several distributive theories can apply to transport. They conclude that a just transport system includes minimum levels of accessibility and the spatial equality of opportunity. Randal et al (2020) evaluate the role of transport as a conversion factor within the capabilities approach (see section 3.3.2), arguing that transport must be integrated with wider aims of promoting wellbeing. Nello-Deakin et al. (2019) explore the role of fairness in redistributing roadspace, arguing that suggestions for roadspace reallocation based on current use of roadspace would recreate existing injustices. Hail & McQuaid (2021) draw from equality

of opportunity and equality of outcome to explore how transport affects female transport users. Some work looks into improving the planning process, by proposing new approaches to include equity in it (Thomopoulos et al., 2009; te Boveldt et al., 2020). These studies describe ways in which transport projects can be evaluated against different fairness definitions. These studies highlight that there is indeed not a universally accepted definition of fairness that is applicable to all situations and cases.

A further body of research uses terms like justice, fairness or equity to explore the distributive impacts of a policy. This is particularly evident in research around the distribution of EV charging stations: A review by Hopkins et al. (2023) finds that a wide range of metrics is used in research on the equity of charger distributions. These studies aim to identify an equitable distribution of chargers, but without defining 'equity'. Equally, a review by Chen et al. (2025) that existing studies use a range of metrics to assess equity in relation to EV charging. Moving away from EV charging, Brown et al. (2018) explore the equity implications of different public transport ticketing models, and Millonig et al (2022) discuss how mobility budgets could be allocated fairly. These studies discuss fairness, equity or justice, but do not define it or draw from philosophical theory.

This highlights a challenge: While research on transport often comes with normative views and an implicit assumption on what is fair, these views are not explicitly stated (Mullen and Marsden, 2016; Lewis et al., 2021; Martínez-Díaz, 2026). For example, research might label a transport situation as unfair, without explaining which definition of fairness such an assessment is drawn from. Focusing on transport emission policies, Lucas and Pangbourne (Lucas and Pangbourne, 2014) explored the implicit equity assumptions behind policies. A review by Soukhov et al. (2025) explores this further, and identifies a range of different conceptualisations of fairness being used in different research projects, often implicitly so. A lack of clarity on what is considered fair or equitable however leads to misunderstandings and risks carrying forward existing injustices. As Lewis et al. put it, "It is difficult to engage in a moral debate when you do not realize there is a debate to be had" (2021, p.2), meaning that much of transport research has not yet embraced these normative discussions. However, as section 3.3.2 shows, many different and sometimes conflicting definitions of fairness exist. When applied to transport, these different fairness definitions would lead to very different outcomes (Lewis et al., 2021).

Two emerging strands of research can address this. Firstly, emerging work explores ways of quantifying fairness and justice in ways support project evaluation and development. Here,

Arnz et al. (2025) explore ways of quantifying minimum mobility needs for all. Soukhov et al. (2025) review existing conceptualisations of fairness, allowing future research to develop a more coherent framework for fairness in transport that can be applied here.

Secondly, transport scholars noted that conversations around equity in the transport field focus on the distributive questions around who wins and loses (Schwanen 2021, Karner 2020). They call for widening approaches. Karner (2020) calls for a shift from a distribution-focused view on transport equity to a wider view of transport justice, and of considering the processes and knowledge involved in creating the distributive outcomes. Schwanen (2021) also asks for what he calls epistemic justice: Considerations for how different people are differently able to share their views, and how the transport system incorporates these views. This relates to Fischer's (2007) view on policy epistemics – he calls for a wider consideration of knowledge as the more technocratic policy makers might have a very different understanding of a situation than the wider public. Also Soukhov et al. (2025) highlight a need to include wider sources of data and consider people's lived experiences.

Beyond work on fairness and the creation and application of theories, related strands of research discuss specific normative questions. A key debate of the past decade here is on whether mobility or accessibility should be the focus of transport improvements. Mobility describes where and how far you can travel whereas accessibility describes which and how many places and opportunities you can reach (Martens, 2017). Scholars on transport fairness tend to argue in favour of accessibility, as mobility doesn't sufficiently consider local conditions and the uneven spatial distribution of opportunity (see e.g. Ferreira & Papa, 2020; Lucas et al., 2016; Luz & Portugal, 2021; Martens, 2017; Pereira et al., 2017). However, Ferreira and Papa (2020) observe that mobility thinking dominates current transport planning. Reasons for this include a long-standing focus on mobility growth and thus on metrics like passenger numbers and distances travelled, and current economic approaches making it easier to model mobility than accessibility.

Work on Transport-Related Social Exclusion (TRSE) considers the connections between transport disadvantage and social disadvantage (Lucas, 2012). Social exclusion is here defined as a lack of opportunity to participate in activities of daily life, and connected to that a lack of social connections. TRSE was brought to attention by the Social Exclusion Unit in 2003, who found that TRSE was often caused by a lack of access to key activity locations. This occurred also because location access was no explicit planning target, which means that nobody felt responsible for access provision (Social Exclusion Unit, 2003). A decade later, Lucas (2012)

identified that while academic work on defining and addressing TRSE progressed, these approaches were not yet taken up by planners. TRSE is commonly described through several components of exclusion, such as time-based exclusion (e.g. not having time to make a trip), economic exclusion (e.g. lacking the money to pay for a trip) or digital exclusion (e.g. not being able to navigate the digital systems for buying tickets and receiving transport information) (Luz and Portugal, 2021). Transport for the North (TfN), one of the sub-regional transport bodies in England, advanced work on defining and measuring TRSE. They identified that 21.3% of people in the North of England live in areas at high risk of TRSE, while only 16% of people in the South and Midlands live in such areas (Transport for the North, 2022). This highlights the spatial element of TRSE. Mullen (2021) highlights that the shift to EVs risks increasing TRSE, as it may reduce infrastructure available for those who are unable to buy an EV and thus continue driving petrol and diesel cars.

Human needs theory offers another useful perspective on fairness in transport (Mattioli, 2016). Mattioli outlines that there's a set of basic needs universal to every person, place and generation. Serious harm occurs if these needs are not met, and it is possible to set a threshold above which a need is met. Scholars have developed different lists of needs which show considerable overlap (Gough, 2017). Needs can be fulfilled through different need satisfiers that stand in hierarchies. It is possible for each need to have several satisfiers and for each higher order satisfier to have several lower order satisfiers. These need satisfiers depend both on culture and on the individual capabilities of each person (Mattioli, 2016; Pereira et al., 2017). Based on this, Mattioli (2016) argues that this framework offers a route towards better integration of justice issues in transport research. This notion of human needs fits accessibility concerns, as transport in itself is usually not a need but can indeed enables the satisfaction of needs. The focus on meeting needs lines up with sufficiency approaches, while the acknowledgement that each person has a different ability to use transport for needs satisfaction fits with discussions on capability.

This section highlights the wide range of approaches towards fairness research in transport. Three elements stand out here as relevant for this research. Firstly, prior work points to the importance of explicitly stating normative assumptions and fairness definitions used. Here this will be done through using the Just Transitions approach. Secondly, existing research highlights a need to consider not just distributive but recognition and procedural aspects of justice in transport, and to draw from a wider source of insights. This will be done by directly studying the views of the public, as discussed in chapter 4. Thirdly, prior research has explored related areas of normative discussion. This serves as a reminder to study normative and moral values –

related themes in the data, also where they are not explicitly labelled as ‘fair’, as they may still bring justice-relevant insights.

## 3.4 Inequalities in transport

Transport policies brought to address climate change and/or injustices do not enter a vacuum. Rather, they overlap with the already uneven transport system which brings different levels of access to different people and places. Further, as Wood (2023) points out, developing theories on fairness is not enough to meet the real world challenges of transport: “There is sadly often an asymmetry between conceptualising justice and, in a non-ideal world, the potential avenues to remedy these injustices” (Wood, 2023, p. 6). Therefore, this section discusses inequalities in transport.

To do so, it is firstly important to consider that transport is described as a derived demand. People usually don’t use a mode of transport for its own sake, but rather to reach other places of relevance (Van Acker et al., 2010). These places can include institutions, such as for education, work or healthcare, but they also include informal locations such as to visit a friend. Transport planning traditionally focuses on the commute to and from work, not least because this regular trip is easy to measure. More complex journey patterns are less represented in research (Hail and McQuaid, 2021). This bears the risk that current travel provision is tailored more to commuting and less to other travel needs. In the context of inequality, some people are more likely to experience the benefits of the transport system, while others face the disadvantage of unsuitable transport. The following sections discuss two prominent themes in literature which both address uneven distributions of transport benefits and burdens.

### 3.4.1 Transport poverty

Transport poverty describes a situation where a person is unable to access the places required for their day to day activities, be this due to a lack of transport provision, costs, required travel time or safety concerns (Lucas et al., 2016). For example, Bondemark et al. (2021) found that the up-front cost of monthly travel cards were prohibitive to some people and forced them to buy day passes regularly, costing them more overall. And Mullen (2021) argues that a lack of money might force people to stay in areas with poor transport connections instead of relocating. Some people find themselves in situations where they have to meet their transport needs even though this places significant strain on their budget (Mattioli et al., 2020). This is called ‘forced car ownership’, and this phenomenon arises out of a combination of financial

constraints and a car focused transport system. The latter will be discussed in the following section.

Where transport poverty relates to people's overall available budget, this is influenced by wider political and economic circumstances. The recent cost of living crisis (see section 2.5) both increased the cost of energy and thereby transport energy, and reduced the budget people have available for transport due to also rising costs for other things. Political decisions can influence how such price changes affect the public. A much cited example here is that the UK has decided to freeze fuel duty at a constant level since 2011 and introduced a temporary cut in 2022 of 5 pence per litre which still applies now (Office for Budget Responsibility, 2025). Meanwhile, train fares increase annually, with the current cap for annual increases set to 4.6% per year in England and Wales (Office of Rail and Road, 2025). However, in the autumn 2025 budget the UK Government announced that fuel duty would increase from September 2026, while rail fares will be frozen for one year from March 2026 onwards (UK Government, 2025a). Examples of non-financial large-scale decisions influencing transport poverty include the discontinuation of bus services and planning decisions that place businesses and thus jobs in locations that are hard to access without cars.

### 3.4.2 Lock in to car based systems

Scholars argue that our society has become more car-dependent and that more and more having a car is seen as a social norm or standard (Mattioli, 2016). Often, schemes and innovations to improve transport, provide access to alternative modes or address pollution are designed with car users in mind. This means that these proposals are more likely to meet the needs of car users than of non-car users who already face disadvantages in a car-dominated system (Mullen and Marsden, 2016; Linovski et al., 2018; Haarstad et al., 2022). This also affects people's social networks: When studying the introduction of a low emission zone in Antwerp, De Vrij and Vanoutrive (2022) found that also non-driving residents within the low emission zone were affected, as visitors with older cars were now unable to reach them.

Research on car dependency encompasses a range of issues. As Van Eenoo (2025) observes, literature conceptualises car dependence in many different ways. The majority of work here acknowledges that car dependence is systemic and tied with other aspects of life. For example, Mattioli et al. (2020) identify five elements of car dependency which range from the car industry, to land use and even cultural factors.

This makes it challenging to escape the car based system and think of truly innovative approaches. In their study of transport innovation in four different cities, Haarstad et al. (2022)

found that, as transport innovations are placed into a car-dominated transport system, they tend to replicate the existing "automobility" focus. This means that innovations are designed to exist alongside cars rather than being powerful agents of change which can replace cars altogether. Scholars thus point out that reducing car use is not enough for thoroughly addressing the role of cars in society (Van Eenoo, 2025) and that a wider transition needs to take place (Mattioli et al., 2020). However, given that cars have such a central place in the current transport system, such a wider transition will disrupt current travel patterns and current distributions of benefits and disadvantages – which raises further questions on fairness.

### 3.4.3 Zero Emission Vehicles

Different drivetrain technologies come with different technological, environmental, social and governance implications. As the transition to ZEVs takes place over a prolonged period of time, a range of technologies are in use across the vehicle fleet. This may result in various inequalities which are discussed here. The majority of research on ZEVs has focused on electric vehicles (EVs), hence the focus of this section on EVs.

Here, work focuses on the distribution of costs and observes that higher income people tend to access EVs more (Guo and Kontou, 2021; Caulfield et al., 2022; Hopkins et al., 2023). Other work considers the distribution of and access to charging infrastructure (Hopkins et al., 2023; Chen et al., 2025). A focus here is on optimizing the distribution of charging stations, for example along principles of efficiency or equity (Liu et al., 2025; Chen et al., 2025). This research points to the scale of charging infrastructure needed, illustrating the changes to the built environment brought by a transition to EVs.

The EV transition will bring a change in human behaviour: Ryghaug and Toftaker (2014) point to the "transformative properties of EVs", thus highlighting that a transition to EVs goes beyond a mere change in drive train, as people are reflecting on and changing their mobility behaviours. This indicates that a transition to EVs may also interact with existing inequalities regarding transport access and use. However, a recent review by Taamneh and Makahleh (2025) illustrates that only few studies examine the social factors driving EV uptake, including user perceptions and behaviour. This points to an important research gap around how perceptions and behaviour influence the uptake of EVs.

The public are often seen as rational and predominantly interested in technical aspects of the transition (Ryghaug and Toftaker, 2016; Yildirim et al., 2026). For example, Bennett and Vijaygopal (2018) studied how people would vote in a yes/no referendum on a ban of the sale of new petrol and diesel cars. They found that most people knew little about EVs and therefore

recommended that marketing should focus on their technical aspects as well as associated health impacts (Bennett and Vijaygopal, 2018).

However, as Sovacool et al. (2019) points out, most research here is either positive or descriptive, and more critical or normative examinations of EVs are missing. Similarly, Henderson (2020) notes that most research fails to examine the underlying assumptions around the role of EVs in the transport system. He points out that, while a transition to EVs may face only little political friction compared to other policy options, that doesn't mean there are no justice concerns around EV. He thus asks the question on who is promoting EVs with which motivation, and he calls for wider and more critical research around the underlying assumptions of a shift to EVs (Henderson, 2020).

So far, only little research exists which examines the justice implications of ZEV's more critically. Among these, Dall'Orsoletta et al. (2022) take a lifecycle view to map the injustices associated with EVs on a global scale, observing that most recognition and procedural injustices described in the literature focus on the extraction stage. This indicates that there is a gap in the literature around injustices within the UK, which this study aims to address. Sovacool et al. (2019) studies EV injustices in Nordic countries, concluding that policymakers need to understand that mobility decisions involve moral questions. However, their research used expert interviews, arguing that the topic of EVs is complex and expert interviews would lead to a more in depth conversation. Penn et al. (2022) find that the focus on EVs might widen existing inequalities between the modes by creating reinforcing feedback loops which further benefit cars and disadvantage public and active travel. They call these feedback loops "death spirals". Budnitz (2024) specifically looks at parking practises, pointing out that EVs just like other cars are parked most of the time. More generally, a shift to EVs doesn't address the wider challenges that come from living in a car dominant society (Cass et al., 2005; Mattioli et al., 2020; Van Eenoo, 2025).

Thus, both the lack of critical research around a transition to EVs but also the injustices pointed out by those few existing critical studies mean that the Zero Emission Vehicle mandate is a useful case study for understanding public perceptions on fairness.

### 3.4.4 Link to Just Transition tenets

Various inequalities within the current transport system are discussed, to exemplify how different people are affected differently by transport. When studying decarbonisation policies in this research project, the interaction of these policies with the current inequalities needs to be considered.

Most of the examples of transport inequalities discussed here all fall within the distributive justice tenet of Just Transitions. This illustrates the prevalence of distribution focused research within transport justice studies, as discussed in section 3.3.3. While section 3.1.4 discussed the role of and gaps in consultation, thus relating to procedural justice, less research has been conducted around procedural justice themes.

This is a challenge. As Middlemiss et al. (2024) note, visions of Net Zero transitions tend to be very homogeneous, with little consideration for different groups of people and their differences. However, as this section illustrates, different people face different transport situations. These, in overlap with decarbonisation policies, may lead to even more uneven and possibly unfair situations. This means that different people's circumstances need to be adequately considered. Recognition justice here brings the open view and humility needed to recognise these differences and make room for their study, while procedural justice includes these views adequately. This is important – as Kortetmaeki et al. (2025) note, not considering procedural and recognition justice might make the transition less governable.

## 3.5 Role of perceptions

As section 1.1 pointed out, effective policies to decarbonise transport are needed quickly in order to address climate change and meet emission targets. However, section 3.4 identified various inequalities in the transport system. Section 3.3.3 noted that current work on fairness focuses on distributive effects, even though recognition and procedural aspects are also important. This section explores the role of perceptions, and introduces framing as a way in which perceptions can be created or influenced.

### 3.5.1 Perceptions and policy

A growing body of research investigates into the role of intangible variables and factors that influence how people perceive and interact with the world. For example, An et al. (2023) find that stereotypes affect how people perceive and interact with mobility options. Martiskainen and Sovacool (2021) find that people have a higher willingness to change if they feel positive emotions towards a transition or policy. Similarly, Bretter and Pangbourne (2025) find that emotions influence travel behaviour. Specifically, they observe that negative emotions towards cars lead to more use of sustainable modes. Te Broemmelstreot (2022) consider that narratives influence how people feel about a policy. Similar research on framing considers how a policy is presented and how this affects public perception (Nisbet, 2009).

This research is important in the context of decarbonisation (or any transition) policy. Here, the goal is for policies to be successful and taken up by the public in order for the policy to reach the desired outcome quickly. Public support is thus seen as important for policy success (Upham et al., 2023). Particularly the perception of a policy as fair increases policy support (Bretter and Schulz, 2024; Mehdizadeh et al., 2024).

There are however barriers to how people perceive a policy. In our thinking, humans tend to employ heuristics, or "mental shortcuts" in which we draw from existing knowledge, past experience and guidelines or rules of thumb to process information. This is to ease the cognitive load of learning new information (Searle, 2025). This is also how framing works, as explained in section 3.5.2. That means that everyone processes information differently, given everyone's different base of existing knowledge. This shows up in the form of bias. For example, status quo bias means that support for a policy is higher when it is framed as status quo, and lower when it is presented as an alternative approach (Moleman et al., 2025). Ego-centric anchoring bias means people assume that others are more like themselves than they actually are (Ralph and Delbosc, 2017).

This needs to be studied qualitatively, to be able to understand the complexity around and context within which people take up information and form opinions (Whitmarsh et al., 2025). Specifically, there is a research gap around how different policies are perceived by the public (Mehdizadeh et al., 2024). Studying the views of more different people thus means that there is more knowledge available on the narratives, stories, views and perceptions of how people take in the world (te Brömmelstroet et al., 2022). This links with procedural justice.

### 3.5.2 Framing

Framing is a way in which perceptions are generated or influenced. "Framing describes the presentation and contextualisation of any piece of information (Entman, 1993; Nisbet, 2009). According to the definition of Entman, "To frame is to select some aspects of a perceived reality and make them more salient in a communicating text" (Entman, 1993). Frames thus evoke certain perceptions within the recipients (Hovardas and Korfiatis, 2008). In the process of communication, information is always framed (Hulme, 2009). Frames can be introduced consciously to trigger specific thoughts in those receiving the information (Meraz, 2009; Guggenheim et al., 2015). But most often, framing takes place subconsciously, with the frame used depending on the communicator's background and context (Hulme, 2009). Hulme notes that each frame also comes with notions on what the problem is, who is responsible for solving it, and in which way (Hulme, 2009). Therefore, each frame might highlight a different

understanding of the problem and different solution. Where different frames are used alongside each other, this may lead to conflict and misunderstandings (Hovardas and Korfiatis, 2008)" (Ternes et al., 2024).

Section 3.3.3 discussed that there is no agreed upon definition of fairness in transport planning. "Still, some information might evoke fairness-related thoughts in people. Therefore, framing can be used to guide the search for information in the data. As Matthes and Kohring observe, frames addresses questions of problem definitions, proposed solutions, responsibility, moral evaluation (Matthes and Kohring, 2008). Looking for these elements in the data will reveal how information is framed and which fairness-related frames are used" (Ternes et al., 2024).

## 3.6 Systems Thinking and System Dynamics

Given the complexity of both people's transport situations (see section 3.4) and of different views on fairness (see section 3.3), a research method is needed which is designed to handle complexity. Systems thinking and specifically system dynamics modelling will here be discussed as a suitable methodological approach.

### 3.6.1 Systems Thinking

The term systems thinking encompasses a range of approaches for the study of complex systems. Lloyd and Smith (2025) observe that the origin of systems thinking is unclear. While some see it as the natural way of thinking for some people, others identify specific origins of systems thinking. Arnold and Wade (2015) reviewed the definitions of systems thinking provided by key scholars in the field and found that they all provide different definitions of what systems thinking actually is. Key elements across these definitions however include the presence of various elements that are interconnected with each other and feedback on each other, an interest in complexity, and boundaries that define what is not part of the system (Arnold and Wade, 2015; Government Office for Science, 2022; Lloyd and Smith, 2025).. The value of systems thinking is seen in its ability to make sense of complex systems and to understand the mental models (i.e. the individual understandings of the system) held by different people (Senge and Sterman, 1992). Systems thinking encompasses a wide range of both methodologies and specific tools (Barbrook-Johnson and Penn, 2022; Lloyd and Smith, 2025).

Increasingly, systems thinking approaches are finding their way into practical applications (see e.g. Lyons et al., 2024). The UK government has released guidance for civil servants on how to incorporate systems thinking approaches into their work (Government Office for Science,

2022). They also developed the ‘Net Zero Systems Tool’ which draws from systems thinking to help policy makers understand how different decarbonisation themes interact.

### 3.6.2 System Dynamics

System dynamics modelling is one systems thinking approach (Lloyd and Smith, 2025). It was developed by John Sterman and colleagues at Massachusetts Institute of Technology in the 1950s and 1960s, initially to model business dynamics (Sterman, 2000).

In contrast to broader systems thinking, system dynamics encompasses well defined modelling approaches, one being qualitative while the other is quantitative. This section briefly introduces both types.

Qualitative models, called Causal Loop Diagrams (CLDs) map out the connections between different variables. Polarity is assigned to each connection, indicating whether a change in variable A causes a change of the same, or of the opposite direction in variable B. Connections are depicted through arrows. A plus sign at the arrow head denotes a positive connection – if the first variable changes in one direction, the second variable changes in the same direction. A minus sign indicates a negative connection – if the first variable changes in one direction, then the second variable changes in the opposite direction. Two types of feedback loops arise: Reinforcing feedback loops are those where several variables interact to continuously trigger further of the same change. This leads to either spiralling growth or decline. Balancing feedback loops are those where the interaction between several variables causes them to remain roughly constant. Feedback loops are shown as circular arrows and labelled ‘R’ for reinforcing or ‘B’ for balancing feedback loops. Where CLDs are analysed, this often happens by imagining a change of one variable and tracing the effects of these changes through the system. This can be used to understand the effects of policy changes. Leverage points, which are the points where a single change in the system has a large effect on the system overall, can be identified (Sterman, 2000; Shepherd, 2014).

Figure 2 shows a simple CLD to illustrate the key components. It shows the connection between the three variables “Learning”, “Attention paid” and Tiredness”. It thus tells the following story: If one pays more attention, one learns more. More learning motivates one to again pay more attention, thus forming a reinforcing feedback loop. However, more attention paid also increases tiredness. If one is more tired, one pays less attention, forming a balancing feedback loop.

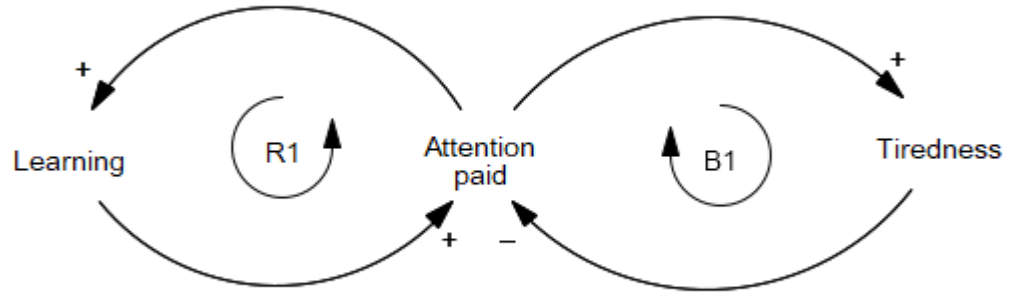



Figure 1 - A simple example Causal Loop Diagram (CLD)

Quantitative models are called stock-and-flow models. Often, stock-and-flow models are developed from CLDs, by adding stocks and modelling the flows between them. A stock can be a tangible unit such as the number of cats in a house, or an intangible (but still measurable) entity such as the level of support for a policy. The value of these stocks changes via flows into or out of it. All causal connections now have equations describing mathematically how one variable affects another. While these are based on literature and evidence as much as possible, in some cases values need to be estimated to provide accurate information (Sterman, 2000; Shepherd, 2014).

### 3.6.3 Participatory work on System Dynamics

Participant involvement is a well-established feature of System Dynamics modelling. This section reviews existing work in order to find a participatory approach that's suitable for this project's research goals.

System dynamics embraces and has established approaches for co-developing models together with stakeholders (Hovmand, 2013; Shepherd, 2014). The benefits here are that this creates a shared language between stakeholders and helps understand the perspective of different stakeholders by uncovering relevant variables and connections. Drawing from people's mental models and perceptions is common in system dynamics, meaning that there is room for people's input by design (Forrester, 2009). Further, there is a large and growing body of literature on modelling approaches that directly involve stakeholders (see e.g. Luna-Reyes et al., 2006; Berard, 2010; Hovmand, 2013; Király and Miskolczi, 2019).

Király and Miskolczi (2019) discuss three strands of participatory system dynamics research: Group model building, as developed by Vennix et al. (1996) involves the creation of a system dynamics model, often in a corporate context and to address a one-off problem. While the

development of a full simulation model is generally the goal, this is not always achieved (Andersen et al., 2007). This is because the focus is on keeping stakeholders engaged and only progressing the modelling process up to a point where participants still fully understand the model (Király and Miskolczi, 2019). Andersen et al. (2007) also reflect that, while developing a full simulation model provides empirically sound outputs, steering the group conversation towards the identification of feedbacks and stocks can slow down naturally occurring conversations.

Participatory system dynamics modelling, aims to create a full simulation model, drawing from and being tested with stakeholder input. Often, experimentation with computer-based simulation models is part of the group work process. Once researchers have developed a full simulation model, this is brought back to the participants for feedback (Király and Miskolczi, 2019). Stave (2010) here reflects that the more participants are engaged in the modelling process, the more learning and insight they gain from it.

Community-based system dynamics as developed by Hovmand (2013) and colleagues, focuses on the creation of CLDs. Here, participant learning is centred even more, participants are part of the entire modelling process. It aims to empower an often disadvantaged community in creating lasting change (Király and Miskolczi, 2019).

In reality, however, applications of system dynamics modelling with participants don't fall as neatly into one of these categories. Instead, modellers use the fluidity and flexibility of these methods to develop a modelling approach that suits their needs and research questions (Király and Miskolczi, 2019). Initially, approaches to develop models with participants often remained undocumented, limiting the application of shared methods to different case studies (Hovmand et al., 2012). More recently, efforts are being made to share best modelling practise in the form of scripts. A script is a standardised approach towards one part of modelling, e.g. variable elicitation. By developing and drawing from a shared pool of scripts, modellers can continue to tailor their approach to the modelling task at hand (Andersen and Richardson, 1997; Hovmand et al., 2012).

Another way of looking at past work on participatory system dynamics is by considering who was involved in model creation. One large body of work focuses on expert stakeholders, who had extensive knowledge of the system under consideration, and who participated in the research in their professional capacity (see e.g. Jittrapirom et al., 2017; Hunter et al., 2021; Jittrapirom et al., 2021; Penn et al., 2022). This brings advantages. Expert participants are more likely to be familiar with workshop settings and confident in their ability to learn a new method and participate in group discussion. Due to their work experience, they'll have a wider view on

the situation, beyond their own personal views. However, every person including experts will hold some biases of their own. This means there is a risk that these biases influence the way that even an expert perceives and describes a system (Ralph and Delbosc, 2017).

Another body of work using system dynamics does involve lay participants, who are invited to share their lived experiences on a topic. However, these studies would usually involve training the participants in system dynamics methods. This mean that these workshops took a considerable amount of time and often went over multiple sessions (see e.g. Kopainsky et al., 2017; Ballard et al., 2020; Gullett et al., 2022). This however poses a barrier to entry for some participants. They might not have the time to participate or might feel intimidated by the challenge of learning about a new method.

There is thus a methodological gap: Group model building is valuable for eliciting participants' mental models, and to understand the views of the public. As this chapter explains, everyone will be affected by the decarbonisation transition, but not everyone currently gets to participate in the debates around it. Understanding people's views on fairness is thus important for a fair transition. However, current applications of system dynamics here have high barriers to entry. Further, transport planning authorities often have limited resources, so are unable to conduct a lengthy process with significant numbers of participants. Thus, this research will develop and use a novel approach that combines the benefits of group model building with ideas from other participatory approaches to fill this research gap. Details on this are described in section 4.5.

### 3.6.4 Comparison with Participatory Systems Mapping

Causal Loop Diagrams take a dual role in Systems Thinking research: As discussed above, they are a key part of System Dynamics modelling, and often used as the first step towards a full simulation model.

However, Causal Loop Diagrams are also one of many qualitative participatory systems mapping and systems thinking tools. Here, CLDs are most closely related to Participatory Systems Mapping (PSM). Table 6 below compares CLDs and PSM to each other, pointing to benefits and disadvantages in both methods. In the context of Systems Thinking, methods are seen as more flexible and fluid than in System Dynamics, and tailoring the approach to the research needs is common (Lloyd and Smith, 2025). This research will therefore adapt existing approaches of CLD development to address the methodological gap around developing CLDs with the public. This is further explained in section 4.5.5.

| | Participatory Systems Mapping | Causal Loop Diagrams |
|---|---|---|
| **Similarities** | Both methods utilize visual representation of causal connections. Variables form the nodes in the diagram and may represent any element of a system. The variables are linked through causal connections, which can be positive (If variable A changes, variable B changes in the same way) or negative (If variable A changes, variable B changes in the opposite direction). | |
| **Differences** | The aim is to create large maps that capture all complexity that is relevant to stakeholders. Sub-maps are then created for further analysis.<br>Stakeholder creation is at the heart of the method. The focus is on participant views, not expert knowledge.<br>Feedback loops may arise in the map, but they are not essential. | Causal Loop Diagrams, especially when used to communicate with stakeholders, are simplified to focus on the most important mechanisms.<br>Diagrams can be created in participatory ways, but also from existing data or literature.<br>Feedback loops and dynamic behaviour of the system are of key interest. |
| **Benefits** | Centres the views and experiences of participants.<br>Does not require specialist knowledge or training. | Formal, structured approach to diagram creation allows for comparison.<br>Existing literature containing causal loop diagrams on the EV transition. |
| **Drawbacks** | Complexity of systems maps limit the ability to compare across multiple systems maps. | Too methodologically rigorous to be taught to non-expert participants in limited time. |

Table 2 - Comparison of Participatory Systems Mapping and Causal Loop Diagramming.

### 3.6.5 Applications to transport research

Transport systems are inherently complex and interact for example with land use and individual behaviour choices (Tennøy et al., 2016). Further, changes take place on different time scales, and especially infrastructure changes lock in past decisions for long periods of time (Gota et al., 2019). System dynamics models are thus a suitable tool for use in transport research. A system dynamics approach helps to better understand particularly dynamic systems and transitions therein (Kopainsky et al., 2017). System dynamics approaches also help understanding the changes within a system over time, and thereby can help making better and more holistic decisions (Hatzopoulou and Miller, 2009).

Various applications of system dynamics to the transport sector exist, as a series of review papers shows (Shepherd, 2014; Fontoura and Ribeiro, 2021; Ghisolfi et al., 2022; Harrison et al., 2024). Here, Harrison et al. (2024) observe that System Dynamics is most often used around sustainability and strategy topics, and also point out that System Dynamics is increasingly used outside of academia. Fontoura and Ribeiro (2021) note that within sustainability research, System Dynamics is often used to investigate negative externalities and find ways to reduce them. Focusing on the freight sector, Ghisolfi et al. (2022) identify a need for System Dynamics models that investigate the system in a more holistic way.

As explored in this thesis, transport decarbonisation and fairness are both complex themes in themselves, and even more complex when considered in combination. System Dynamics as an approach that's explicitly designed to handle complexity is thus suitable.

## 3.7 Research gaps and research questions

As discussed above, a fast decarbonisation of the transport sector is needed to limit transport's contribution to climate change, mitigate harmful effects on humans and help the UK achieve its net zero emission target. However, progress against the UK climate targets is currently lagging behind, which means more effort needs to be put into decarbonisation (section 1.1).

Transport is deeply integrated into people's lives, but in ways that are uneven across people and places. Access to transport, the costs and benefits of the transport system, and the ability to inform decisions and shape transport systems of the future are spread unevenly across people and places, in the UK and globally (section 3.4). The UK is committed to a major transition in the transport sector. Such a transition will likely impact on the population in different ways, and may reduce or exacerbate these inequalities. This raises questions of fairness, which this research seeks to explore.

As section 3.3 describes, current philosophical practise carries bias, and thus philosophical theory might not be able to represent the views of the public. Thus, this thesis instead seeks to understand the views from non-philosophers on fairness in transport decarbonisation. The goal here is to move away from using existing theories, and towards capturing views in an open and holistic way.

Two groups of people are of particular interest here: Transport planners shape the transport system, hence their views on fairness have the potential to influence planning processes and outcomes. The public uses these transport systems daily, and their perceptions of fairness

might influence their travel behaviour and their reactions to transport decarbonisation policy. While both these groups thus play an important role in decarbonising transport, little is known about how they think about fairness. These are the research gaps that this thesis seeks to address.

Current research on fairness in transport focuses on distributive questions (see section 3.3.3). To ensure that also recognition and procedural aspects are considered, the research questions follow the Just Transition framework and are set out against the three tenets of a Just Transition:

**Recognition justice**

*RQ1: How is fairness understood by the transport planning sector?*

*RQ2: How does the public perceive the role of fairness in transport decarbonisation?*

**Procedural justice**

*RQ3: How are fairness concerns incorporated in transport decarbonisation planning?*

*RQ4: How and to what extent are different voices and different knowledge used in the transport planning process?*

**Distributive justice**

*RQ5: How and to what extent are distributional impacts addressed by current plans to decarbonise transport?*

*RQ6: How does the public perceive the distributional impacts of transport decarbonisation?*

# 4 Methods

This chapter describes the methods used to meet the research aims. The chapter starts by outlining methodological needs arising from the literature review and the epistemology chosen. Key decisions around the research design are justified and aligned with the Just Transition framework outlined in section 3.2. Next, the chapter describes in detail the methods used to answer the research questions. To understand the views of transport planners in study 1, interviews and document analysis were conducted. To map the perception of the public in study 2, workshops were held, and the research was supplemented with document analysis. These workshops use a systems mapping approach, which is further described here.

## 4.1 Research philosophy

To guide the research, and to be able to appropriately evaluate it, it is important to set out the theoretical perspective behind this research. The theoretical perspective describes the philosophical views that guide the researcher in their decision making. It is in itself composed of views on ontology and epistemology (Moon and Blackman, 2014).

Ontology refers to what there is to know. Therein, realism assumes that a shared, objective reality for all exists, while relativism sees reality as something constructed by everyone's own thinking processes (Moon and Blackman, 2014). Critical realism sits in between these two extremes of the spectrum, by arguing that while an objective reality exists, this is always perceived through our individual and differing minds and may therefore never be fully understood (Mingers, 2000; Churchman et al., 2026).

Epistemology refers to the way we create knowledge and meaning. Here, the spectrum ranges from objectivism – assuming that meaning sits with the object – and subjectivism – assuming that meaning is created by the subjects and applied to the object. Constructionism bridges these positions, by arguing that while objects exist independently of the subjects, the meaning of these objects is constructed as the subject engages with the object (Moon and Blackman, 2014). This means that humans engage with and therefore construct meaning from the world around us. As each person has a different set of experiences, understandings and assumptions they bring to an object, their interpretations and constructed meanings will differ (Crotty, 2020).

Drawing from ontology and epistemology, one's theoretical perspective describes the foundational assumptions and philosophical views underlying any research (Moon and Blackman, 2014). It thus considers the role and purpose of science (Churchman et al., 2026). Here, the opposite ends of the spectrum are often considered to be positivism and interpretivism. Positivism aims to identify patterns and use these to predict the future. It relates to realism and objectivism. A positivist researcher would assume that scientific methods, observations and measurements can be used to derive objective truths. (Moon and Blackman, 2014). Interpretivism was formed in contrast to positivism. It seeks to gain understanding of phenomena and their contexts by looking at individual cases and interpreting them. In drawing from subjectivism and relativism, its goal is to bring understanding of a specific topic or situation (Moon and Blackman, 2014). Constructivism sits in between these positions, as it assumes that people individually make meaning of reality as they engage with it. Moon and Blackman (2014) also introduce theoretical perspectives with other aims: Critical theory seeks to provide liberation by questioning power structures, while post-structuralism and post-modernism seek to deconstruct current assumptions on knowledge and research.

In 2011, Schwanen et al. argued that most transport research originates from scientific disciplines and relates to positivist views. Ten years later, Lowe (2021) made similar claims, and explained the prevalence of positivist research in part through the easier availability of funding for this work. There are however arguments as to why positivism is not always appropriate. Lowe (2021) argues that both a researcher's demographics and lived experience and their positionality may shape which data they collect. This connects to findings by Ralph and Delbosc (2017), who found that transport experts tended to assume the public had a more similar travel behaviour to themselves than data supported. Lowe (2021) also argues that research communities have shared ideas on what is worth studying, and that this influences topic decision. With a focus on the professional sector, Tennoy et al. (2016) equally find that transport planners tend to learn from within their own industry circles. Also Schwanen argues that transport research needs to move beyond a purely technical view and towards welcoming different framings of what the problems and solutions are (2019), and calls for researchers to acknowledge that their own views are partial and biased (2021).

Chapter 3 has discussed that people have different experiences and interactions with the transport system, leading to varied and at times unfair outcomes. A sense of (un)fairness is also shaped through people's individual perceptions of the transport system, of decarbonisation policies and of the wide range of outcomes achieved by both. Pointing to a research gap on how both planners and the public view fairness in transport decarbonisation, the goal of this thesis

is to seek understanding of these views and perceptions. Positivism and its focus on one shared reality would not hold space for these different views. This thesis is further based on the observation that much of the fairness conversation in transport originates from within academia and through philosophical debate, and on the assumption that this leaves out the views and inputs of many people. These, so far left out views, are to be centred in this research project. This also indicates that a positivist approach, using scientific enquiry to study fairness and thereby centring academic views and work, cannot be suitable to the research question.

This conceptualisation of the research goals instead fits with a constructivist theoretical perspective. Patton (2002, p. 96, cited in Moon & Blackman, 2014), describes that "Constructivists study the multiple realities constructed by people and the implications of those constructions for their lives and interactions with others". Constructivism thus focuses on the individual perceptions and experiences that people develop on the world they live in (Taylor, 2018). This lines up with the aim of this research to study the views of different actors in transport decarbonisation, namely the planners and the public. It is hypothesized that these actors may have different views on fairness that will influence decarbonisation. Further, it is the goal of this research to understand and hold space for these multiple perspectives and views.

Related here are considerations around axiology, thus around the values of and purposes behind science (Churchman et al., 2026). Values exist both in the research philosophy followed and in the problems we choose to engage with (Hill, 1984). Hartmann (in Biedenbach and Jacobsson, 2016), distinguishes between values that are intrinsic (i.e. good in their own right), extrinsic (good as a means to an end) and systemic (good within a specific set of rules) values. In this research, I build onto my intrinsic values of social justice and of intact ecosystems. I see climate change as a threat to both social justice and ecosystem wellbeing, and thus place value on activities that mitigate climate change. Transport thus holds dual extrinsic value, as it both directly connects to social justice (see e.g. section 3.4), but also in its current form contributes to progressing climate change (see e.g. section 1.1).

The remainder of this chapter will discuss how this research philosophy has influenced the methods selection, before describing in detail how the two studies were approached.

## 4.2 Positionality

The constructivist position taken in this research means that people interact with the reality around them in different ways, based on their views and backgrounds. This means that also I,

as the researcher conducting this research project, will bring my own perspective to the work. In this section, I reflect on my positionality and that of research participants and data sources used.

When contacting transport planners as prospective interviewees for study 1, I introduced myself as a postgraduate researcher. My aim was to present myself as trustworthy and knowledgeable, as I hoped this would help with participant recruitment. I also drew strongly from my professional networks, including contacts at the University of Leeds and at industry partner Arup. My hope here was that my affiliation with organisations that are well known and trusted would increase people's willingness to participate. Indeed, I received more responses from prospective participants recruited via these connections than from those recruited via direct emails.

When recruiting participants from the wider public for my workshops, I introduced myself instead as a PhD student. Here, I hoped that introducing myself as a student would invoke people's willingness to help. Participants received a £50 incentive for joining a workshop, however upon handing out the incentives, several of them noted that they didn't think about the money involved – this indicates that people had other motivations for joining the workshop beyond financial incentives.

Beyond the role description I chose for myself, I did not adapt the way I present myself in the research. I did however aim to present myself in similar ways to all participants of the same study. I did so by scripting my introduction and explanations of the research, but also by wearing similar clothes for each data collection day.

As the person designing the research, I was able to influence how participants would view their role and position in the project. In both studies, I aimed to centre participant knowledge and study each person's individual views as a source of data, in line with my research philosophy. I thus approached each participatory element of this research with curiosity and openness, showing appreciation to every piece of knowledge shared. This was particularly important during the workshops with members of the public. They were not used to sharing their views and be regarded as knowledgeable in the same way as professional participants would be. Thus, this study required particular attention towards creating a welcoming and safe atmosphere. I achieved this by receiving training in the facilitation of focus groups. Based on this training I developed strategic approaches towards facilitation (see appendix). This ensured that all participants had a consistent experience in the workshops.

It is important to note here that data gathered from participants (in the form of interview transcripts and causal loop diagrams) differs from data obtained through documents. Participant-sourced data resulted from the interaction between me and the participants, and (in the case of the causal loop diagrams) through interaction between participants. They thus arise from the specific research situation. In contrast, the documents used throughout this research were likely developed by several people representing a body of governance, and they were designed to be publicly available. These different data sources should therefore be treated differently, in accordance with the information they are able to provide (Grant, 2019; Rajah and Kopainsky, 2025). Sections 4.4 and 4.5 describe how these different data sources were obtained and analysed for both studies.

## 4.3 Principles for method selection

### 4.3.1 Methods needs arising from literature and research questions

To address the research gaps identified in the literature review, a considered selection of methods and approaches is needed. The literature here points to several principles that this research needs to align with:

Firstly, the literature review revealed gaps around whose views on fairness in transport decarbonisation are studied. Particularly the views of the public and of transport planners around fair transport decarbonisation are not known. Both of these groups are however important in relation to the research questions: Transport planners play an important role in shaping the transport system, thereby being able to influence fairness in transport. The public interact with transport frequently, thereby being affected by fairness. Therefore, the views and perceptions of these two groups on fairness in transport decarbonisation will be studied.

The literature review also revealed that there is no single unified definition of fairness. Instead, various different definitions are used in different contexts and places. For the methods, that means that using a specific definition of fairness would limit what can be captured. Also, it would mean that the power to define what is fair is again with academics instead of the wider public. Instead, what is needed is an open approach, one that focuses on questions rather than answers.

The Just Transition approach can be used here, if applied with consideration. As section 3.2.1 revealed, there is discussion in the field around the specific interpretations and historic connections between the tenets usually cited under Just Transition, energy justice or

environmental justice. This leads to very different uses of terminology and a wide range of research done under a "Just Transition" headline. But, as Wood (2023) notes, this breadth is useful in understanding this research topic, as long as clear definitions and critical thinking are present. So here the Just Transition approach with its three tenets (see section 3.2) is used not to give answers on what should be considered fair – as Wood (2023) notes, this isn't possible as the tenet structure itself leaves much room for interpretation anyway. Instead, the tenet structure is used to ask questions and understand what participants themselves would consider fair or just here. Having the tenets to start asking questions from ensures a good amount of breadth to start with, and it honours research and activist voices around the value of recognition and procedural justice, thus moving away from discussions in transport that so far were focused on equity and distribution, as Karner et al. (2020) noted.

However, as Abram et al. (2022) say, the Just Transition approach is often used in a reductive way, describing issues without addressing systemic injustices. They thus call for a greater consideration of the systemic nature of injustices. Also Wood (2023) highlights that the Just Transition tenets need to be considered in connection to each other, as even injustices arising within one tenet will affect the other tenets. From this systemic nature of injustices arises a need to understand the system from which the injustices arise, and to evaluate fairness claims in a systematic way. Systems thinking (see section 3.6) is designed to address complex questions and develop a holistic understanding of systems and the interaction between system components. That makes systems thinking a suitable approach for this research, as it can be used to study both the connectedness of themes within a tenet, and connections spanning across tenets.

Agent Based Models (ABMs) are often presented as a bottom-up alternative to the top-down nature of Systems Thinking. An ABM models individual actions and their interactions, gaining systems understanding from the patterns forming (Bastarianto et al., 2023). While ABMs can give insights into emerging behaviours, they require detailed granular data to do so (Nugroho and Uehara, 2023). However, as discussed in section 3.1.4, participation in data collection and information gathering exercises is uneven. Justice researchers thus point to the need for critical reflection on data collection and for new approaches for gathering data, to ensure that transport data indeed represents all transport users (Karner et al., 2023; Agrawaal et al., 2024). This PhD research seeks to understand fairness perceptions, around which large research gaps exist currently (see section 3.7). Thus, an approach that requires large amounts of data would not be suitable.

### 4.3.2 Alignment with epistemology

As Crotty (2020) notes, the method choice needs to align also with the research epistemology, which in transport is largely positivist . This is reflected in the large amount of transport research that talks about fairness or justice with implicit and unstated normative assumptions (Lewis et al., 2021). Positivist research would assume that there is one definition of fairness that is the best and universally applicable.

Moral philosophy instead provides various different definitions of fairness. Research also acknowledges that people have different moral intuitions and form fairness views in response to their environment (Haidt, 2001; Lewis, 2013). Such a framing means looking beyond a positivist framing and explains why I have taken a constructivist approach to this research, which believes that people construct meaning from and in conversation with the world around them. Thus, the methods used here need to be able to honour and study these different views.

### 4.3.3 Alignment with Just Transition principles

The theoretical framework of this research project draws from the concept of a Just Transition, which is discussed in section 3.2. This means that also the research methods themselves should align with Just Transition principles, aiming to minimise injustices in the research process. Thus, this section will reflect on which principles for methods selection arise from an alignment with Just Transition principles.

Recognition justice involves questions on which themes are considered, and which questions are asked. This research made some literature-backed decisions at the start to frame the research design and choice of research questions. Within this however, it aims to capture the views of participants and offer them room to express their ideas. As section 3.3 discussed, while current research on transport justice focuses on academic perspectives, there has only been little research that openly and qualitatively studies non-academic perspectives on transport justice and decarbonisation. Thus, little is known about what planners and people think here even though they are important actors in the transition. This research thus studies their views and perceptions. This is done without a pre-defined theory on what is fair, in order to give participants adequate option to shape the research also outside the bounds of existing theory. A qualitative approach allows for participants to share their views and provide richer insights into their perceptions. The aim here is not just to understand what people consider fair, but more crucially why they do so. This is best achieved through qualitative research (Berg, 1998; Robson, 2016). Qualitative research can also provide insights into the perceptions of the

public on policies, helping to understand why people are against or in favour of a policy (Mehdizadeh et al., 2024).

Procedural justice means including all relevant stakeholders and their knowledge adequately. This supports the choice of a systems thinking approach. Systems thinking provides established pathways for studying and modelling different views. Indeed, people's "mental database" (Forrester, 2009) is a key source of information when developing system dynamics models. Olaya (2012) highlights the need to include all relevant system components in a model. Thus, in the context of this research a model about transport fairness needs to include humans and their transport use among the variables. This, by deduction, means that humans need to be involved in the model building process to access their mental databases. A participatory approach facilitates the most direct access to people's mental databases and allows not just information on what is important to participants, but also, and crucially to systems thinking, why it is important and where the connections are. It also, in line with recognition justice demands, allows participants direct input on which themes shape the research agenda. While various approaches to participatory research exist, procedural justice demands that these approaches are tailored to participant needs. Sections 4.4 and 4.5 describe how this tailoring is done for research with transport planners and with the public respectively.

Distribution justice considers how the benefits and negative impacts of a transition are spread across society. In terms of method design, it means that benefits and drawbacks of participating in the research should be distributed adequately. This is here done by following ethical procedures, anonymising data and compensating members of the public adequately for the time they've given to the research. The research itself will then explore how the different participants perceive the distribution of benefits and disadvantages of the decarbonisation transition.

### 4.3.4 Summary of key methods options and decision points

Section 4.3 set out the parameters which should guide the methodology selection. This section summarises the discussions made in response to the methodological needs.

Section 3.3 identified that there are many different definitions of fairness. However, only little is so far known about what the public and the transport planning sector think about fairness. Thus, input from these two groups of people will be sought in this research.

The Just Transition framework is chosen as a suitable way of understanding different views on fairness without imposing a definition of what should be seen as fair. Aside from guiding the development of research questions (see section 3.7), it also guides the methodology.

Qualitative research allows for an exploratory approach and the collection of deeper contextual insights. This fits with recognition justice principles as it allows participants to share their views and shape the research agenda. A qualitative approach also fits the epistemology of this research. Constructivism considers the relationships between subject and object. Nuanced qualitative information gives better understanding as to how this relationship materialises, and how different people construct meaning.

A participatory approach means that information is sought directly from research participants, who are thus able to shape the research. This fits with procedural justice. It also fits the constructivist approach as it acknowledges that people draw from their own experiences to make sense of the world, and therefore seeks to study these experiences and interpretations.

A systems thinking approach is suited as it explicitly includes information on people's perceptions and mental models, and it includes complexity and a holistic view.

## 4.4 Study 1: Understanding fairness within transport planning

This section describes the methods used to understand the role of fairness within the transport planning sector. The selections of case study, data and analysis methods are described.

This research draws from two types of data, which are combined as they give different kinds of information. Transport plans and strategies describe the vision and policy choices of the body of governance, setting a direction for future transport development. They have gone through many different hands and processes, thus showing the polished and publicly shared intentions of the organisation writing the plan. While these documents are referred to by different titles, they will here be called 'transport strategies' for simplicity. In contrast, interviews show what is currently front and centre of the minds of transport planners. This will help to differentiate whether fairness is something that's actually in people's minds, and/or whether and how it is discussed at an institutional level.

Semi-structured interviews are used to understand the views of planners, while the transport plans and strategies can be obtained online. Then, a blend of inductive and deductive coding is

used to identify themes across the interview transcripts and documents. Details of this are described below.

Reflecting back on the research principles laid out above, interviews and inductive coding allow for an open analysis of the research data, without imposing theory or pre-defined research ideas onto them. Some necessary limitations are introduced to allow for comparability between data and for adherence to the research timeline. These consist of the use of an interview guide (see table 3) for the semi-structured interviews, and in using the Just Transition tenets as an initial guide for deductive coding.

### 4.4.1 Data selection and acquisition

As discussed in chapter 3, transport planning responsibilities are distributed across several layers of governance in the UK. In addition, at the regional and local level various different governance and thus transport planning arrangements exist. This means that transport strategies from national to local levels of governance are considered for inclusion in the study, to allow for comparison both horizontally within one layer of governance and vertically across layers. Transport strategies are selected for this study because the act as central documents that describe the future policy direction for a body of governance. Alternatively, more specific policy documents could have been used, however as planning responsibilities differ between different levels of governance (see section 3.1), this would have limited the ability to compare between case study locations.

Two filters are applied here to reduce the number of bodies of governance included in the study to a manageable level, one geography-based and one time-based:

There are many more local than national or regional bodies of governance and thus transport strategies. The aim of this study however is to get a cross section of the fairness conversations across all layers of governance. Thus, it is helpful to only select a sub-set of the local bodies of governance for inclusion in the study. Here, the focus will be on local bodies of governance in the North of England. This region is of particular interest for a number of reasons. Firstly, the sub-national transport body (STB) Transport for the North, which covers the North of England, is the only STB outside of London with statutory status. This means that Transport for the North has a responsibility to produce a transport plan (Transport for the North, 2023). Secondly, the region is of interest due to a recent government focus on what was referred to as ‘levelling up’ and described an ambition to address inequalities between different regions in the UK (UK Government, 2022b). Particularly under Boris Johnson’s time as Prime Minister from 2019 to 2022, ‘levelling up’ was a key slogan (Tomaney and Pike, 2020). The North has already

undergone a large transformation in the second half of the 20th century, to move away from mining and heavy industry. But still now, regions in the North tend to have lower life expectancy and income levels compared to London and the South East (UK Government, 2022b). These factors make the North of England a relevant case study region, where both the potential fairness risks but also the opportunities of transport decarbonisation are particularly relevant.

For the purpose of this research, the North of England is defined along the geographic bounds of Transport for the North. Figure 1 below shows how which bodies of governance are situated within Transport for the North, with data being accurate in summer 2022, when data collection for this research project took place. Any local authorities listed in the diagram were potential case study locations, and underwent the selection process detailed below.

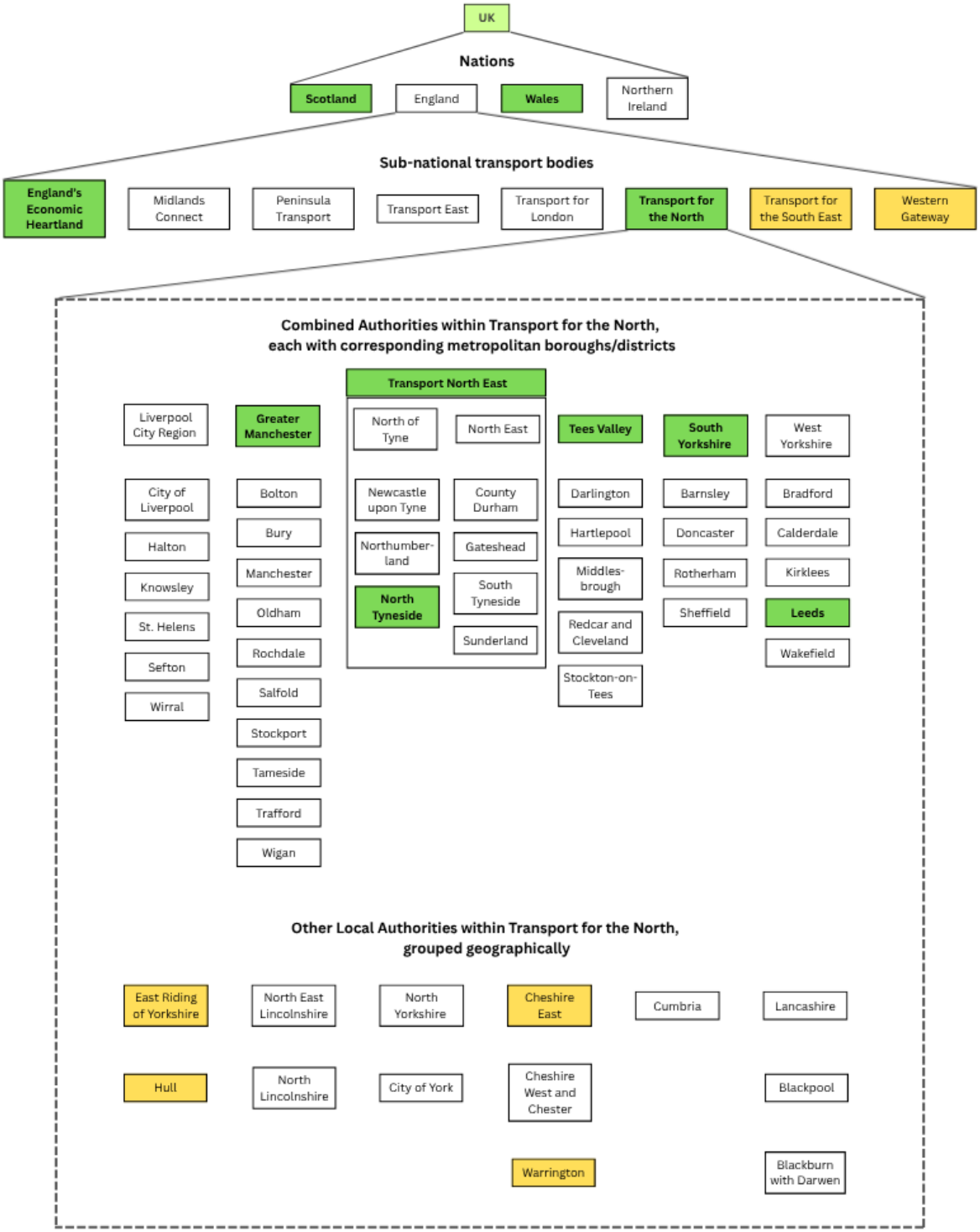



Figure 2 - Diagram showing how the different bodies of governance within the North of England relate to each other. Data valid as of summer 2022. Bodies of governance marked in green were included in the research. Here, the lighter green used for "UK" indicates that the strategy was analysed but no interview was scheduled. Yellow indicates bodies of governance eligible for but not included in the study as no interview could be arranged.

In 2019, the UK amended the Climate Change Act to legislate for a net zero target (as discussed in section 1.1) (UK Government, 2019). This means that, while it is hoped that efforts to decarbonise transport were already under way before, from this moment on decarbonisation was an unavoidable topic for all bodies of governance. To study how fairness was considered within these efforts to decarbonise, only bodies of governance were included that released their transport strategies since the start of 2019. The cut off time for release was August 2022, when data analysis began.

This resulted in 17 bodies of governance being shortlisted for case study. They all were approached for interview using a combination of email and LinkedIn messaging, and existing contacts of the researcher and supervision team. Interviewees were sought who worked at the body of governance at the time of creating the strategy, who were actively involved in the creation and who had overview over its various elements.

It was possible to arrange interviews with nine bodies of governance, who form the case study locations of this study. For some bodies of governance, multiple interviewees expressed interest. Thus, 10 interviews with 12 interviewees were conducted. As table 2 below shows, a good spread across the different levels of governance was achieved.

| **Level of governance** | **Body of governance** | **Document** | **Response to interview request?** |
|---|---|---|---|
| UK | UK Government | Transport Decarbonisation Plan (2021) | No |
| **Devolved nation** | **Welsh Government** | **Llwybr Newydd Wales Transport Strategy (2021)** | **Yes** |
| **Devolved nation** | **Transport Scotland** | **National Transport Strategy (2020)** | **Yes** |
| **Sub-national transport bodies** | **England's Economic Heartland** | **Transport strategy (2021)** | **Yes, two interviewees in one interview** |
| **Sub-national transport bodies** | **Transport for the North** | **Transport Decarbonisation Strategy (2021)** | **Yes** |
| Sub-national transport bodies | Transport for the South East | Transport Strategy for the South East (2020) | No |

| | | | |
|---|---|---|---|
| Sub-national transport bodies | Western Gateway | Strategic Transport Plan 2020 – 2025 (2020) | No |
| **Regional** | **Transport North East** | **North East Transport Plan (2021)** | **Yes, two interviewees in one interview** |
| Counties | East Riding of Yorkshire Council | Local Transport Plan (2021) | No |
| **Combined authorities** | **Transport for Greater Manchester** | **Greater Manchester Transport Strategy (2021)** | **Yes** |
| **Combined authorities** | **South Yorkshire Combined Authority** | **Sheffield City Region Transport Strategy 2040 (2019)** | **Yes, two interviewees in separate interviews** |
| **Combined authorities** | **Tees Valley Combined Authority** | **Strategic Transport Plan 2020 – 2030 (2020)** | **Yes** |
| Local authorities - not in a Combined authority | Cheshire East Council | Local Transport Plan 2019 – 2040 (2019) | No |
| Local authorities - not in a Combined authority | Hull Council | Local Transport Plan 2020 – 2026 (2020) | No |
| Local authorities - not in a CA | Warrington Council | Local Transport Plan 4 (2019) | No |
| **Local authorities - part of a Combined authority** | **Leeds Council** | **Connecting Leeds Transport Strategy (n.d.)** | **Yes** |
| Local authorities - part of a Combined authority | North Tyneside | The Transport Strategy for North Tyneside, 2017 - 32 (revised 2021) (2021) | No |

Table 3 - Shortlist of bodies of governance of interest for the study. All were approached for an interview, and the places for which an interview was conducted form the body of case study locations. From Ternes et al., 2024.

For each body of governance included in the study, their most recent transport plan or strategy was downloaded from their website. Interviews were conducted (details below) and afterwards transcripts were created. The strategies and interview transcripts formed the data for this research.

### 4.4.2 Interview process

All interviews were scheduled by sending participants a link to the appointment picking site Calendly, where they were able to book in for their preferred slot. The consent form and participant information sheet were sent prior to the interview. Interviews were scheduled to take one hour and took place online using MS Teams. This made it possible for participants from all across the country to join. It also reduced barriers to entry as a video call would slot into a participant's work schedule better than an in person visit. Lastly, using MS Teams made for easy recording and transcription.

The interviews offered an opportunity to go deeper into themes not usually covered in the transport plan. To allow for a level of comparability between the interviews and to ensure all topics of interest are covered, a semi-structured interview approach was chosen. In contrast, a closed questioning approach would not have resulted in the same level of depth, while a more open interview approach would not allow for aligning the interview structure with the Just Transition tenets. The interview guide (see appendix) included a list of questions to ask during the interview, with probing topics to ask about should the interviewee not discuss them themselves. However, there was sufficient time in the interviews to also follow up on other themes mentioned by participants.

The first set of questions served as an ice breaker and introduction to the interviewee. Participants were asked about their current role and motivations to work in transport. Open questions were asked here to allow the interviewee to speak freely, while the researcher reacted in a curious and positive way to make the interviewee feel welcomed and at ease. The interviewees were also asked about the transport strategy and their role in its creation, to better contextualise the rest of the interview.

The next set of questions revolved around the process of developing a transport strategy. The strategies themselves would only speak about these processes in very general terms. To better understand the procedural justice angle of the strategies, detailed questions were here asked on the information considered, on the role of consultations and on how conflicting information were handled. The first two interviewees both spoke about the roles of elected officials and of consultancies. To get more information here, probing prompts on these two groups were added to all subsequent interviews.

Next, distributional outcomes were considered. Interviewees were asked about the influence of the 2019 Amendment to the Climate Change Act (see section 1.1) on the strategy, and about the key points and goals of the strategy.

A large part of the interview was dedicated to conversations on fairness. These started with the researcher describing that in the UK, the cost for a litre of petrol has increased by 40p over the last year, and asking the interviewee for their spontaneous thoughts on the topic. Interviews were conducted in autumn 2022. Previously, due to the war of Russia on Ukraine fuel prices in the UK increased to a maximum of 191.27p per litre for petrol and 198.84p per litre for diesel on 7.7.2022, compared to the previous year's values of 132.88p per litre and 135.28p per litre respectively (RAC Foundation, 2025). While fuel prices have decreased again since then, the increase at the time was a topic for conversation and media attention. Then the researcher followed this up by asking whether this is fair. A similar approach was repeated, this time with the topic of flat fare public transport tickets that were introduced in several European countries. For example, Germany offered a ticket for country-wide public transport for €9 per month (BBC, 2022). These questions were designed to allow for the interviewees to talk freely about their views. As fairness can be a very intangible topic, giving interviewees a specific topic was intended to help them develop thoughts along a more concrete example, and to capture their spontaneous thoughts. Then, more direct questions were asked about whether they have a definition of fairness at their body of governance, how to evaluate fairness and how to weigh between processes and outcomes.

The interview was closed by asking if anything important to the interviewee was missed out, before thanking the interviewee for their time and interest.

Interviews were recorded with MS Teams and an automatic transcript was generated. After each interview, the video recording was used to correct and complete the transcript.

### 4.4.3 Analysis and coding approach

The research data considered in this study thus consist of the transport strategies, and of the written interview transcripts. Both types of data were coded in the same manner, as discussed below.

Coding can be deductive or inductive, with both methods having different benefits and disadvantages. Here a combined approach is used, following the directed content analysis approach described by Hsieh and Shannon (2005). In this approach, the key coding themes are drawn from prior research. More focused codes are then developed from the data in an inductive manner. This approach best fits the research needs: An existing coding structure results from the Just Transition tenets, which are the theoretical framework of this study. Beyond these tenets however this study seeks to uncover new information on the role of fairness in planning for decarbonisation, thus requiring an inductive coding approach.

Here, the key coding themes are related to the Just Transition tenets. However, transport planning is an iterative process that responds to a current situation, develops measures to bring change, and shares visions. Distributional effects can be observed in the current transport system, and for anticipated future outcomes. (Un)fairness can be recognised in current or future transport systems, and even the procedural measures taken can themselves be recognised as fair or unfair. Therefore, additionally literature on framing is considered. As section 3.5 discussed, information is always presented in context and this framing influences how people perceive a piece of information. Thus, framing is a helpful lens to add the required level of specification to the Just Transition tenets. The framework used by Matthes and Kohring (2008) identifies that frames consist of problem definitions, proposed solutions, assignment of responsibility and moral evaluation. Overlaying this with the Just Transition tenets gives five distinct coding categories, described in table 4 below.

| **Theme** | **Definition** | **Relation to frame component (based on Matthes & Kohring)** | **Relation to three tenets of justice** |
|---|---|---|---|
| Concepts of fairness | Explicit mentions of fairness, of any concept of fairness, equity or justice, or of specific definitions of fairness (e.g. equality of opportunity). | Moral evaluation | n/a |
| Current state of transport | Descriptions of what transport is like right now, including descriptions of inequalities. It links to recognition justice, as it shows which themes are recognised as inequalities in the current system. | Problem definitions | Recognition justice |
| Policy suggestions | Policies that are recommended or discussed. This gives insight into distribution justice considerations and can show to what extent the impact of decarbonisation on different people and places is understood. | Proposed solutions | Distribution justice |
| Procedural and working with other people | References towards working with other people, and descriptions of how knowledge or views from different sources are included in transport planning. | Assignment of responsibility | Procedural justice |

| | | | |
|---|---|---|---|
| Visions for transport | Quotes describing how transport should be in the future, listing visions and goals. This links to recognition justice, as it highlights which qualities of the transport system are recognised as important. | Proposed solutions | Recognition justice |

Table 4 - Overview of the categories for coding, as set up from literature. Following an inductive approach, these were then expanded on and refined during the coding process. From Ternes et al., 2024.

The data was coded using Nvivo software. The first data sources were coded into the broad categories listed in table 4 above. Then, the coded references were revisited to identify more specific codes within the broad categories. In an iterative process, all data was coded into these more specific codes. To illustrate this with an example: The Welsh Transport Strategy states "We will recognise the fact that some people – particularly those who live in rural areas – may have fewer transport choices for low-cost independent mobility" (Welsh Government, 2021). This was initially coded under the theme "Current state of transport". Later in the inductive coding process it was coded under "Current state of transport – Are inequalities observed? – Geographical", meaning that this quote describes a geography-based inequality within the current transport system.

After coding was completed, a qualitative analysis put the findings in context with existing literature and discussed broader themes within the data.

It is worth noting that Grounded Theory was not used in this research. Grounded Theory describes a process of theory development from qualitative data. Therein, a working theory is developed from data and iteratively tested and refined through additional qualitative evidence (Flick, 2018). This however means that Grounded Theory involves an element of aggregation and generalisation from research findings, which is in contrast with the aims of this research. Rather, work done in both studies 1 and 2 seeks to explore the breadth of views and perceptions held on fairness in transport decarbonisation, focusing on diversity and holding space for contrasting views.

### 4.4.4 Limitations of study 1 research design

The research design faces several limitations:

Firstly, only strategies from 2019 onwards were included to align with the introduction of the net zero target. However, it is likely that strategy development took place over several years, meaning that it is possible that significant parts of the development took place before the net zero target. This means that the influence of climate change policy on the strategy is unclear

from the release date alone. This is mitigated by asking interviewees about the role of climate change in their strategy.

Secondly, the focus on the North of England in studying bodies of governance at the local level might mean that other themes are missed out on. Whether the geographic focus appeared to have influenced the findings will be discussed in subsequent chapters.

Thirdly, only one or two people at each body of governance were interviewed, thus representing only part of the team working on the strategy. Thereby, it is possible that they had different views on fairness, depending on their position within the planning team. Further, there is a possibility of self-selection bias as the recruitment material mentioned fairness. However, within the scale of this research, it would not have been possible to comprehensively cover all those who participate in planning processes. Findings from this research project do point to the need for a more in depth review of the actors and influences involved with transport planning.

## 4.5 Study 2: Understanding public perceptions of ZEV Mandate

This section describes work done to understand how the public perceives fairness in the context of transport decarbonisation.

Following from the research principles, a participatory approach was used. System dynamics methods were adapted to suit the needs of this research, and are applied in ten workshops across Leeds. The participants, all members of the public, were invited to think and discuss broadly.

To serve as a tangible starting point to the conversation, the Zero Emission Vehicle (ZEV) Mandate policy was chosen as a case study.

Aside from the causal loop diagrams (CLDs) developed in the ten workshops, this study also analysed government documents around the ZEV mandate and draws from an interview with government officials. These were used to compare the participants views to the policy texts.

### 4.5.1 Case study location

Leeds was chosen as a case study location for practical reasons, due to its proximity to the researcher and associated knowledge of the area and reduction in travel costs. Choosing one city allowed for a closer comparison between focus group findings, as all participants were experiencing transport in the same city, under the same governance system.

However, there are several factors making Leeds a particularly interesting case study location. Firstly, the city council has an ambition to make Leeds "a city where you don't need a car" (Leeds City Council, 2020). Leeds has a history of transport challenges, not least with decades long conversations around building a tram system (Nilson, 2024). Further, Leeds offers a diverse mix of neighbourhoods, which helps recruiting a wide range of participants. Leeds is part of the Transport for the North STB.

### 4.5.2 Case study selection

This research aims to map out people's perceptions of fairness in a participatory way. A case study based approach fits with this aim. Using a case study to anchor the participatory research has multiple benefits over exploring their fairness thoughts in a more general way: Firstly, a case study allows for a more in depth exploration of a theme within its natural context (Robson, 2016). This aligns with the ambition to study fairness perceptions in a systemic way. Secondly, using a case study makes the conversation topic more accessible for participants (Robson, 2016). This lines up with observations made during the interviews with transport planners (see chapter 5). When these interviewees were asked case study-based questions on fairness, they were happy to share spontaneously formed thoughts. Yet when asked more general questions on fairness, they took a longer time to answer, and many of them opted to speak in their personal capacity. This suggests that people may find it easier to talk about fairness in the context of a tangible situation than in a more general and abstract sense.

The urgency of transport decarbonisation suggests that it is helpful to select for the case study a policy that will soon be implemented (note: at the time of writing the thesis, the chosen policy has been implemented), and that will thus bring fairness questions in the immediate future. To develop a shortlist of possible case studies, the recommendations by the CCC on transport decarbonisation made in the sixth carbon budget were used (Climate Change Committee, 2020). These policy suggestions were assessed against a number of criteria: Are they expected to be implemented soon? What is their potential for decarbonisation? What is the public and research discourse? Are there fairness challenges? Is the policy easy to understand for most research participants?

Section 9.7 in the appendix shows the full list of policies considered, alongside a qualitative evaluation against these criteria.

Based on this assessment, the Zero Emission Vehicle (ZEV) mandate emerged as the most valuable policy for case study. This policy can have a large impact on emission reduction, it is

already committed in law, it is easy to explain also to non-drivers, and as the following section discusses, it comes with many questions on fairness. As Wadud et al. (2024) note, in the UK only 0.75 million vehicles are currently fully electric, with another 32.9 million vehicles still to be replaced if full electrification is desired. This illustrates the scale of the transition ahead.

Table 9 below lists the documents included in the analysis. A full table of government documents on the ZEV mandate is included in the appendix.

| **Document** | **Release date** | **Notes** |
|---|---|---|
| Green Paper for a New Road Vehicle Regulatory Framework in the UK | 2021 | Introduces a consultation on details of the ZEV policy design. The consultation seeks input, among others, on the technical and emission standards that vehicles have to meet to be eligible for sale after 2030. |
| Outcome and response to ending the sale of new petrol, diesel and hybrid cars and vans | Apr 2022 | Outcome of the consultation from 2021. Describes that from 2024 onwards, manufacturers have to sell an annually increasing percentage of zero emission vehicles. |
| Zero Emissions Vehicle Mandate and non-ZEV Efficiency Requirements Consultation-stage Cost Benefit Analysis | Mar 2023 | Formal cost benefit analysis of the proposed policy. |
| Consultation on a zero emission vehicle (ZEV) mandate and CO2 emissions regulation for new cars and vans in the UK | Mar 2023 | Describes proposed ZEV regulations alongside CO2 regulations for non ZEV vehicles. Consults on policy design features as they emerged from the April 2022 consultation. Most questions are phrased as yes/no questions, seeking approval of the proposed policy details. |
| Zero emission vehicle (ZEV) mandate consultation: Summary of responses and joint government response | Sep 2023 | Summary of responses to March 2023 consultation. Describes that, following consultation, “The ZEV mandate scheme’s function is unchanged.” (Department for Transport, 2023e) |

| | | |
|---|---|---|
| Zero Emission Vehicle Mandate and $CO_2$ Regulations Joint Government Response Cost Benefit Analysis | Oct 2023 | Final cost benefit analysis following consultation from March 2023. |
| Pathway for zero emission vehicle transition by 2035 becomes law | Jan 2024 | Official announcement of ZEV mandate policy.<br><br>Here, the policy content suddenly changes: Previously, the sale of new ICE cars and vans was to end in 2030, and from 2035 all new cars and vans were to have zero tailpipe emissions. In the policy announcement, it is now described that "80% of new cars and 70% of new vans sold in Great Britain will now be zero emission by 2030, increasing to 100% by 2035" (Department for Transport, 2024). |

Table 5 - Government documents included for analysis in this research.

### 4.5.3 Workshop group composition

Each workshop group was composed so that all participants shared one similarity with each other – either they lived in the same neighbourhood or they held the same characteristic such as being a student. The aim of this was to create a sense of connection between participants, easing them into the conversation and helping them feel comfortable. Beyond this characteristic, groups were composed to be heterogeneous so that across the entire participant pool a wide range of people contributed to the research. Heterogeneity in the focus group also encouraged participants to think deeper in response to the different viewpoints shared (Robson, 2016).

To achieve as wide as possible representation from across the public, workshops were conducted in multiple locations. Three neighbourhoods were recruited based on geographic and demographic criteria, and two workshops were conducted in each neighbourhood. In addition, four groups were recruited for specific groups of interest. Table 5 lists which workshops were envisioned for this research.

The criteria for selecting participants of originate in literature. Income is an important factor as it influences which and how much transport a person can afford. Indeed, those in the highest income quintile travels over twice as far as lower income quintile (Massey-Chase et al., 2025). People on higher incomes are also more likely to purchase an EV (Hopkins et al., 2023). People on lower incomes face a higher risk of transport-related social exclusion (Transport for the

North, 2022). Geography is an important factor, as transport is inherently place-based and different locations thus have different types and levels of transport provision available. Here, Flipo et al. (2023) note that particularly rural transport is often overlooked. One's type of residential dwelling and home ownership status also influence how one can engage with the ZEV mandate and with EVs more widely. Home owners are more likely to have access to off-street charging, which is cheaper than using public chargepoints (Scamell et al., 2022). They also have more ability to make decisions over their dwelling, while renters are to an extent limited by decisions of their landlords.

As the ZEV mandate is a car-focused policy, a different approach would have been to recruit participants with different car ownership status and driving behaviour. However, I assumed that people generally select their transport options based on travel needs, cost and transport availability, hence car ownership would correlate with the factors mentioned above.

Therefore, participants were recruited in different neighbourhoods with different transport provisions and average income. The neighbourhood-focused approach meant that participants were familiar with local conditions, and it reduced travel distance and increased familiarity with the venue, both of which was hoped to make participants feel more comfortable to attend. Leeds City Centre was selected as a dense urban location with good public transport provision and the majority of people living in flats. Alwoodley was chosen as a suburban neighbourhood with a comparatively high average income, which Kippax was selected as a more rural village on the edge of Leeds and with a lower average income. Initially, the plan then was to allocate participants further into one of two neighbourhood groups based on a criterion of interest. This was to be able to compare between these groups. This only worked in Alwoodley, where one group was held for home owners and one for renters. In the City Centre, participants availability meant that it was not possible to have groups for drivers and non-drivers, while overall low recruitment figures in Kippax meant that all eligible participants were accepted.

To complement this approach and focus more on themes of interest, four thematic groups were held. Students were recruited to have more participants who are younger and on lower incomes. Further, students are more transient and less settled into a longer term lifestyle than other people. Caring responsibilities result in specific transport needs and so were identified as a second group. Lucas et al. (2016) finds that single parents have distinct travel behaviour, making more but shorter trips. People with caring responsibilities are also at higher risk of transport-related social exclusion (Transport for the North, 2022). Environmentally conscious people were recruited as Nayum and Thøgersen (2022) observe that environmental beliefs

influence the extent to which a person engages in environmental behaviours. While there is mixed evidence on how these beliefs influence action, it indicates that environmental beliefs do influence behaviour. As the ZEV Mandate is a climate policy, environmentally conscious people might have distinct views on the policy. Lastly, people who already drive an EV were recruited, as they have lived experience of ZEVs.

| Group | Location on map | Description of target participants | Recruitment |
|---|---|---|---|
| Leeds City Centre – two groups | 3 | Urban residents, with good public transport options. | Local facebook groups |
| Alwoodley - renters | 6 | Suburban residents, neighbourhood with higher average income. | Local facebook groups |
| Alwoodley – home owners | 6 | Suburban residents, neighbourhood with higher average income. | Local facebook groups |
| Kippax – two groups | 1 | Rural, lower average income, limited transport options. | Local facebook groups |
| Students (Held at Leeds University) | 4 | Younger, lower incomes, possibly new to Leeds. | Posters at University of Leeds. |
| Parents and carers (Held in Headingley) | 5 | Are caring for at least one child, elderly or disabled person, are thus like to have particular demands on their time, often additional travel needs. | Relevant facebook groups and WhatsApp chats. |
| Environmentally minded people (Held in Otley) | 2 | People who are particularly interested in the environment and climate change. | Recruited via an environmental organisation, people with existing engagement with the organisation were selected. |
| EV drivers (Held in Leeds City Centre) | 3 | People who regularly drive an EV, and thus have first hand experience of ZEVs. | Recruited via facebook and via networks at the University of Leeds. |

Table 6 - Description of workshops, the target participants for each and the recruitment approach used.

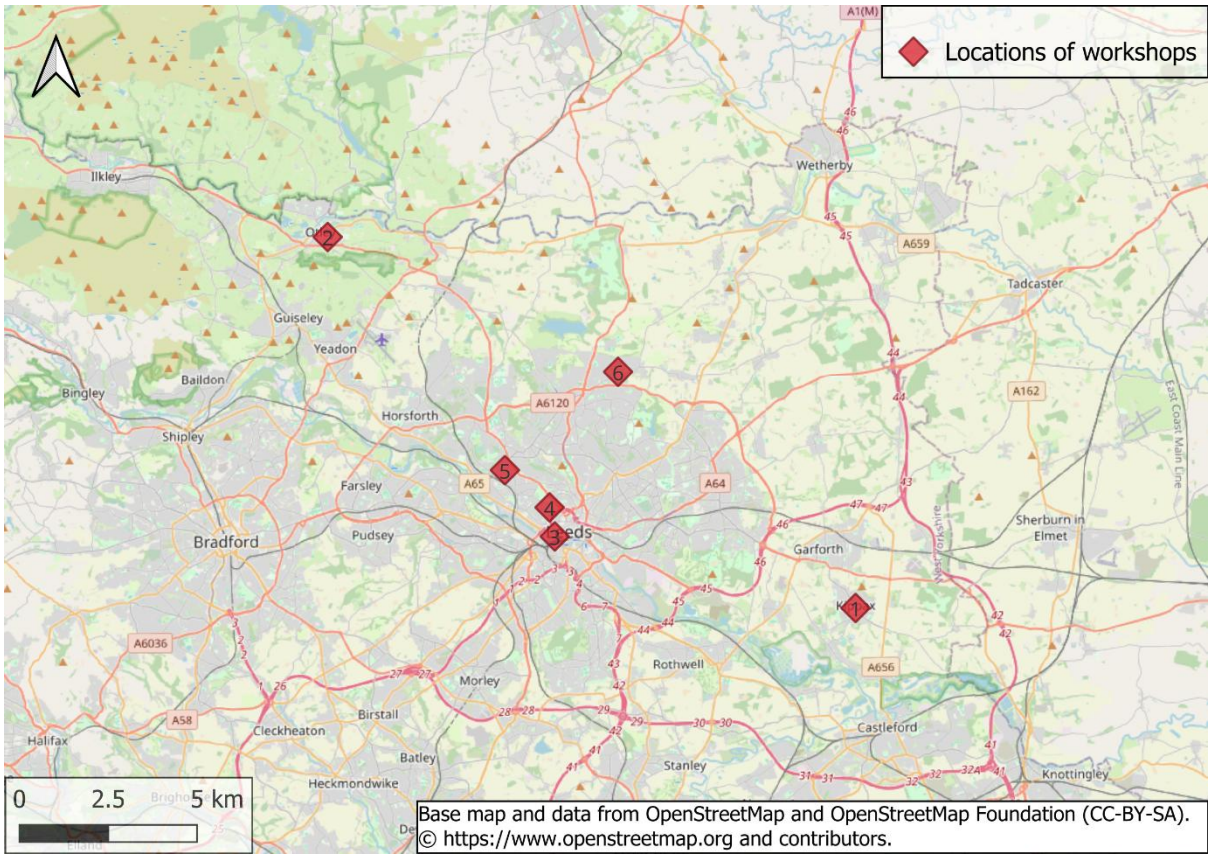



Figure 3 - Map depicting the location of all workshops.

### 4.5.4 Participant recruitment

Prospective participants filled in a screening questionnaire (see appendix 9.6). They were asked about their age and income brackets, the first half of their postcode, and their living, car ownership and care circumstances. The postcode information was used to verify that the person lived in the target neighbourhood. The other information was collected to recruit a wide range of participants from among these criteria. Participants were invited by email to the workshop, with reminders being sent out the day before.

A £50 incentive was offered for participation in the 2h workshop. This was to increase access to the workshop, for example for people who had to pay for transport or childcare, or who missed out on paid work during this time. For the location specific groups, the workshops were held in a venue within the neighbourhood. The student group was held on the university campus, and the group for environmentally conscious people in a venue that's often used by the environmental group. This was done to reduce travel time and increase participant comfort by being in a familiar location. These measures allowed for a wider range of participants to join and share their views, and thus fits with the procedural justice considerations described above.

### 4.5.5 Methods used

The methodology for this study draws from Systems Thinking and System Dynamics. As discussed in section 4.3, this allows for open exploration of the complex decisions and perceptions around fairness. Particularly Causal Loop Diagrams (CLDs) are useful here. As mentioned in section 3.6, they are qualitative maps capturing the causal connections driving a system. Their advantage is in the depth of existing resources both on how to create CLDs in a group setting and on existing applications of CLDs in transport and in participatory research (which are discussed above). The formal notation allows for easy comparison with and integration into existing CLDs. However, as discussed in section 3.6.3, existing applications have either involved expert participants, or they included a lengthy process of methods training for lay participants which increases workshop length and can pose a barrier to entry to those who are short on time or who feel overwhelmed by the prospect of learning about the methodology. Therefore, elements of Participatory Systems Mapping (PSM) were integrated into the study design. This method is more focused on centring participant views over formal notation adherence. While CLDs focus on feedback loops, PSM maps tend to be larger and also capture connections outside of feedback loops (Barbrook-Johnson and Penn, 2022).

The workshop structure was designed to maximise the benefits of both methods. In System Dynamics, various approaches for organising and facilitating a specific component of a group modelling exercise exist, called ‘scripts’. These scripts allow for a consistent application of the method, bring transparency and allow for methods to be adapted and refined by others (Andersen and Richardson, 1997; Hovmand et al., 2012). Here, as the following section will elaborate on, the existing “Hopes and fears” script was used to identify relevant variables with participants (Luna-Reyes et al., 2006).

Then, the workshops were facilitated in a way that captures all aspects seen as relevant by participants, thus following a PSM approach (Penn et al., 2022). In contrast, participatory System Dynamics approaches often focus on capturing feedback loops and data required to develop quantitative models (Kopainsky et al., 2017; Penn et al., 2022). This required careful facilitation, to ensure all views are captured. As Hovmand et al. (2012) argue, modelling is an intervention and therefore needs to be approached with care, especially in groups where conflict might occur. Therefore, I as the workshop facilitator sought training on the soft skills required to facilitate such workshops and hold space for all views that might be brought up. I worked with a facilitation coach to develop a structured approach towards addressing various situations that might arise in the workshops (see appendix 9.9). This allowed me to capture all

participant views equally, and it also helped to mitigate the subjective influence that a facilitator or modeller inevitably has (Rajah and Kopainsky, 2025).

The outputs of the workshops were captured in causal maps that were purposefully less formal than a CLD. This is to align the mindmap closer with narrative style used by people in their everyday communication. After the workshops, the maps were converted into CLDs. Section 4.5.7 includes details on this.

### 4.5.6 Workshop structure

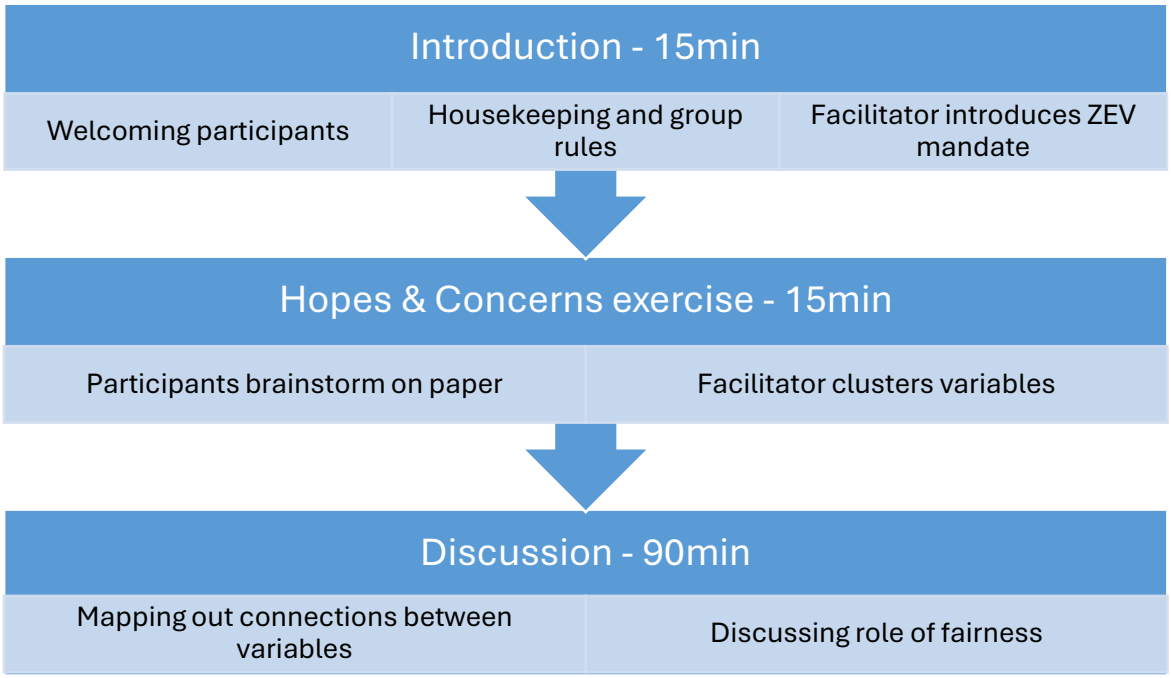



Figure 4 - Flow diagram outlining the steps followed in the focus groups

The workshop started with a welcome, a brief introduction of the housekeeping information and group rules, and the schedule for the evening. Then, the ZEV mandate was introduced to participants. Information here was kept brief and at a similar level to what participants would find when reading the news or watching TV. The aim of the research was not to educate, but to explore the knowledge and perceptions that participants already held. The presentation slides used here can be found in the appendix.

Next, participants were given a booklet which they could use to note down their thoughts during the workshop. This is adapted from Mazzoli Smith et al. (2018), who noted that research participants might not be comfortable sharing all their thoughts in a group conversation, and who found it beneficial to hand postcards to participants so they could mail back additional thoughts they had after the workshop. In this study, participants could use their booklet at any

time during the workshop to make anonymous notes, before the booklets would be collected after the workshop.

Participants were now invited to write down their hopes and concerns associated with the ZEV mandate, under the question of “How will your life change as a result of this policy?”. This is an adaptation of the hopes and fears exercise commonly used for variable elicitation in system dynamics group modelling workshops (Luna-Reyes et al., 2006). It is thus a proven way for generating a list of variables that can be taken forward into modelling. However, in a trial workshop, the participants noted they struggled with the emotional weight of the term ‘fear’ and preferred talking about concerns instead. This was taken on for the workshops.

Next, each participant selected from their notes the two hopes and two concerns that felt most relevant to them and wrote them on sticky notes. The researcher collected these notes and clustered them into themes. Then, starting with the most commonly discussed theme, a mindmap was created on a whiteboard, within view of the participants. Here, participants discussed how their hopes or concerns connect to the ZEV mandate. I mirrored participants’ language when creating the mindmap and regularly checked with participants to ensure accuracy. In this, I focused on listening and capturing participant views, rather than sharing information. Thus, I didn’t interrupt or correct when factually inaccurate information was shared. I did however let conversations unfold where participants asked questions to each other. This resulted in a mindmap depicting participants’ views on how the ZEV mandate will affect their lives.

In the second half of the workshop, participants’ attention was brought to fairness. Participants were asked to identify parts of the mindmap they found to be particularly fair or unfair. They were also asked to suggest changes and additions to increase fairness. These additions were noted down on the mindmap with a different colour pen.

The mindmaps were photographed as the main piece of data of the workshop. In addition, the booklets were collected. An audio recording of the workshop and notes by a note taker provided further information.

### 4.5.7 Initial data analysis and coding

After each workshop, the mindmap was first recreated digitally using Microsoft Whiteboard. Then, it was converted into a Causal Loop Diagram (CLD) that follows CLD methodology. The changes made for conversion are set out in table 7. Figure 5 visualises how a mindmap and CLD look different to each other.

| From mindmap... | ...to CLD |
|---|---|
| Variable names often included verbs of change or direction, e.g. “More EVs on the road” | Variable names are neutral regarding the direction, e.g. “Number of EV on the road” |
| Arrows indicate connection | Arrows indicate a change of a particular polarity (same or different as starting variable) |
| Several variables referring to the same situation, e.g. “More EVs on the road” and “Less EVs on the road” | Variables were aggregated, e.g. “Number of EV on the road”<br><br>In some cases, this lead to feedback loops becoming more visible. |

Table 7 - Description of how the mindmaps generated in the workshops were converted into formal Causal Loop Diagrams.

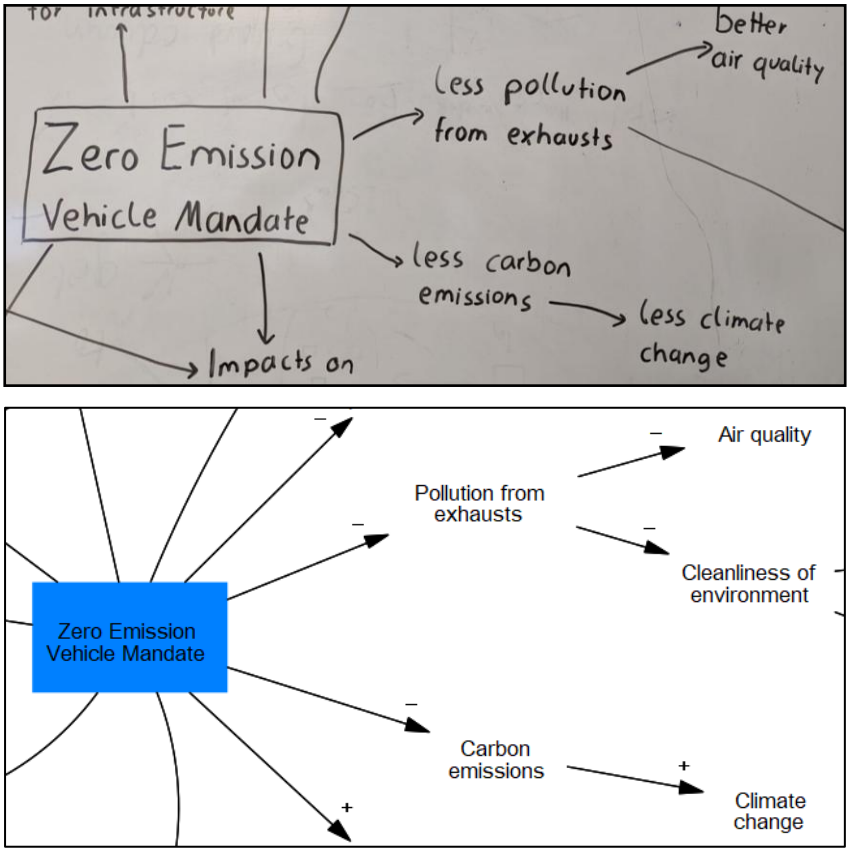



Figure 5 - Comparison of the same area in the mindmap (top) and CLD (bottom) to illustrate how the workshop data was converted into CLDs.

Then a thematic analysis was conducted. The workshop CLDs were imported into Nvivo as images and then coded inductively (see section 4.4.3) to identify which themes were covered.

Here, the aim of the study was a broad exploration of the different perceptions held towards the ZEV Mandate, without a guiding theoretical framework. Thus, an inductive coding approach allowed for capturing the desired breadth of views. Also Kim and Andersen (2012) argue that open coding is suitable for extracting underlying themes from causal maps.

Coding thus meant that areas of the CLD was assigned to one or several codes. These areas would include either one variable, or several variables that are linked to each other by connecting arrows. Each of these areas would constitute one entity of a code. Where the same code occurred in different parts of the CLD, not connected by arrows, this would count as separate entities of a code. This is visualised in figure 6.

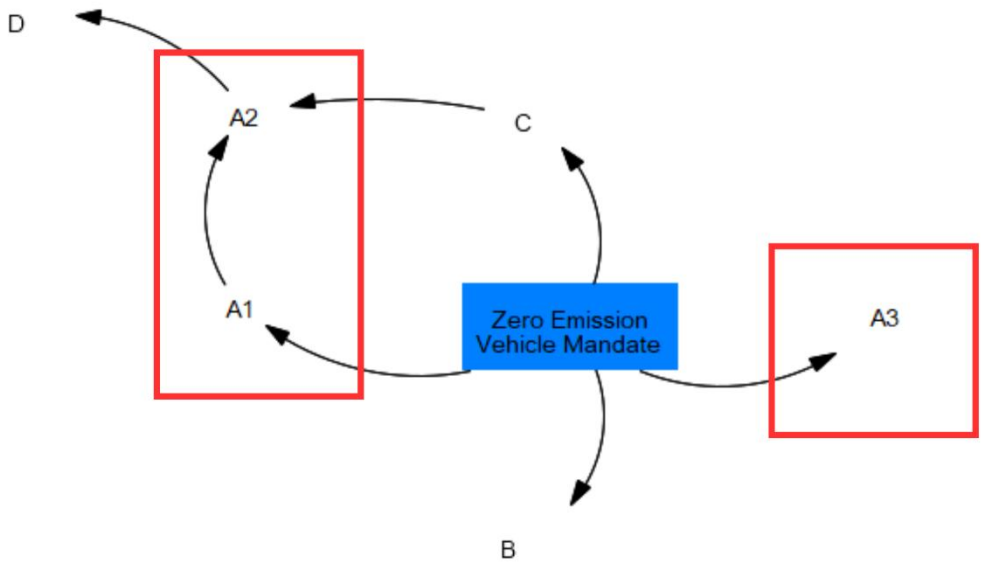



Figure 6 - Simplified visualisation of the coding process. Each letter represents a variable. Variables A1-A3 are coded to the same code. However, as A3 is not connected to A1 and A2, they are coded as two separate entities of the code.

### 4.5.8 Identification of key themes

To gain deeper insights from the coded data and identify connections between the variables, key themes were developed. Codes that were often identified to be connected to each other were grouped into themes. All codes that were identified in at least half the CLDs were to be included in a theme, as this allowed for a deeper analysis of the cross-cutting themes brought up in the majority of workshops. Fairness variables were included in the analysis.

The themes were developed as follows: An initial visual analysis of the coded CLDs was undertaken to draft up a list of which variables should be grouped into which theme. Then, for each theme all variables and connections that were grouped under this theme were extracted from the workshop CLDs and collected in a new project in Vensim. Where the same variable was identified by several workshop groups, it would thus be shown several times. These repeat variables were merged in Vensim. Where similar but not equal variables were identified by several groups, an overarching or generalised variable was introduced to summarise this. For example, variables around “air quality” and “air pollution” were combined. This resulted in thematic CLDs which combined the views of all workshop groups.

Then, the government documents were coded with the same code book as used for coding the CLDs. This means that for each variable, both quotes from the workshop CLDs and from the government data were coded. After the key themes from the workshops were developed following the approach outlined above, the government views were considered. For each key theme, the government quotes on the variables included were mapped onto the existing thematic CLDs. Depending on the amount of overlap between public and government views, different approaches were taken: Where a large amount of overlap was found, it was possible to create a joint CLD depicting both government and public views. Where less overlap was found, two separate CLDs were developed.

### 4.5.9 Comparison with government views

While the thematic analysis revealed the views and perceptions of the public, it was of interest to study the views of the government and to be able to compare how well public perceptions were responded to in the government policies.

For this, several government documents around the ZEV mandate were selected for study, as detailed in table 8. These documents were downloaded from the government website in January 2025.

In addition, a short semi-structured interview with two government officials was conducted in September 2024. This was used to ask further questions on the ZEV mandate, particularly on the process surrounding how the policy was developed. The interview was transcribed for further analysis.

The codebook developed through coding the CLDs was here applied to deductively code the government documents and the interview transcript. The aim here was to explore how the

themes brought up by the workshop participants would or would not be addressed in the policy documents, to find similarities and differences.

| Document title | Release date |
|---|---|
| Green Paper on a New Road Vehicle CO2 Emissions Regulatory Framework for the United Kingdom (2021) | 2021 |
| Outcome and government response to the green paper on a New Road Vehicle CO2 Emissions Regulatory Framework for the UK (2022) | Apr 2022 |
| Zero Emissions Vehicle Mandate and non-ZEV Efficiency Requirements Consultation-stage Cost Benefit Analysis (2023) | Mar 2023 |
| Consultation on a zero emission vehicle (ZEV) mandate and CO2 emissions regulation for new cars and vans in the UK (2023) | Mar 2023 |
| Zero emission vehicle (ZEV) mandate consultation: Summary of responses and joint government response (2023) | Sep 2023 |
| Zero Emission Vehicle Mandate and CO2 Regulations Joint Government Response Cost Benefit Analysis (2023) | Oct 2023 |
| Phasing out sales of new petrol and diesel cars from 2030 and supporting the ZEV transition: summary of responses and joint government response (2024) | Dec 2024 |

Table 8 - Documents included in the analysis.

### 4.5.10 Limitations of study 2 research design

The first limitation is based on Rajah and Kopainsky (2025), who argue that workshop outputs, such as the CLDs drawn from in this study, emerge from the social reality of the workshops. They are more than the sum of the inputs of all participants, as they also reflect on group dynamics and the flow of conversation in the workshop. This means that some participant's views might be overrepresented. In this project, this was mitigated by giving participants the option to write their thoughts down, and through thorough facilitation. Still, CLDs are a different data source than government documents, thus they can't be compared like for like. Therefore, the analysis here focuses on the CLDs as the public perceptions are the main point of interest. The analysis of governmental inputs serve mainly to then compare if themes important to the public were also addressed in the policy.

Secondly, the sampling strategy used here can't guarantee to capture all different views, as cars interact with many different areas of life. This is acceptable for this research as the goal is not to map out all possible fairness perceptions, but rather to investigate whether the perceptions of the public are captured in policy or whether meaningful gaps exist. The discussion of findings will include a reflection on other characteristics that future studies should consider researching.

## 4.6 Summary

This chapter presented the methodology used throughout the PhD research. It demonstrates how the principles for method selection emerge from the literature review, and gives details on how the research projects were structured. Research with the public used a novel participatory approach, aimed at filling gaps in existing uses of system dynamics methods. Reflections on this approach will be included in section 6.7.1.

# 5 Results of study 1: Fairness in transport planning

This chapter presents insights into the role of the transport planning sector in providing fair decarbonisation. It describes the results of study 1 along the Just Transition tenets, before discussing them in a wider context. The chapter ends by reflecting back on the research questions.

This chapter focuses on studying the role of fairness within the transport planning sector. It thereby addresses the research questions 1, 3, 4 and 5. Public perceptions of fairness and thereby the remaining research questions will be addressed in chapter 6.

This chapter draws from material already published as Ternes et al., 2024.

## 5.1 Results

As described in section 4.4.3, the initial codes were developed along the Just Transition tenets. Thus, the results are presented along these tenets as well. Quotes from the data are here attributed as follows: Quotes from transport strategies are attributed to the issuing body of governance, as these strategies are publicly accessible. Quotes from interviews are attributed only to the type of body of governance: N for national government (inc. devolved nations), STB for sub-national transport body, LA for combined and local authorities.

### 5.1.1 Recognition justice

Under the lens of recognition justice, this research looks at the extent to which fairness is recognised as an important theme in the research, as well as the different definitions and interpretations of fairness that might be used. Given the research focus on transport decarbonisation, it also considers if and how climate change is recognised as a fairness-relevant theme.

**Explicit mentions of fairness**

Within the strategies, fairness and related terms were only mentioned sparsely. When they were brought, up, they did not come with any explicit definition of what should be considered fair. References to fairness were mostly made within vision statements and other general descriptions of the desired future state of transport. This vision statement in the Scottish

transport strategy illustrates how fairness was usually mentioned in passing, alongside other vague descriptions of the future transport system.

> *"This Strategy advocates a Vision for Scotland's transport system, that will help create great places - a sustainable, inclusive, safe and accessible transport system, helping deliver a healthier, fairer and more prosperous Scotland for communities, businesses and visitors." – Transport Scotland*

Within the interviews, fairness was not raised as a topic by the interviewees. That was despite the initial interview invite outlining that the research looks into fairness in transport, and also despite the interview containing discussions of current transport themes which would have offered room to comment on fairness.

**Institutional definitions**

Towards the end of the interview, fairness was explicitly brought up by the interviewer. Participants were first invited to comment on the fairness of the discussed current themes and then asked whether it is possible to give a general definition of fairness. Here, the interviewees took a pause for reflection before answering. Many of them also made it clear that they would answer this question in their personal capacity. A broad set of ideas was then brought up around fairness. Many spoke about wishing to reduce something negative, such as barriers to participation and to accessing opportunities, and inequity more generally, as shown by the following quote:

> *"I would say we more generally approach fairness with regards to economic and socio demographic inequalities and the reduction, of reduction of those". – STB1*

A positive framing was used to describe what participants wish to see more of. This included equality of opportunity, more inclusion of vulnerable groups and making the benefits of transport available for everyone, as the following quote illustrates:

> *"Inclusive is the word that that is used instead and that's about ensuring that the benefits of a thriving city are shared out amongst everyone in the city and reach everyone in the city." – LA3*

The interviewees also reflected on how to bring about these positive changes. Here they described the role of planning processes and appraisal guidelines in steering future transport developments. Some also noted their own ability to plan and prioritise work accordingly.

When asked whether the body of governance they worked for had a definition of fairness available, most participants said no. The following quote sums up the answers received here:

> *"I don't think we've ever sat and thought about our definition of fairness. It's not something that we've ever really considered." – LA1*

Few interviewees however indicated at work in progress: One offered to send follow up material, one referred to wider work in their body of governance around this. To maintain confidentiality, no further details on these can be shared here. However, these insights shared by the interviewees imply interest in questions around fairness.

During these conversations, multiple interviewees brought up thoughts around the choice of language. They observed that fairness can mean different things to different people. This fits with the thoughts around language use made for this research project (see section 3.3.1). Others used different terms in the conversation without such explicit reflection. For example, they spoke about equality, accessibility or inclusion. One interviewee however noted that while such different terms might be used as synonyms, they could still carry different meanings and be perceived differently by different people.

**Connections to fairness literature**

While no clear definitions of fairness were provided, this does not necessarily mean that fairness ideas are completely absent from the data collected – it only indicates that nothing was explicitly labelled as 'fairness'. This section thus explores whether statements made in the interviews and transport strategies map onto fairness definitions from literature.

The most common theme here was that of equality. Within the transport strategies, this materialised in discussions of benefits to be available for 'everyone', with 'everyone' referring to all people who are affected by the transport strategy. The following quote gives an example for this:

> *"We want Leeds to be brilliant for the bus with a bus network that connects everyone and everything." – Leeds City Council*

Some of these statements can be further mapped onto the theme of equality of opportunity. Here, the transport strategies spoke of "opportunities" to be available for everyone. "Opportunities" was here either used to describe either specific places and services, including education or healthcare, or it was used with reference to growth and to the economy. In a similar context, statements were made around inclusivity and accessibility, referring either to

access to the transport system and here particularly to public transport and active travel, or access should be given to abovementioned opportunities. Thus, the majority of statements here related to the topic of accessibility, with a focus on formal settings and services. One interviewee noticed explicitly that the social functions of transport are often overlooked:

> *"We're thinking about transport, perhaps in terms of physical access. But not transport as a social driver and enabler." – N1*

Some statements differentiated between different groups of people. Here, the focus was on residential location, considering the needs of rural people and of people living just outside the remit of the strategy in particular. Business needs were also considered, and statements that businesses should receive the benefits of the transport strategy alongside people indicates an economic focus.

It is interesting to also look at what is absent from the strategies, what is not recognised or explicitly set out here. Where the particular benefits, themes and people described above were set out in the strategies as requiring a focus, this was usually done without any explanation as to why that is the case. This means that it is not possible to understand the reasoning and principles behind which the planners decided on these focus points.

**Climate change**

As discussed in chapter 1, it is clear to research that addressing climate change will require new policies, which interact with an already wide range of transport conditions. This raises fairness concerns. This section thus looks at how the connection between climate change and fairness was recognised in the strategies and the interviews.

While climate change was mentioned in the strategies, it wasn't always the driving force of change. Here, the effect of climate change on humans was mostly described in connection with health, for example by referring to pollution, a lack of active travel provisions and concerns for road safety. The strategies mentioned climate change as a separate theme, and did not draw explicit connections as to how a changing climate and the need to mitigate it would affect fairness. This is particularly noticeable in the absence of any discussion on how decarbonisation policies would affect different people differently.

During the interviews, interviewees were explicitly asked about how decarbonisation has influenced the thinking behind and development of the transport strategy, a range of answers

was given. They reveal that decarbonisation considerations played different roles for the different bodies of governance. Several interviews noted that strategy development was already under way when the net zero target was set by the UK government, implying that it had limited ability to influence planning and policy. Others stated the opposite, noting that decarbonisation was already an important topic for the body of governance and the introduction of the net zero target thus didn't change much. Few indeed noted that the net zero target brought further momentum to their climate mitigation commitments. As the following quote illustrates, only one interviewee noted that climate change connects to other themes:

> *"[…]obviously we weren't just trying to solve the climate issues. You know there's all the other issues around inclusivity, making a fairer and better transport system for everyone and obviously also the health benefits […]. So the rationale for it wasn't just purely climate, but I think climate made us go that extra step in terms of, well, actually you can't do just tinkering at the edges. You've got to do something more radical and change the way it is." – LA3*

**Inequalities**

Inequalities and injustices are different to each other, and an inequality may even be considered fair in specific circumstances. Still, studying the inequalities described in the data can give a better understanding of which themes and challenges are recognised. During the interviews, only few mentions to inequality were made. Instead, interviewees spoke more of fairness. In the strategies, the majority of references to inequality were found in the descriptions of the current transport system and the challenges fund therein. Inequalities were identified based on location, either between different areas or neighbourhoods, between urban and rural areas or more generally between the area covered by strategy and the UK overall. Inequalities were described in the transport system itself or more widely regarding health, the economy, deprivation or the provision of jobs, as illustrated by the following quote.

> *"Whilst overall the region is an economic success, there are significant areas of social inequality and deprivation, where opportunities for individuals to realise their full potential are limited." – England's Economic Heartland*

The framing and sentiment with which an inequality is presented can give insight into whether an inequality is seen as unfair. "Some inequalities were presented as neutral observations, often including statistics. Most of them however were framed as negative. This negative

sentiment shows in the use of negatively connoted words in places where neutral words were available, and by discussing solutions and ways to change the situation. This shows that inequalities are indeed seen as negative. No positive sentiments were made here, and no situations of equality were described. Where positive statements about the current state of transport were made throughout the strategies, they were either general comments that transport has improved without describing how, or they referred to very specific measures that were introduced. None of these statements were placed in the context of equality" (Ternes et al., 2024).

Also absent from the descriptions of inequalities were quantifiable metrics or indicators to define the inequalities. This makes it impossible to deduct whether all inequality should be removed or whether a certain level of inequality would still be acceptable. Further, the focus here was entirely on those being disadvantaged or losing out from the inequality. Mentions of those who are well off, experience benefits or use too much transport were absent. A temporal context was also absent from descriptions of inequalities, meaning that it is not possible to say whether these inequalities have changed over time.

### 5.1.2 Procedural justice

Here, procedural justice considers all aspects of how and by whom the transport strategies are shaped, which knowledge is included and where the power to drive processes and make decisions lies.

**Modes of interaction**

During coding, the data were analysed for who is involved and what the mode of interaction or knowledge use is. Here, the strategies overall remained vague in their descriptions of which stakeholders are involved in developing the strategy. The majority of references was made towards the generic terms of 'stakeholders' or 'partners', not offering any further definition of who these stakeholders are. The interaction was most often framed as working in partnership, with reference to either the abovementioned undefined stakeholders, other bodies of governance or the private sector. The following quote is exemplar of the level of vagueness found throughout the strategies:

*"We will work with partners to reduce transport carbon emissions to support Greater Manchester's ambition to be net zero carbon by 2038" – Transport for Greater Manchester*

A difference was observed between the different levels of governance. Strategies released by higher levels of governance bodies (UK government, nations, sub-national transport bodies) more frequently described interactions in which they hold more power, such as giving work, agency or support. The recipients were either other bodies of governance (usually at the same level or lower), industry or undefined stakeholders. The lower levels of governance more often referred to modes of interaction where more power was located with another actor, such as asking for funding or support. These other actors usually were other bodies of governance or the private sector.

During the interviews, participants were able to give more detail on how a transport strategy is created. Interviewees described that they would commonly use the previous iteration of the strategy as the starting point, draw in more recent evidence and data on transport in the area, consider the political views and needs prevalent at the time, and respond to local and national transport-related events. This however still leaves open a wide range of decisions and different potential priorities.

**Planner's reflections on procedural aspects**

When asked how they navigate between these different and potentially conflicting priorities, interviewees noted that it is inevitable to receive some opposing views and attract some conflict, and that no transport strategy can please everyone. Interviewees also described how it is common for some voices to be louder and more audible than others. This was in reference both to parts of the public and to colleagues within the body of governance itself. Wide consultations, working with many different colleagues and drawing from their own experience were mentioned as ways to navigate these conflicts.

Interviewees also reflected on their own role within the planning process. Here, notable differences were observed in the self-perception of the interviewees and the way they understood their role and responsibilities. Some interviewees described their role as neutral, their task being to provide "objective" information and "good" solutions to decision makers. They felt that as transport planners it was not up to them to make decisions or value judgements – these tasks should rather be left to elected politicians who carry a public mandate. This quote even shows disdain towards planners who go beyond this neutral position:

*"So it's a political value judgment and in a sense I think it over the years, transport planners have been a bit too ready to take those on themselves and make judgments that they're really not qualified for." – LA2*

This however sits in contrast to earlier analysed statements on fairness guidance, which suggest that there is no institutional definition of what is considered fair, and that such decisions are thus left to the individual practitioners. Indeed, other interviewees spoke more openly about their own views and preferences. They also had stronger views on which outcome would be desirable. These interviewees also tended to speak more about their own career journeys and drew explicitly from their background knowledge in answering interview questions. This indicates that these interviewees saw themselves as holding some active role in the decision making processes. The following quote particularly illustrates how one interviewee actively positioned herself to shape the content of the transport strategy:

*So I fought quite hard [...] against a lot of political pressure from on top, who just want, who just wanted a transport policy that was about decarbonisation and cycling, and I fought and I said you cannot encourage people to shift, you cannot encourage modal shift or people to use active travel, unless you ensure that transport is accessible as widely as possible. – N1*

**The role of consultations**

In the strategies themselves, only few and general mentions were made towards public consultations – this fits with above discussed findings that most descriptions of procedural justice aspects were vague in the strategies. During the interviews, participants were asked about public consultations and thus had a chance to expand more. Some interviewees described consultations as an important step in the planning process, and highlighted their role in getting public support for the transport strategy. Other interviewees however described consultations as a mere formality and thus didn't expect or even want the consultations to bring up new insights. This fits with observations regarding the timeline. Most consultation processes had in common the fact that public consultations took place only towards the end of a planning cycle. At that point, bound by external deadlines, the scope for change will have been small. One interviewee describes this view as follows:

*"Now that the problem with a lot of public consultations is what the public gets to see is something that's quite often really, very, very nearly finished. And they don't really get much of a say in how it's come about. So it's a corporate and*

*political expectation that when the public gets to see something, it's already quite polished." – LA2*

Descriptions of the consultation process itself reflect the wide range of attitudes held towards consultations. Some interviewees described at length steps that their bodies of governance took to attract diverse respondents, use new technology and more generally put large amounts of efforts into the consultations. However, the majority of interviewees referred to standard guidelines for consultations being followed, or to repeating previously used approaches. One interviewee stated that they felt that they already had sufficient information to develop a new transport strategy, and therefore no further consultation took place.

These discussions of consultations also were the only time in the interview where the planners referred to formal guidance. No other mentions to official guidance or legislation that could be drawn from when seeking to improve fairness were made. Instead, the role of professional experience was highlighted when describing decision making processes, as the previous section described.

Related here, it was noticeable that bodies of governance with a larger transport planning team were more able to conduct further research and consultation, and planners here were more reflective about both their own role and the value of consultations. In contrast, interviewees from bodies of governance with a smaller transport planning team seemed more occupied with the day to day operation of the transport system and had fewer resources available for wider thinking and consultation.

**Other powers involved**

"Half of the interviewees also mentioned that consultancies played a role in creating the strategy. These paid consultants were engaged in organising the public consultations, analysing data, policy appraisal and writing the strategy. This is interesting as most strategies did not mention the involvement of consultancies. Where consultants were mentioned, their contributions to the strategies were not specified. Also, the interviewees did not reflect or comment on the role of consultancies. They remained vague in regard to their role and no critical thoughts about involving consultants were shared. This could be important as consultants are likely to be an important filter of what data gets reported back" (Ternes et al., 2024). The following quote illustrates both the lack of detailed descriptions of the role of

consultants, and also that consultancy support is seen as a normal part of the strategy development process:

> *"[I] then obviously got sort of support coming in from consultancy to things, to write some of the detail to do some of the kind of links to national policy and that side of things." – LA5*

Interviewees also spoke about the role of elected officials, who are politicians representing either the body of governance, or a part of it such as a ward. Here, different kinds of relationships were described. Some interviewees spoke positively about the engagement and interest of elected officials. They described a way of working where the elected official would be briefed on issues, to then make decisions and feed them back to the planners. Other interviewees felt they had to push back against the views of elected officials, with one interviewee describing having to work hard to make sure accessibility was considered in specific transport policies. Another interviewee mentioned that a significant transport project for the area was largely happening due to the active involvement of an elected official. Related to discussions on decision making power above, interviewees note that elected officials have more freedom to set policy and priorities, while transport planners are expected to execute on these. One interviewee summarised this as follows:

> *"Essentially this is a government policy and policy is set by ministers and it is up to ministers. They are the elected people. If they don't like the policy, it will not happen. So, you know, if the minister says no, I don't like any of it. There's nothing in public sector as a civil servant can do." – N1*

Interviewees were asked to reflect on the question of whether a fair process is required for fair outcomes. They all agreed that process and outcome are linked. They observe that a thorough process can bring new topics on the table and helps creating buy in from the public. The following quote shows that this interviewee also observed how this procedural inequality has had an influence on distributional outcomes:

> *"I think the fact that the transport system in the UK is so car dominated reflects the fact that many people's voices over years and decades haves not been heard and reflected, and that the needs of commuters commuting from a suburb to a city centre has dominated rather than say those taking a trip between neighbourhoods to fulfil caring responsibilities. The fact that those voices have*

*been heard differently and to different extents has produced the outcomes that we've seen." – STB1*

### 5.1.3 Distribution justice

Distribution justice considers the distribution of benefits and negative impacts across people and places. In the context of this research, this refers to the impacts of decarbonisation. As discussed in chapter 1, decarbonisation policies will interact with already very uneven transport conditions. This risks bringing about even more fairness challenges. This section discusses how the distributional impacts of transport decarbonisation are considered in transport planning.

**Policies discussed**

The strategies presented a number of decarbonisation related policies, one of them being infrastructure changes to encourage the uptake of public transport and active travel. While here specific locations are mentioned that will benefit from these changes, what is missing is an explanation as to why these locations were chosen and which people are present there. A similar observation is made around behaviour change, where the strategies mention a goal of increasing the use of active and public modes, but without a discussion of specific barriers and reasons why certain people might not use these modes yet.

Regarding electric vehicles, distributional impacts are only discussed around charging infrastructure. Some strategies here referred to the difference in access to EV charging between those who do and don't have access to off-street parking. However, other EV related themes from literature (see section 3.4.3) were not addressed. This includes the uneven access to EVs for different parts of the population, differences in charging cost between different types of chargers, and negative externalities such as space taken by public chargers.

**People and Places**

As above results show, many of the strategies treated people as coherent units, with little mention of differences between people and places. The Leeds strategy is an exception to that, as it shows awareness that needs differ between people and places:

*"Our targets are set across Leeds but we know that the different characteristics of our district will mean different choices in different location." – Leeds City Council*

This is further illustrated through references towards reducing the amount of travel by private car, found in a small number of transport strategies. This indicates awareness of the role of high mileage travellers. However, missing here was detail on how to determine which kinds of car use by which people should be reduced. Similarly, conversations around mode shift and behaviour change did not specify which people, trips or behaviours should actually be changed. The only exception here is in the strategy by Transport for the North. As the following quote illustrates, they did show awareness of how decarbonisation measures should differentiate between different groups of people.

> *"[...]to effectively reduce surface transport emissions, proportionately greater focus will be needed on transport decarbonisation measures that are likely to affect higher-income groups."*
> *– Transport for the North*

During the interviews, the planners were asked to describe what for them are the key points of the strategy. Most here listed a number of policies, but again didn't expand further on how these policies would affect people differently. Interviewee LA3 marked an exception of that, as this person spoke clearly of needing different kinds of approaches to achieve a transport system that works for all.

> *"I think the biggest point is there is no one silver bullet. So you've got to do a multitude of things across a multitude of fields to get to the end point. And I think the whole strategy developed around this, we've got to have an alternative for every journey for everybody and that is the, that's the real change in policy from the past, where transport strategies were all about how do we reduce congestion in the peak hour for commuting into city centres."*
> *– LA3*

## 5.2 Discussion

Regarding the research approach, the findings show the value of combining two research methods. The interviews revealed spontaneous thoughts of the planners and allowed follow up questions around processes, thus giving more insights into procedural questions. In contrast, the strategies revealed the public intentions and commitments of the bodies of governance and included more information on distributive effects.

A key finding of this study is the lack of fairness conversations both in the strategies and in the interviews. Those fairness conversations that did take place lacked a clear definition of fairness, opening up the term to multiple or contrasting observations. This matches work by

Linovski et al. (2018), who found that Canadian transport planning documents lacked definitions of 'equity'. In this project, fairness only became a conversation topic after it was prompted by the interviewer, which indicates that it is not on people's minds. Still, the insights obtained into the planning processes and outcomes allow for reflections around fairness.

The remainder of this section discusses the main themes emerging from the findings.

### 5.2.1 Partial considerations of inequality

The document analysis shows that, while some themes around inequality were addressed in the data, this represented only a partial view of inequality. Here, inequality was recognised in the strategies and by transport planners in the context of transport access issues. Framed in terms of sufficiency, the planners discussed a need for accessibility improvements for those least well off. Challenges around transport accessibility have been recognised for a long time. In 2003, the Social Exclusion Unit highlighted how a lack of transport access increases the risk of social exclusion (Social Exclusion Unit, 2003). In a paper from 2016, Lucas et al. however found that transport poverty and related issues of transport-related exclusion were still poorly understood or addressed by planners (Lucas et al., 2016). More recently, transport related social exclusion has gained more interest in planning, also through the work by Transport for the North (Transport for the North, 2022). The findings of this study confirm that transport access issues are now understood better by planners. However, while access issues are now recognised, this does not mean that adequate policies are put in place. As the transport strategies predominantly discuss policies "for everyone", this raises questions over how the challenges specifically for people with low or inadequate access to transport will be addressed.

In contrast to this, discussion around demand reductions were largely absent from strategies and interviews. In the occasions where travel demand was mentioned, it was covered only in a brief and general way. Following Shue, the discussions thus addressed that some should be receiving more, but left out questions on whom this "more" should be taken from (Shue, 1993). This sits in contrast with academic research on travel and broader energy demand reduction. This research describes energy demand reduction as an essential step towards decarbonisation. It recognises that transport emissions are spread unevenly and argues that therefore some people have more responsibility towards reducing their travel than others (Barrett et al., 2022; Büchs et al., 2023). However, as Cass and Lucas (2022) observe, high emitters justify their lifestyles and travel choices through a range of discursive strategies. This indicates that relying on behaviour change alone is not sufficient to address high emitters, and

more stringent measures are needed. However, no such measures towards demand reduction were discussed by interviewees.

### 5.2.2 Fairness as composite measure

In the transport strategies, fairness was often mentioned in value statements and objectives, alongside other adjectives describing the desired state of the transport system. Also multiple interviewees liked fairness to various other themes of relevance to their bodies of governance. They described that increased fairness would result from improvements in other areas of transport. This indicates a view towards fairness being "a composite measure of various other themes that are already of relevance to the body of governance they work for" (Ternes et al., 2024). This relates to work by Kennedy et al. (2024), who describe fairness as a 'floating signifier', which is a term whose definition changes across people and use cases. In their work on fairness in data use, they found that participants used different definitions alongside each other. This indicates that the different contexts and meanings attached to a fairness definition are important to study. It thus highlights the importance of context, and further supports the systems thinking approach used in the following chapter 6.

Throughout the data fairness was often framed in context with economic factors. This was observed especially when discussing the distribution of benefits and disadvantages. This indicates that planners view fairness as a topic that ties in with other, more important values, and that fairness thus does not need to be stated directly. However, as Tennøy et al. note, this is problematic. If a goal or objective is not clearly stated, it likely will be overruled by other, more visible planning objectives (Tennøy et al., 2016). Thus, as fairness is not mentioned as a key theme in planning, it risks that fairness concerns are overlooked in light of other, more prominently discussed issues.

### 5.2.3 The role of planners

The interviews with transport planners revealed insights into their self-perception and views on decision making responsibilities. Here some interviewees described their position as neutral and their role as providing objective information. Other interviewees described their own active role in the planning process and could recall situations where they held responsibility for selecting and shaping information. The former position lines up with a positivist perspective (see section 4.1) while the latter lines up with interpretivist and non-positivist perspective, marking a fundamental difference in views between these planners.

This is relevant as the interviews also revealed that the views and experiences of planners are frequently drawn from in the planning process. When asked about how they navigate between conflicting information, planners described drawing from their own expertise. More generally, interviews stated that there is no established definition on fairness within their bodies of governance. No legal frameworks around fairness (such as the Public Sector Equality Duty, see section 2.4) were mentioned in the interviews. Thus, in the absence of a defined position on fairness, planners will have to either follow their own views on fairness or none at all. However, as experts may themselves be biased (Ralph and Delbosc, 2017), this risks that they bring their own biases around fairness into their planning work. It also makes it harder to scrutinise decisions made.

Findings from the transport strategies support this. It was sometimes possible to implicitly identify the underlying fairness views from the data. However, each transport strategy and interview included multiple different, sometimes contradicting views on fairness. This inconsistent use of fairness framings risks bringing about misaligned or ineffective policies (Hovardas and Korfiatis, 2008). The lack of clarity on what fairness means thus risks that policies will be less effective.

### 5.2.4 Procedural considerations

This research found diverging views on procedural aspects of planning. While some participants noted that they could do more in the consultation process, others felt that their approach was sufficient, and one interviewee said that no public consultation was done around their transport strategy as they had all relevant information already. In most cases, consultations were conducted towards the end of a project where their ability to bring changes was limited. This relates to work by Barnett et al. (2012), who studied consultations around renewable energy projects. They found that the officials involved in these projects had a specific idea of who the public is and what they need, however these 'imagined publics' might differ from actual public needs. Yet, the perception of public needs by officials shaped the way consultation was done. Here, the divergence around consultations and tendency to do them at the end of a planning process indicate that consultation responses have limited weight. Related here, Yazar et al. (2025) find that cities who don't explicitly engage with procedural justice questions tend to approach participation in a more tokenistic way. This could be seen in discourse related to getting the public "on-board" with ideas for example. This indicates the relevance of explicit strategies and commitments towards justice. However, as this thesis finds, most of the studied bodies of governance don't have fairness or justice strategies,

bringing the same risk of tokenistic participation. Indeed, several interviewees discussed how consultations happen towards the end of a planning process, where the expectation is that existing plans will simply be confirmed by the public.

### 5.2.5 Decarbonisation

While both decarbonisation and fairness were mentioned in the strategies and the interviews, they appeared as two unrelated topics. In the interviews, decarbonisation and fairness were discussed in different parts of the conversation and no connections between the themes were mentioned. In the strategies, decarbonisation was highlighted as an important theme. However, while the strategies also described inequalities in transport, for example around access (see section 5.2.1), how decarbonisation policies would interact with these inequalities was not described. This indicates that the role of decarbonisation both as a source of potential further inequalities but also as a potential opportunity for addressing inequalities was not recognised. This sits in contrast with academic positions on fairness and decarbonisation. It is widely recognised that some transport decarbonisation policies may increase inequalities (see the discussion on Zero Emission Vehicles in section 3.4.3). However, improving access to lower carbon forms of travel can also address injustices (Mullen and Marsden, 2016; Mullen, 2021b). A lack of connection between decarbonisation ambitions and fairness thus marks a missed opportunity for a faster transition.

### 5.2.6 Limitations

Aside from the methodological limitations discussed in section 4.4.4, the main drawback of this study results from the time horizon chosen for selecting transport strategies to choose. As the interviews revealed, some of the strategies studied were already under development before the net zero target was established in 2019. More generally, the interviews established that transport strategies were often developed using a previous iteration of the strategy as the starting point, meaning that strategies developed before 2019 may have had a strong influence on the present strategies. Future research could therefore include previous iterations of a transport strategy in the research design to establish to what extent the introduction of the net zero target influenced how a body of governance planned towards transport decarbonisation.

## 5.3 Conclusion

This part of the research project aimed to study how fairness is considered in the transport planning sector. Interviews with transport planners at various bodies of government were

conducted alongside a content analysis of transport plans and strategies released by these same bodies of governance. The findings reveal that fairness is not a key consideration for these bodies of governance, materialising in an absence of clear fairness definitions, let alone guidance around fairness. While fairness-adjacent conversations take place, they are focused on a narrow set of distributive issues, leaving aside wider questions of who's views are relevant.

### 5.3.1 Reflecting back on the research questions

This study is related to four of the research questions, with questions that specifically ask for the views of the public not reflected upon here. They will be addressed in study 2.

**Recognition justice**

*RQ1: How is fairness understood by the transport planning sector?*

This study revealed that there is no definition of fairness, neither within transport strategies nor in use by transport planners. When asked to comment on the fairness of a specific situations, planners were happy to share their views. When asked about how to define fairness in general though, planners responded slowly and in their personal capacity. This indicates that, in the absence of an organisation-wide view of fairness, planners rely on their own views to judge a situation. However, this risks that different or even contradicting views are held within the same body of governance, leading to misunderstandings or misaligned policies. Indeed, this study found that a partial and distribution-focused conversation of fairness-adjacent themes took place. As discussed in section 5.2, fairness being considered by a relatively tight knit policy community brings a risk of bias.

**Procedural justice**

*RQ3: How are fairness concerns incorporated in transport decarbonisation planning?*

As this study found, fairness is not systematically addressed in transport decision making. Therefore, fairness concerns are not actively incorporated in transport decarbonisation planning. The study revealed that fairness-adjacent themes are discussed. However, the lack of conversation and intentional labelling of things as 'fair' means that it is not possible to answer how addressing fairness would make a difference to how decarbonisation is approached.

*RQ4: How and to what extent are different voices and different knowledge used in the transport planning process?*

This study identified a range of approaches to participation and decision making. While some bodies of governance spoke positively of extensive consultation exercises, for the majority of

bodies of governance these are mainly seen as ‘tick box’ exercises with very limited ability to actually influence the planning process. Interestingly here, half of the interviewees reported that consultancy firms were involved in creating the plan, but weren’t able to describe in detail the tasks of these consultancies. This adds a layer of intransparency, as the processes and practices of the consultancy are not known, thus this study cannot evaluate how the consultancies used different knowledges. Interviewees also described the role of elected officials, who were generally presented as having the ability to set the policy direction. Regarding their own position, some interviewees shared that they took an active role in the process and argued for the inclusion of themes they felt important, while others saw themselves as neutral delivery agents.

**Distribution justice**

*RQ5: How and to what extent is fairness addressed by current plans to decarbonise transport?*

While the above questions considered procedural involvement of fairness, this question seeks to understand whether distributional concerns were addressed by the strategies and plans themselves. While there was no fairness definition given, the plans and strategies touched upon fairness-adjacent themes. This study found that the strategies focus on distributional questions of transport accessibility, and on provision for those with least access. Important themes such as demand management, or the fairness implications of decarbonisation were not covered. Thus, the strategies only included a section of the fairness themes recognised by academia.

### 5.3.2 Next steps

Findings here show that fairness is not systematically incorporated into planning, and consultations have limited power in influencing outcomes. Still, as section 3.3 shows, people hold very different views on fairness, and their views and perceptions influence the success of policies. Thus, the next chapter will present findings on the public perceptions of fairness in transport decarbonisation, before findings from both studies are brought together in chapter 7.

# 6 Results of study 2: Perceptions on Zero Emission Vehicle policy

This chapter discusses the second case study, focusing on the perceptions and views of the public on fairness in transport decarbonisation. After reiterating the research gaps identified in the literature review, the process for case study selection is described and background information to the Zero Emission Vehicle Mandate as the chosen case study is shared. The results are presented and then discussed in the context of a Just Transition, and in connection with the aims of this PhD research. Thus, this chapter answers research questions 2, 4 and 6.

This chapter draws from a conference paper submitted to and presented at the 2025 UTSG Conference. Where material is taken directly from this conference paper, this is referenced as (Ternes, 2025).

## 6.1 Research gaps

The work in chapter 5 has identified how the transport planning sector thinks about and utilises fairness in their work, allowing to answer some of the research questions set out in section 3.7. This chapter will address the remaining research gaps.

Around **recognition justice**, the lack of focus on fairness by practitioners was established. This chapter will focus on the views of the public around fairness. The participatory and qualitative approach used here will allow for deeper understanding of how the public views fairness and which related themes are recognised to be important.

Around **procedural justice**, chapter 5 established gaps both in the consultations undertaken with the public, and in how these consultation findings are used within transport planning. It showed that the public only has limited influence on the content of transport plans, and thus the public's views on fairness in decarbonisation will only have been considered to a small extent. This means it is now important to study the views of the public directly and to understand how they perceive fairness. In addition, there is an opportunity here to examine how the public perceives their role and their (lack of) power in the context of transport decarbonisation.

For **distribution justice**, previous research into transport planning found that plans often catered to "everyone", without distinction for people's different experiences and

circumstances. However, as section 3.4 discusses, people's experiences with and access to transport vary widely, and decarbonisation policy will interact with these differences. Thus, it is important to study people's varied life experiences more deeply, giving room to perceived differences between people and places.

## 6.2 Details on case study

### 6.2.1 Policy details

Data collection for this project was done in autumn 2024, so the policy definition from that time is used in the research. At the time, the ZEV mandate legislated as follows: "80% of new cars and 70% of new vans sold in Great Britain will now be zero emission by 2030, increasing to 100% by 2035" (Department for Transport, 2024). This was announced under the framing of giving certainty and following examples of other major economies in Europe. The regulation sets manufacturers annual targets for which percentage of total vehicle sales need to be zero emission at the tailpipe. This is measured in ZEV allowances, in that each manufacturer receives a number of such allowances which let them sell non-ZEV. Allowances are allocated so that a manufacturer will meet their target by only selling as many non-ZEV as their ZEV allowances let them. Selling fewer non-ZEV allows manufacturers to bank these allowances for future years. Manufacturers who sell more non-ZEV need to use banked allowances, buy allowances from other manufacturers or make a compliance payment (Department for Transport, 2023e). The ZEV mandate also includes an element of CO2 regulation, ensuring that manufacturers keep the CO2 emissions of their fleet to a certain target. This is measured in CO2 allowances, which can be converted to ZEV allowances. A number of exceptions apply, for example for manufacturers producing fewer than 1000 vehicles per year (Department for Transport, 2024).

While the government remains "technology neutral" (House of Commons Library, 2025a) around which technology should replace ICE vehicles, the majority of ZEVs in the UK are electric vehicles. In June 2024, 3% of cars in the UK were battery electric and 8% were hybrid (House of Commons Library, 2025a). 19% of new cars registered in 2024 were battery electric (House of Commons Library, 2025a).

Alongside the ZEV Mandate, the UK government has introduced several other policies and strategies to support the uptake of ZEVs. The Electric Vehicle Charging Strategy was released in 2022 and describes that the government will improve public charging infrastructure, with a

focus on rapid chargers at strategic roads and on improving local on-street charging (UK Government, 2022c). Grants for local authorities to improve their on-street charging infrastructure were given out under the Local EV Infrastructure (LEVI) fund. Local authorities were able to bid for these funds (UK Government, 2023). Around the same time, grants for 'plug in vehicles', i.e. for eligible hybrid and electric vehicles were available. Manufacturers had to apply for these, with the intention that consumers can buy eligible vehicles at a lower cost (UK Government, 2022a). It is important to note that this paragraph describes policies that were active at the time where the final consultations and decisions around the ZEV Mandate were run, thus describing the timeframe studied in this project. More recently, new policies around ZEVs have come in, which are discussed in section 7.5.

### 6.2.2 Notes on language choice

The ZEV mandate policy documents refers to Zero Emission Vehicles (ZEV) throughout the text. However, most ZEV currently on the road are battery electric vehicles (EVs). Most research in this space focuses on EVs as well (see section 3.4.3). That means that this chapter largely builds onto research on particular types of ZEV, such as EV.

In addition, this research focuses on the thoughts of participants, therefore endeavouring to capture their language as closely as possible. So, while the policy will be introduced as the ZEV Mandate, it might be that participants end up talking about EVs instead of ZEV. As the goal of this study is to capture participant perceptions, their language choices will be mirrored throughout the presentation and discussion of research findings. As the results (section 6.5) will show, throughout most of the workshop conversations the language shifted from talking about ZEVs to talking about EVs.

## 6.3 Focus group composition

As discussed in section 4.5.3, the recruitment aims of this research were as follows: Each group was to have homogeneity of one characteristic, to give participants a shared theme to connect over and to allow deeper conversation. That aside, across all participants the goal was to get a good variety of different participants, with regards to characteristics such as age, gender or income. In the following writing, groups are referred to by acronym, which are listed in table 10.

Despite best efforts, some groups were over- or underrepresented in the sample. As the appendix shows, the age group of 30-39 year olds was represented most strongly with a share

of 28.3% of all participants. Meanwhile, male participants made only 35.8% of all participants. Still, within each group a mix of genders was achieved.

Aside from the criteria recruited for, the focus groups had different compositions to each other. This stood out particularly in regard to car ownership and average income, as tables 10 and 11 illustrate. Regarding car ownership, half of the groups were composed entirely of car owners. In contrast, groups C2 and S were composed mostly of non-car owners. Groups C1 and PC had a mix of car owners, people with and without car access. 'Car access' here describes participants who, for the question "Do you own a car?" in the pre-screening questionnaire, chose the pre-defined response option "No, but I have regular access to a car (e.g. via a family member or someone you live with)".

| **Group** | **Group acronym** | **Number of participants** | **# car owners** | **# people with access to car** | **# no car access** |
|---|---|---|---|---|---|
| Alwoodley 1 | A1 | 4 | 4 (100%) | 0 | 0 |
| Alwoodley 2 | A2 | 5 | 5 (100%) | 0 | 0 |
| City Centre 1 | C1 | 6 | 2 (33%) | 2 (33%) | 2 (33%) |
| City Centre 2 | C2 | 6 | 1 (17%) | 0 | 5 (83%) |
| Environment group | Env | 6 | 4 (67%) | 2 (33%) | 0 |
| EV drivers | EV | 5 | 5 (100%) | 0 | 0 |
| Kippax 1 | K1 | 3 | 3 (100%) | 0 | 0 |
| Kippax 2 | K2 | 4 | 4 (100%) | 0 | 0 |
| Parents & Carers | PC | 7 | 4 (57%) | 1 (14%) | 2 (29%) |
| Students | S | 7 | 0 | 2 (29%) | 5 (71%) |
| **Total** | | 53 | 32 (60%) | 7 (13%) | 14 (26%) |

Table 9 - Spread of car ownership and access to a car across the workshops. Information retrieved from the pre-screening survey that prospective participants filled in. Due to rounding to the nearest integer, percentage values do not always add to 100%.

Table 2 shows that the Student group had the lowest and the EV group the highest average income. Among the range of average incomes across the different groups, the PC and Env group had lower incomes and the location specific groups had medium incomes. Interestingly, the two Kippax groups had higher average incomes than the two Alwoodley groups. That is although, based on data from 2020 for UK Middle layer Super Output Areas (MSOAs), MSOA

Leeds 012 covering Alwoodley has a higher average net annual income of £41,300 and MSOA Leeds 089 covering Kippax has a lover average net annual income of £31,300 (Office for National Statistics, 2023). An important limitation to consider here though is that the pre-screening survey only asked about income bands within £10,000 intervals. This was done to only collect the amount of sensitive data that was deemed necessary for this research, but it comes with the limitation of potentially masking larger differences between groups.

| Group | Group acronym | £0 - £9,999 | £10,000 - £19,999 | £20,000 - £29,999 | £30,000 - £39,999 | £40,000 - £49,999 | £50,000 - £59,999 | £60,000 - £69,999 | £70000 or more | Prefer not to say | Average income |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Alwoodley 1 | A1 | | 1 | 1 | 1 | 1 | | | | | £30,000 |
| Alwoodley 2 | A2 | 1 | | 1 | 1 | | | 1 | | 0 | £32,500 |
| City Centre 1 | C1 | | 1 | 1 | 1 | 1 | 2 | | | | £38,333 |
| City Centre 2 | C2 | 1 | | 1 | 2 | 1 | 1 | | | | £33,333 |
| Environment group | Env | | 1 | 4 | | 1 | | | | | £26,667 |
| EV drivers | EV | | | 1 | | 3 | | | 1 | | £47,000 |
| Kippax 1 | K1 | | | 1 | 1 | 1 | | | | | £35,000 |
| Kippax 2 | K2 | 1 | | | 2 | | | | 1 | | £37,500 |
| Parents & Carers | PC | | 3 | 2 | 1 | | 1 | | | | £26,429 |
| Students | S | 3 | 3 | | | | | | | 1 | £5,000 |

Table 10 - Distribution of incomes of participants across the workshops. The average income for each group was calculated by taking the middle value of the income band for each participant, and then. "Prefer not to say" responses were excluded in calculating the

## 6.4 Initial observations

### 6.4.1 Causal Loop Diagrams

During each workshop, the participants' input was captured in a mind-map, which was then photographed. After the workshop, the mind-maps were digitised and converted into causal loop diagrams, following the process outlined in section 4.5.7. Figure 7 shows one of the CLDs obtained, with others listed in the appendix. The blue variable reads "ZEV Mandate" and formed the starting point for mind-map creation. In the second part of the workshops, the participants

were asked to specifically comment what they find fair or unfair around the ZEV Mandate. Variables identified in that stage of the workshop are referred to here as ‘fairness variables’, and are marked in pink in the CLDs.

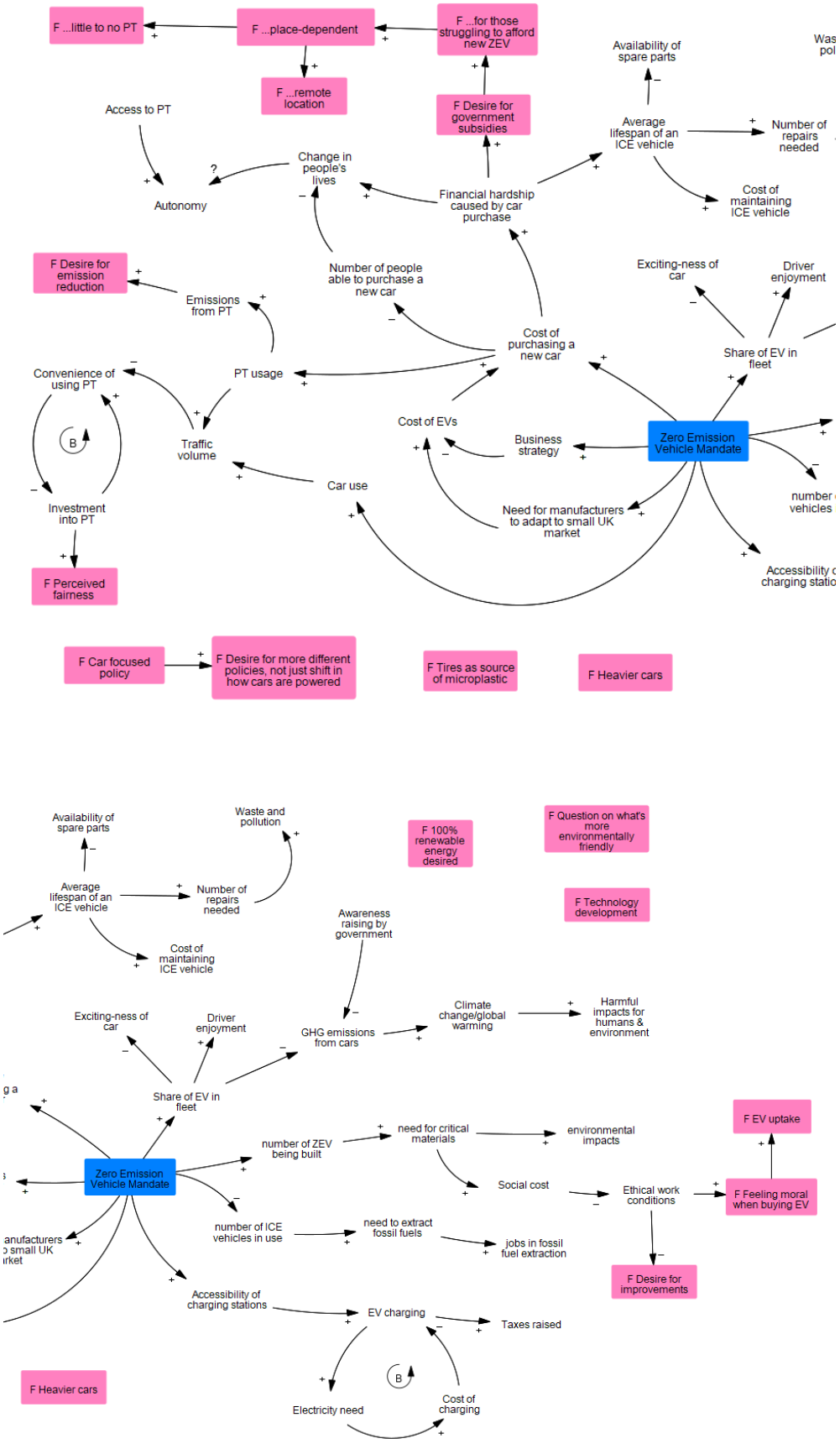



Figure 7 - CLD based on mindmap created in workshop with student group S. The CLD is presented in two segments to improve readability.

### 6.4.2 Codes

During the inductive coding process, explained in section 4.5.7, 38 codes were identified in the data. Table 12 lists these codes in order of decreasing frequency. A table describing all codes can be found in the appendix.

Here, a single instance of a code can refer either to one variable, or to a set of variables that are directly connected with each other in the CLD (i.e. it is possible to trace the connecting arrows from one variable to the others). Where a CLD includes the same code, but in different places of the CLD (i.e. it is not possible to follow the arrows and get from one coded variable to another), this is coded as separate instances.

| **Code** | **Number of mentions in CLDs** | **Number of CLDs mentioning this code** | **Theme** (see section 6.4.3) |
|---|---|---|---|
| Inequality | 46 | 10 | Cost and privilege<br>Charging and charging practises |
| Cost | 43 | 10 | Cost and privilege |
| Charging | 20 | 9 | Charging and charging practises |
| Public transport | 20 | 10 | Effects on public transport |
| Climate & environment | 19 | 9 | Climate, air quality, policy framing |
| Knowledge | 17 | 8 | Charging and charging practises |
| Social effects | 13 | 9 | |
| Technological development | 13 | 7 | |
| Car dominance | 12 | 8 | Car ownership and transport use |
| Air quality & pollution | 11 | 10 | Climate, air quality, policy framing |
| Energy | 11 | 8 | Charging and charging practises |
| Journey planning, travel time | 11 | 6 | Charging and charging practises |
| Repairs and maintenance | 11 | 8 | Car ownership and transport use |
| Car manufacture | 10 | 7 | |
| Governance and policy making | 9 | 4 | |
| Active travel | 8 | 6 | Effects on active travel |
| Health | 8 | 7 | Effects on active travel |
| Accidents | 7 | 5 | Effects on active travel |

| | | | |
|---|---|---|---|
| Giving up car | 7 | 7 | Car ownership and transport use |
| Keeping old cars | 7 | 7 | Car ownership and transport use |
| Noise | 7 | 7 | Effects on active travel |
| Privilege | 7 | 4 | Cost and privilege |
| Safety | 6 | 6 | Effects on active travel<br>Charging and charging practises |
| Effects on businesses | 4 | 4 | |
| Fossil fuels | 4 | 4 | Car ownership and transport use |
| Mining and materials | 4 | 4 | |
| Second hand EV market | 4 | 4 | Car ownership and transport use |
| Trust vs resistance | 4 | 3 | |
| Automatic cars | 3 | 2 | |
| Choice vs restriction | 3 | 2 | |
| Crime | 3 | 3 | |
| Driving comfort & experience | 3 | 2 | |
| Traffic | 3 | 3 | Effects on public transport |
| Consultation, citizen involvement | 2 | 2 | |
| Emotions | 2 | 2 | |
| Rebound effects | 2 | 2 | Cost and privilege |
| Town planning | 2 | 2 | |
| Freight | 1 | 1 | |

Table 11 - List of codes identified in CLDs, in descending frequency of mention across the CLDs

These codes cover a wide range of themes and discuss the entire life cycle of a ZEV. In the manufacture stage of a ZEV, the codes include the effect of mining for raw materials, ethical work practises, the role of standards and regulations, and the influence of industry on these regulations. Cost is discussed throughout the ZEV lifecycle, and includes recognition of how cost is spread across different people. The effects of the ZEV mandate on air quality, noise pollution and climate change are discussed. Related here, themes covered included the provision and use of fossil fuels, energy provision and generation and the energy sector more widely. Codes also consider the vehicle market and consumer choices, discussing second hand purchases and those who need to keep old cars for longer or who will give up car ownership altogether. Codes around the daily practises of car driving include those on charging and charging infrastructure, on journey time and planning, and on repair and maintenance. Some codes take a more systemic view of the transport system and discuss car dominance,

rebound effects and general effects on traffic such as congestion. Also, codes discuss effects on active travel and on public transport. A number of codes discuss questions of governance, consultation and town planning in the context of the ZEV mandate. Related, codes focus on the intangible effects of the ZEV mandate, including the knowledge required to switch to a ZEV, the social effects on communities and jobs, the role of choice and of trust in the government. Codes focussing on technical aspects consider automatic cars, driving comfort and general technical aspects such as the weight of ZEV. Several codes discuss aspects of safety, including perceived security, accidents and crime.

### 6.4.3 Key themes

Following on from the initial coding, 8 key themes were identified from the workshop data. For the four themes of *Cost and privilege, Charging and charging practises, Car ownership* and *Effects on public transport*, thematic CLDs were developed which will be discussed below.

For some themes, this analysis revealed that it was not possible to create thematic CLDs. In the case of *Climate, air quality, policy framing* and *Active travel* (section 6.5.1), this was because the conversations on this theme were short and similar in each workshop, which would have resulted in a CLD with only very few variables. In the case of both *Social effects* and *Car manufacture* (sections 6.5.7 and 6.5.8 respectively), this was because the variables coded to these codes and themes connected to different parts of the CLD for different workshops. The lack of similarities across the workshops meant that it was not possible to combine the insights into one CLD.

Additionally, section 6.5.9 discusses codes that occurred in less than half of the workshop CLDs, but that still are relevant to the research questions. As the aim of this study is to understand the breadth of views around the ZEV Mandate, themes only discussed in few workshops may still be of interest here.

### 6.4.4 Comparison with government views

The government documents and interview were coded and the thematic CLDs were expanded based on this. As public transport was not discussed in the here analysed documents, it was not possible to depict the government perspective in a CLD.

The information found in the interview closely resembled that found in the policy documents, thus the interview didn't add any new information to the key themes. Instead, the unique value added by the interview was in giving a better understanding to how the policy consultations took place, and which documents to consider.

## 6.5 Results

This section starts by discussing the themes that emerged across many workshops and were discussed in depth by participants. For each of these themes, the codes used are listed. Then, the variables and connections brought up within the workshops are presented, and contrasted with findings form government documents around the same themes. A thematic CLD is shown, and then the fairness specific findings around each theme are drawn out.

Data discussed here mainly encompasses the CLD variables and their connections to each other. Where the context or reasoning for a connection was not clear from the CLD, the transcripts were referred to in order to understand why participants identified connections between variables.

### 6.5.1 Climate, air quality, policy framing

The ZEV mandate has been developed to reduce greenhouse gas emissions and address climate change. Thus, the codes of *Climate and Environment* and *Air quality* are discussed first, to explore how these themes are discussed and recognised.

During the recruitment, described in section 4.5.4, the poster and text used mentioned “sustainable transport”. However, in the workshops themselves sustainability, climate change or any related themes were not mentioned explicitly, it was only explained that a ZEV is a vehicle that has no tailpipe emissions while being driven.

Still, all workshop groups discussed air quality within their CLDs. For all but one group here it was the first theme discussed as it came up most frequently during the variable elicitation exercise. Only group S, the students, instead started their discussion with climate change as it was the most frequently mentioned variable in the hopes & concerns exercise. This relates to a comment made by a participant in the study described in chapter 5. That person observed that air quality was the dominant theme in transport planning, but recently climate change has become more important. This might indicate that the students, as the group with the lowest average age, have the climate more front and centre of their minds. The student group however only touched upon air quality briefly. They mentioned this topic only as the workshop was already wrapping up, hence there was no time left to explore their views on air quality in more detail.

Across the workshop groups, different terms were used to talk about air quality, including "fumes", "emissions", "pollution". Car travel was identified as the main cause of poor air quality, and the ZEV mandate was seen as a policy that improves air quality. The impacts of air pollution on health were noted, with some groups mentioned specific parts of the population to be more affected, such as children or asthmatics. While the group Env noted that air quality improvements reduce strain on the NHS, group C2 suggested that these air quality benefits will be more present for people in richer neighbourhoods, as they are more likely to be able to afford EVs. Three groups (A2, C2, EV) put air quality in connection with active travel, noting that better air quality is better for those who walk already and will incentivise people to walk more.

The workshop groups, particularly groups A1, C1, K2 and S did recognise that the "ZEV mandate is a climate policy, however they only spent a small part of the workshops discussing climate change before moving on to other themes" (Ternes, 2025). Interestingly, the Environment group did not specifically talk about the climate impacts of the ZEV mandate, but rather talked about related social and behavioural aspects which will be discussed in the following sections. This raises the question of whether this group takes the climate impacts for granted and is more concerned with other themes.

A number of other environment-related themes came up: Groups A1, C2, K2, S recognised environmental impacts of battery production & recycling. Here, C2 noted that this shifts emissions elsewhere compared to fossil fuel production. Most of these groups (A1, C2, S) also discussed work conditions in this context. S also noted a potential rebound effect and found that if work conditions improve, this might make people feel morally okay to buy an EV. A1 discussed the environmental impacts of energy, A2 mentioned waste from scrapping cars, C2 talked about spillage from transporting fossil fuels and EV discussed how noise harms the environment. Groups K2 and S also mentioned emissions from public transport. Other themes mentioned here include: Pollution in food (A2), Cleanliness of houses (A2, C1), Impacts on other species (A2,C1), Pollution from tires and brakes (Env, EV, K2). Fairness was only briefly touched upon here. Participants stated that they would find it fair if transport emits fewer greenhouse gases and runs on renewable energy.

Four groups (A2, C1, P, S) wondered whether, given the environmental impacts of ZEVs, they are overall better or worse for the environment than petrol and diesel cars. The government documents also address these questions. Initially, the government noted that while the ZEV mandate brings down exhaust emissions, the picture is more complex for non-exhaust emissions, requiring more research. In the final Cost Benefit Analysis, the government

describes recent research they did: “This research suggests that overall, BEVs are expected to reduce GHG emissions by 65% compared to a petrol car today, and this rises to 76% by 2030.” (Department for Transport, 2023d). Conversations by workshop participants however highlight that they were largely unaware or unconvinced of these large climate benefits.

The government documents and interview state that a reduction in greenhouse gas emissions is the key motivation behind the policy. They link the ZEV Mandate with wider efforts to decarbonise transport. “The 2019 amendment to the Climate Change Act, in which the target of reaching net zero by 2050 was set, is cited as giving the legal framework for the ZEV mandate” (Ternes, 2025). Here, the government emphasises their role as global leaders on climate change. The government notes: “Although new cars and vans have become more fuel efficient over recent years, it is now clear that zero emission vehicles (ZEVs) are the only way to decarbonise road transport in line with the UK’s net zero legislation, and to end our contribution to climate change by 2050” (Department for Transport, 2023a).

These observations indicate different foci: The government documents highlight that the ZEV Mandate is a climate-motivated policy and decarbonisation is the main aim. In contrast, climate change was only a small part of workshop conversations. While participants briefly commented that the policy would address climate change, their conversations quickly shifted elsewhere.

### 6.5.2 Cost and privilege

This section discusses costs associated with the policy, and related questions of who can navigate the cost implications of EV ownership. As discussed above, the literature identifies cost as a main barrier to EV adoption for parts of the public. Cost was also extensively discussed in all focus groups. This section draws mainly from information coded under *Cost*, *Inequality*, *Privilege*, and *Rebound Effects*, as they were often used together.

Overall, participants observe that the ZEV mandate will affect various costs associated with both the purchase and the ownership and maintenance of EVs. While overall there is a notion that purchase costs will increase, participants are less sure about how the ownership costs of both EVs and ICE vehicles will be affected. Information on focus group composition allows for a rough estimate of average incomes across the groups (see section 6.3). However, as discussed above, the large uncertainties associated with the method used mean that observations made here should not be overstated.

The EV group had the highest average income. Interestingly, this group didn't talk much about the cost of EV in connection to their own lives. It was also the only group to not specifically comment on the cost of EV purchases. Instead, they used positive language around the "resale value" of ZEV, referred to the "opportunity for free workplace charging" and described that public chargers can be a source of "revenue for council". This indicates that money seems to be less of a worry for these participants – but also points to a lack of understanding around how charging infrastructure is funded.

The Student group, Parents & Carers and Environment groups had the lowest average incomes of the workshop groups, then followed by the neighbourhood specific groups. All these groups noted that the cost of car purchase would be prohibitive to some, specifically to small businesses (A1, A2), older people (A2, C2), vulnerable people (C1), people on lower incomes (C2, S), people with less access to public transport (A2, S). This indicates that the workshop groups felt able to talk about impacts of the ZEV Mandate on other parts of the population. This evoked calls for means-tested subsidies (A1, C2, K1, S, P). However, group Env noted that subsidies would be unfair as they would still not allow those on lowest incomes to access EVs.

In contrast, thoughts around the cost of running and maintaining a car, including driving and charging an EV, were less frequent. Several groups (A1, C1, K1, K2, Env) note a lack of clarity around how the ownership and driving costs of EVs will develop. Group S notes a feedback loop here, where as more electricity is needed for charging, the required upgrades to energy generation and transmission infrastructure would, they suggested, make charging more expensive, and people would charge less.

Associated with this is a sense of privilege. Participants note that the policy is aimed at "middle class" (K1) or "rich" (Env, C2) people, that the policy leads to a "two tier system" (C1) and that the policy benefits people in cars and disadvantages people walking (A2). The EV group provided the quotes of "Cars with bigger engines cost more to run. But cars with bigger batteries cost less" (assuming that you need to use more costly public chargers less if you have a bigger battery) and "It's fair once you're in it". This indicates an awareness of the barriers towards obtaining a ZEV and thus partaking in the policy, but also of the benefits associated with ZEV ownership. Table 13 provides an evidence matrix of how the theme of cost and privilege was discussed in the workshop groups.

| Connection | A1 | A2 | K1 | K2 | C1 | C2 | Env | EV | S | P |
|---|---|---|---|---|---|---|---|---|---|---|
| **Disposable income – ability to afford EV** | | | | Worry that not every-one can afford an EV. | | If the average cost of EV increases, fewer people can afford an EV.<br><br>If more people switch to EV, more rich people switch to EV. | Feeling that only rich people can afford EV | If cost of vehicle increases, fewer people can afford the vehicle and make the switch. | If the cost of EVs increases, there will be more financial hard-ship caused by a car pur-chase | If cost of EV increa-ses, fewer people can afford to drive. |
| **Ability to afford EV – Number of people buying EV** | If fewer people can afford EV, more will buy petrol/ diesel car | If cost of cars increa-ses, more people cave to give up car | | | | If more people switch to EV, there will be more EV on the road | | | If the cost of cars increa-ses, fewer people are able to buy a new car | |
| **Number of people buying EV – Number of EV in fleet** | | | ZEV manda-te leads to more EV in use | | | | | | | |
| **Number of EV in fleet – Avg cost per mile** | If more people buy EV, then the cost for charging will de-crease | | Unfair that charging at work is free but petrol is not | | | | | Cars with bigger engines cost more to run. But cars with bigger batte-ries cost less.<br><br>Option for free work-place charging | | |
| **Avg. cost per** | | If cost of cars | | | Cost of driving | | Feeling that | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **mile – disposable income** | | increa-ses, people have less dispo-sable income for other things. | | | has effects on people on lower incomes | | home charging is cheaper than petrol/ diesel | | | |

Table 12 - Evidence matrix to map the feedback loop to the themes discussed across the focus groups.

Summarised, these views are illustrated in a feedback loop shown in the thematic CLD in figure 8: “If people have more disposable income, they are more able to afford an EV. This increases the number of people switching to an EV, the number of EV in the fleet, and subsequently reduces the average mileage costs across the fleet, which increases average disposable income again. One’s household income and household savings enable people to afford an EV, while higher upfront costs act as a barrier to uptake” (Ternes, 2025). While this is here described in average values, what it means in practise is that some people are part of the feedback loop, and others are not. The reduction in mileage cost is only available to those who had the disposable income to buy an EV in the first place.

The government also observed this feedback loop, noting that while ZEVs have a higher upfront cost, the driving cost and thus total ownership cost are lower, bringing benefits. While the government notes that some will be unable to afford a new ZEV, they argue that those people will be able to access ZEV via the second hand market. The only group noted to face disadvantage by the policy are disabled people, who the government supports by offering manufacturers incentives for producing wheelchair accessible vehicles.

This indicates large differences in fairness views: While the workshop participants explicitly stated how the policy’s benefits and disadvantages are distributed in ways that they see as unfair, the government documents do not discuss fairness issues. These differences become more evident when comparing the interpretations of this feedback loop and of the different variables connected to it:

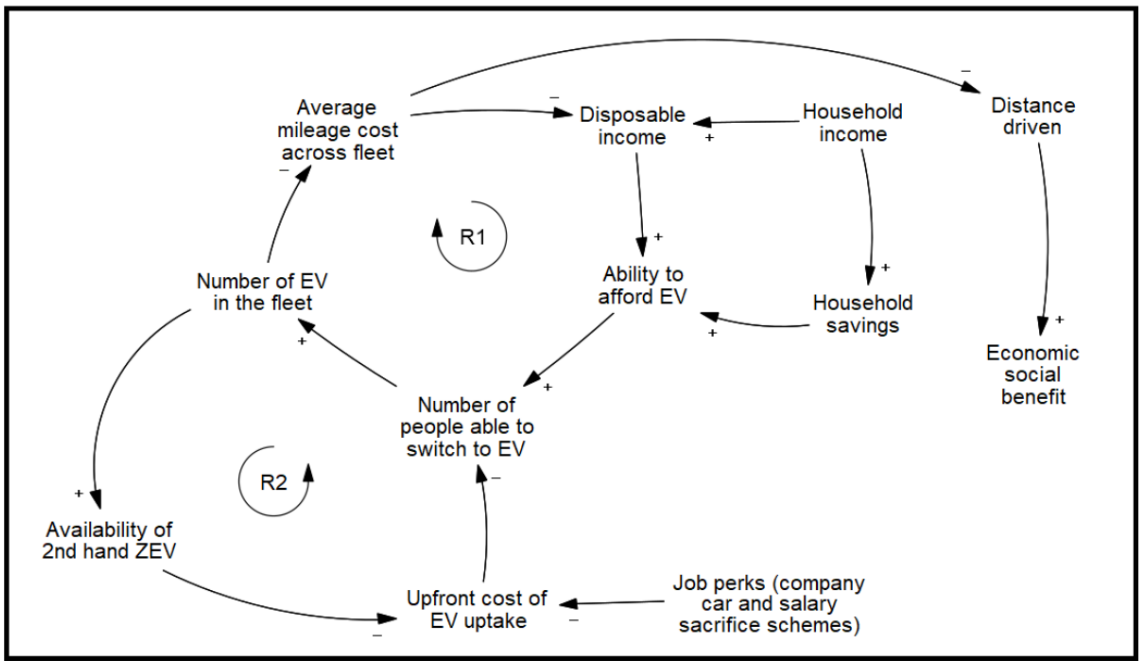
The government notes a further benefit arising from this feedback loop, in the form of rebound effects. The “government’s Cost Benefit Analysis noted that a small increase in overall travel may occur as ZEV are cheaper to drive. This was appraised as positive as this additional travel brings what is referred to as “social benefits” to people. In contrast, the public felt more negative about rebound effects, as they could cause additional emissions and congestion. The

public noted that rebound effects might also occur from a lower sense of guilt that comes with driving an EV" (Ternes, 2025).

Differences arise in notions on how more people can access this privilege feedback loop. Both the government and the public describe the role of benefits and perks available through some employers, such as salary sacrifice schemes, company cars or free EV charging. The public here however noted that these perks are only available to people who are in employment and working for a company offering such perks. The public found that those people are also more likely to be in well paid jobs, having more disposable income towards the purchase of a ZEV anyway. Thus, the public emphasized the role of incentives in creating access to ZEV for more people. Notably though, one participant found that even with subsidies, EVs would be unaffordable to those on the lowest incomes. Instead, the government emphasized the role of the second hand market in providing access to cheaper ZEV over time. Here, the public was more sceptical and worried about the longevity particularly of the batteries in EVs. They worried that if the battery would break, they'd be left with a prohibitively costly repair and no guarantees to help cover these costs. These issues were excluded from government considerations.

Aside from the perceived unfairness around disposable income and job perks, the public identified a third variable that was perceived as particularly associated with unfairness. They noted that home ownership and thereby access to off-street charging will again reduce charging costs and increase the disposable income left for other purposes. However, home ownership is in itself something that's more available to those with disposable income. "The public thus expresses worries that a "two-tier system" is developing between those who are and aren't able to switch to a ZEV" (Ternes, 2025). "In addition, the public notes that the externalities of increased vehicle travel, such as accident risk, congestion, delayed public transport, and air pollution affect everyone, and particularly those not in cars. Thus, the public explicitly raised fairness concerns here, while the government sources remained neutral in framing" (Ternes, 2025).

Government perception




Public perception

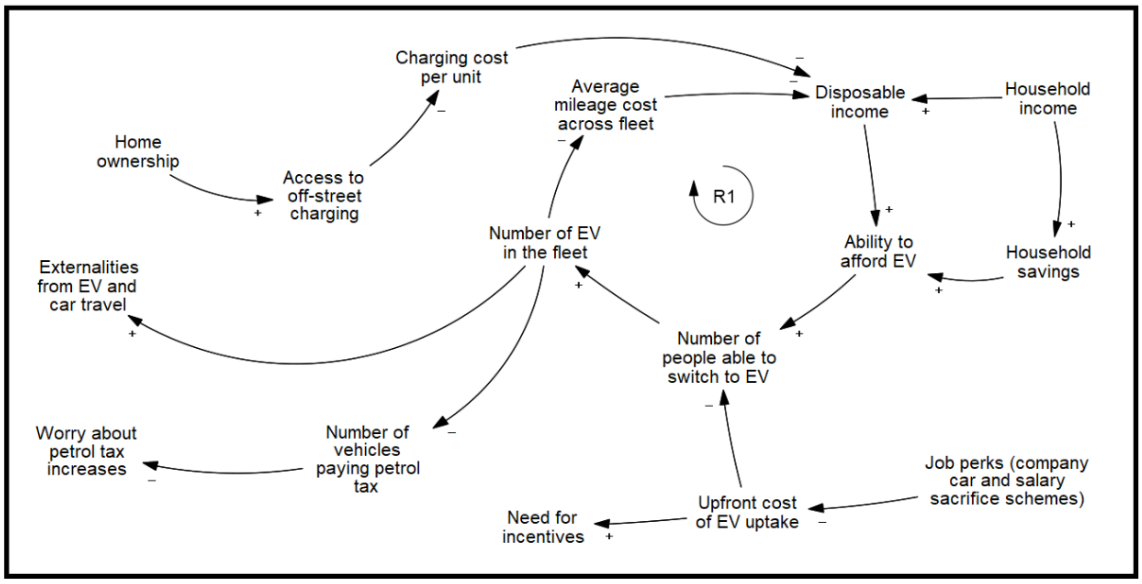



Figure 8 - Causal Loop Diagram illustrating the views of the government and the public around the privilege required to own an EV.

| | | |
|---|---|---|
| R1 | Economy of scales loop | If people have more disposable income, then more people are able to afford an EV, and more people will switch to an EV. This increases the number of EV in the fleet, and thus the average mileage cost across the fleet. As a result, people have more disposable income available again. |
| R2 | Second hand market loop | If there are more EV in the fleet, more second hand EVs will be available. This reduces the upfront cost of EV uptake and thus increases the number of people able to switch to an EV. |

Table 13 - Description of feedback loops in the Car ownership CLD

### 6.5.3 Charging and charging practises

Charging, and the practises and routines associated with charging, were widely discussed by the participants. This section draws mainly from the code *Charging*, alongside *Energy*, *Inequalities, Journey planning & Travel time* and *Knowledge*. Themes around charging cost were already discussed in the previous section. As discussed above, literature on EVs and fairness so far has focused on questions of where to place chargers. It identified that charging would affect home owners and renters differently, and will also differ between denser urban and less dense rural locations. Thus, here groups with different levels of home and car ownership are compared.

Both groups A1 and A2 consisted only of car owners. Both groups talked at length about charging. This is not surprising, since as regular car drivers they can imagine what may change in their lives if they have a ZEV. However, A1 had only renters while A2 had only home owners. Indeed, A1 talked more about public chargers, while A2 talked more about home chargers. Interestingly, both groups also talked about each other. The renter group of A1 talked about having to buy a home charger, which would apply more to home owners, while the home owner group of A2 thought a lot about the effects on renters. A difference though is that the renter groups talked about barriers to having a home charger already before they were asked about fairness, indicating that this is more front and centre of their minds. In contrast, the home owner group only talked about effects on renters after being asked about fairness. They recognise the situation to be unfairly difficult for renters. But as they only brought this up after being asked about fairness, this shows they saw it as something affecting others but not themselves.

The two City Centre groups C1 and C2 were also predominantly renters, but with much fewer car drivers in each group. Charging, especially the day-to-day practises around charging, thus played a much smaller role in their conversations. This shows that for these groups the practices around car travel are less prominent on their mind, and the focus is more on the externalities of car travel and on other modes.

The two Kippax groups K1 and K2 were mostly home owners and car drivers, thereby being similar in composition to A2. K1 spend significant time discussing charger installation, practises and related worries and emotions early in the focus group. When asked about fairness, the only addition made here was on the perception that free workplace charging is unfair as petrol isn't free. K2 also brought up charging themes in the conversation, however this group revisited the topic extensively when asked about fairness. They discussed that not everyone has access to home charging, that chargers are spread unfairly between cities and countryside and that different chargers have different costs.

Among the thematic groups, the Students (S) and Parents & Carers (P) had a lower amount of car drivers. Group S only briefly touched upon charging by noting that more charging requires more electricity, leading to higher charging costs which will reduce the amount of charging taking place. Group P did not discuss charging at all. In contrast, the EV and Environment (Env) groups included more drivers, and they discussed charging themes in more detail. Here, the EV group noted the need for home and public chargers, the need for more public chargers and better maintenance, however none of these were labelled as unfair. Interestingly, this group didn't point out particular points of unfairness, but rather used positive language around 'opportunities'. The fairness conversation in this group instead focused on wider governance questions around the ZEV transition. Group Env group mentioned the difference in charging costs between home and public chargers, but did not label this as fair or unfair. Instead, when this group was asked about fairness, they discussed the need to improve other modes and provide alternatives to the car.

Overall, the results show that the groups who drive cars and are thus more familiar with the practicalities of car travel have more detailed thoughts around charging and chargers. Here, neither home ownership nor the residential location (urban or rural) made an observable effect on how the groups talked about charging. While different groups emphasise different themes more or less, conversations of charger location, cost, availability and knowledge needed to use chargers took place across the groups. The unfairness of paying more for public chargers or some people having access to free charging were recognised.

Comparison with government documents reveals different views particularly around the practises associated with EV charging, which are illustrated in figure 9. The first difference is around the time spent refuelling. “The government assumes that charging an EV effectively takes less time than fuelling a petrol or diesel vehicle, as one just needs to plug in the charger and is then free to do other activities” (Ternes, 2025). This is based on the assumption that chargers will one day be so widespread that one can find a charger at many locations that are already part of daily life, such as supermarkets. “This time saving is seen as positive. During the interview, the government officials mentioned that charging an EV brings a change in routine for people, but they didn’t discuss this in detail and this topic was not addressed in the documents either. In contrast, the public perceived that charging an EV will take longer than fuelling a petrol car, and will bring a change in routine” (Ternes, 2025). A difference in the tone and language choice was also observed. While the government used neutral language around ‘change’, the public described charging as a ‘daily chore’ that needs to be remembered, and that can feel stressful. This connected to thoughts around journey planning. As the public perceived EV charging to take longer and be a more regular talk, they worried they might not have a vehicle available when required. This was particularly brought up in connection with spontaneous trips and with caring duties. Many of the public’s worries around charging related specifically to public chargers. Here, the perception was that there is a risk that chargers might be damaged or occupied, or that available chargers are not suitable for the vehicle. The need to make detours to reach a charger was also noted, particularly by workshops in more rural areas. The public also noted how having to use public chargers bring impacts on specific groups of people: They observed that public chargers require specific knowledge and often also a smartphone to operate, which might pose a barrier to older people. Also, several female participants noted that public chargers are often in darker corners of a parking lot, where they don’t feel safe waiting in the dark. A more nuanced and messy interpretation of what charging will mean for everyday routines exists in the public than with government.

The workshop participants labelled the barriers to charging that they identified as unfair. Particularly the differences between different groups of people regarding their ability to integrate charging into their lives was described as unfair. The government documents did not identify fairness issues around the charging practises. Indeed, their Equality Impact Assessment, which considers how people with protected characteristics are affected by a policy, only discussed that people with protected characteristics might be less able to afford a ZEV. No concerns regarding the use and the practices around ZEV ownership were brought up in the government documents.

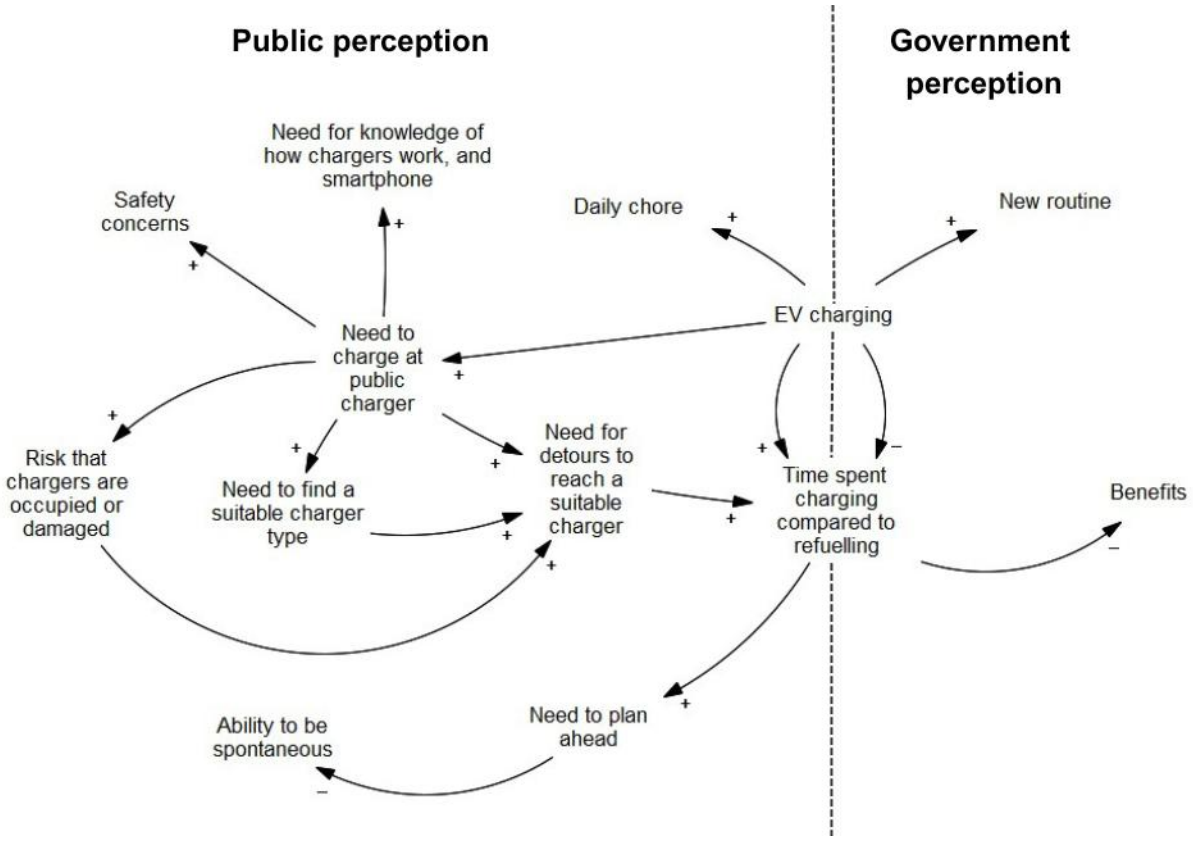



Figure 9 - Causal Loop Diagram showing the difference in public and government perception around charging practises, and around the use of public chargers.

### 6.5.4 Car ownership

This section draws from several codes all related to car ownership, which are: *Car dominance, Fossil fuels, Giving up car, Keeping old cars, Public transport* and *Second hand EV market*. They all revolve around wider questions of which modes people choose and which purchase decisions people do or don't make.

Here it stands out that the two codes of *Keeping old cars* and *Giving up car* only have few coded references across the government documents, but are mentioned in the majority of workshops. This reveals different perceptions held around how people respond to the ZEV mandate. Interestingly here, the government refers to 'consumers' in their documents while workshop participants spoke of 'people' or 'everyone'. Here, both "the government and the public identify that that there is a choice between buying a petrol or diesel vehicle and a ZEV, with the choice eventually removed through the ZEV mandate" (Ternes, 2025). Two reinforcing feedback loops support the uptake of ZEV. As discussed above, particularly the government emphasises the

role of the second hand market in bringing down the cost of ZEV purchase. Also, through economies of scale, the cost of new ZEV will eventually come down which again stimulates ZEV sales.

While the government however assumes that most people will make the switch to a ZEV, the public identify additional behaviour options that may slow down the uptake of ZEV. “While ZEV are a viable choice particularly for people on higher incomes, the participants voiced a strong sense of having to choose between buying a ZEV (potentially with strong implications on their overall available money), keeping an older vehicle running for longer (despite increased maintenance costs, worry about future petrol supply and tax changes, safety concerns and increased emissions and pollution), or having to give up car ownership all together (despite a loss in freedom and access to opportunities, a risk of increased loneliness, and knock on effects on public transport)” (Ternes, 2025).

Here, workshop participants described the difference between those who are able to switch to a ZEV and those who are not as unfair. The feedback loop around privilege discussed in section 6.5.2 already described benefits for those able to switch to a ZEV. This theme adds to it by describing disadvantages for those not able to switch. Participants worried that those who would have to give up their car or keep an old car running for longer would be further disadvantaged by higher transport costs and decreased accessibility.

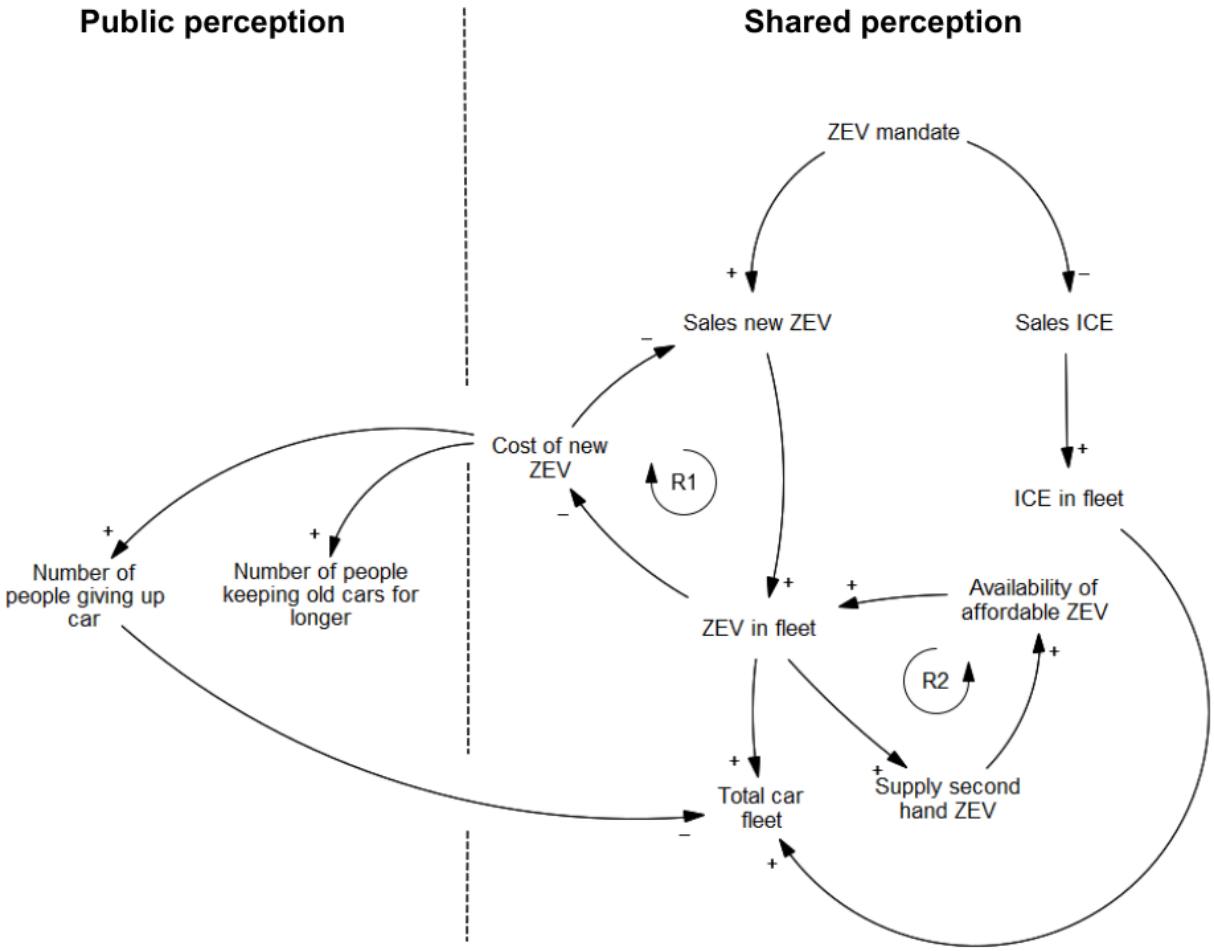



Figure 10 - Causal Loop Diagram showing the perceptions on options available to consumers.

| | | |
|---|---|---|
| R1 | Economy of scales loop | If more people buy a new ZEV, this increases the number of ZEV in the fleet. Economies of scale will bring down the cost of new ZEV, which again increases the number of new ZEV sold. |
| R2 | Second hand market loop | If there are more ZEV in the fleet, the supply of second hand ZEV increases. This increases the availability of affordable ZEV, and thus again the number of ZEV in the fleet. |

Table 14 - Description of feedback loops in the Car ownership CLD

Given these varied perceptions on car ownership held by the public, a comparison between the different groups is of interest. Here, references around car dependence were made across the groups, with no difference observed between groups with more and with fewer car drivers.

Participants speak of the ZEV mandate benefitting those in cars (A2), ask for more focus on other modes (Env, S, EV) and a move away from private cars (P, Env, EV) and speak about negative externalities of car travel such as congestion (C1, C2).

However, the language used and variables mentioned by participants show that there are different roles given to the car. K1 feels that people drive because they have to, emphasising that many people have cars out of necessity. K1 and K2 speak of the role of "petrolheads", highlighting the social role of cars as a shared hobby bringing people together. A2 and S also mention that a lack of suitable travel affects people's social connection, pointing out that the ZEV mandate might increase loneliness for those not able to afford a ZEV. This indicates that people have different values and views attached to cars.

### 6.5.5 Effects on public transport

This section draws from data coded under *Public transport* and *Traffic*.

Following the desire for mode shift expressed by several groups, this section looks more closely at public transport. The groups with few or no car drivers discussed public transport extensively. They worry about increased costs of PT due to the ZEV mandate (C1, C2). They also assume that more people will take public transport as fewer can afford to buy a ZEV (S, P). C1 believes that higher quality public transport would reduce car use, and wish to increase the cost of driving to make public transport a more attractive choice. C2 identifies a feedback loop: Congestion causes delays to PT, reduces the attractiveness of PT and perpetuates a car-focused system, leading again to more congestion. S identifies a feedback loop where a higher number of people using public transport will lead to a decrease passenger comfort, but also increase investments made into PT which eventually improves passenger comfort.

Also some groups with predominantly car drivers discussed public transport. Two groups (K1, EV) here use the term "North-South divide" to express a perceived difference in public transport provision and funding across the country. A reduction in public transport costs (A1, EV) and an increase in provision (K1, A1, Env) is desired. Two groups (A2, K2) didn't talk about public transport.

What stands out here is that the non-car groups discussed public transport in the first phase of CLD development, before any questions on fairness were asked). In contrast, for all car driver groups, public transport came up only after they were asked about fairness. This points to the different roles that public transport has in the lives of these participants.

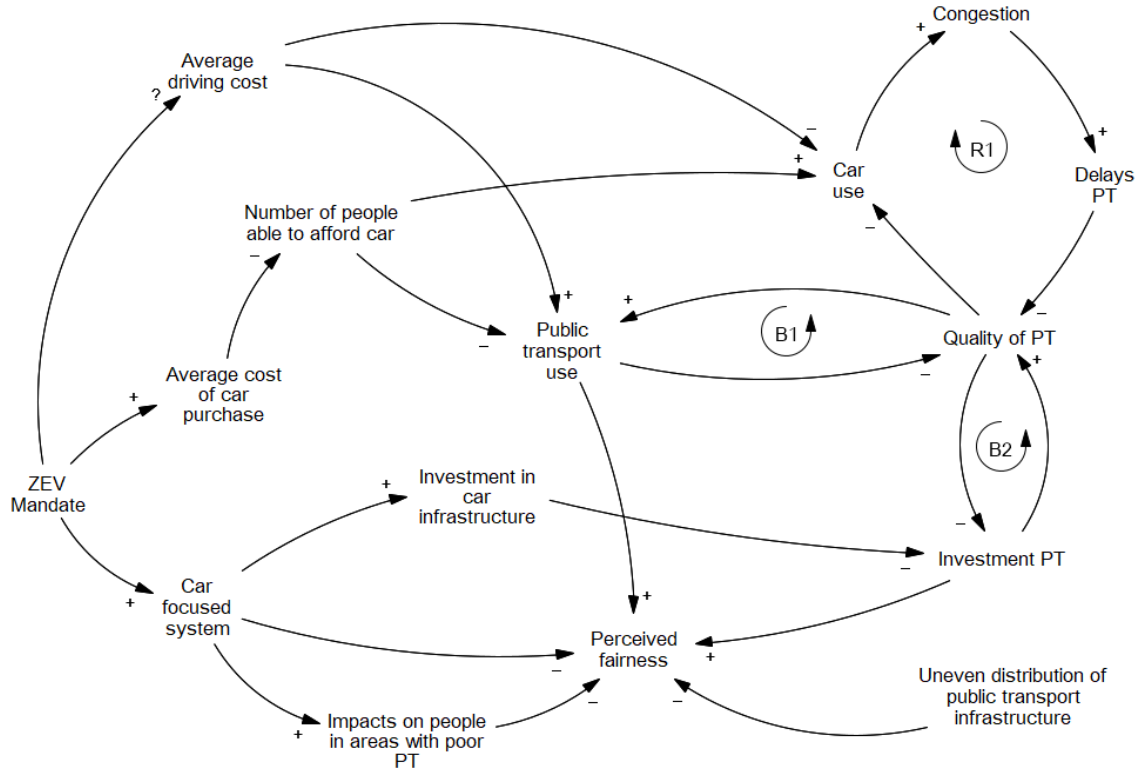



Figure 11 - Thematic CLD describing the public's perceptions around how the ZEV Mandate influences public transport. The ? denotes that participants described that these two variables were connected, but they didn't know the polarity of the connection.

| | | |
|---|---|---|
| R1 | Delay loop | If more people use cars, there is more congestion. This causes delays to PT, reducing the quality of PT. Lower quality PT will again make more people use the car instead. |
| B1 | PT use loop | If PT is of better quality, more people will use PT. But if more people use PT, the PT quality decreases due to e.g. crowding, reducing the quality of PT. |
| B2 | Investment loop | Investments in PT will increase the quality of PT. A higher quality PT reduces the amount of further investments received. |

Table 15 - Description of feedback loops in the public transport CLD.

The CLD shows that the participants identified several feedback loops around PT quality that are influenced by the ZEV mandate. They find that ZEVs are on average more expensive, meaning that fewer people can afford them. In line with findings discussed in 6.5.4, this means that some people have to give up their car, leading to more people using public transport instead. Participants also shared that the ZEV Mandate influences driving costs, however it was

unclear how (perceptions of driving costs will be discussed elsewhere). If driving costs are higher, then more people will use PT and fewer will use the car. Higher use of PT is perceived to reduce the quality of PT due to e.g. crowding. However, if PT is of better quality, more people will use PT and fewer people will use the car. Car use is also affected by the number of people able to afford a car. More car use will cause congestion and delays to PT, again reducing the quality of PT, and leading to fewer people using PT and more people using the car. The ZEV mandate is perceived to be a car focused policy, leading to more investments in car infrastructure and thereby fewer investments in PT. Fewer investments in PT will again reduce the quality of PT, however lower quality PT will lead to more investments into PT.

Participants linked several of these variables with perceived fairness. They felt that the car focused system is unfair, particularly as it affects people in areas with poor PT provisions more. Participants also found it unfair that PT is distributed unevenly across the country. In contrast, investments into PT and use of PT were perceived as fair.

This conversation sits in contrast to the analysed government documents, where no content was coded under Public Transport. While it is possible that the government is considering the future of public transport in other policy documents, the absence of the topic in the ZEV Mandate documents indicates siloing of different modes. The workshop groups' perception of increased public transport use as a result of less car use also stands in contrast with the government's assumption that the ZEV Mandate will lead to people driving more.

### 6.5.6 Effects on active travel

This section draws from data coded under *Active travel*, *Air quality*, *Health* and *Noise*.

Around the theme of active travel, the groups all had similar perceptions, which are discussed below. While six of the workshop groups talked about active travel, conversations around active travel and related themes remained brief, with only few variables in each CLD being coded under the codes considered in this section. Therefore, this theme does not offer enough content to create a CLD, and will be described in writing instead.

Participants said that better air quality is liked with better health. Either health outcomes were described for all (A1, C1, A2, Env), or specifically for young people (C1, K1), those living near traffic (A2), people with asthma (A2, K1). Participants also found that better air quality and fewer emissions from cars will increase people's willingness to use active travel (C2, Env, EV). Also a reduction in noise pollution, which participants expect to occur as a result of the ZEV Mandate, is perceived to increase people's willingness to use active travel.

Several fairness themes were brought up by participants. They find it unfair that the ZEV Mandate disadvantages those walking and benefits people in cars (A2), and want to see active travel being promoted more (Env, EV, K1). They also want to see an increase in the quality of active travel infrastructure, thereby making walking and cycling safer (P).

In contrast, none of the government documents coded made any references to active travel. Similar as with the theme of public transport discussed in section 6.5.5,

### 6.5.7 Social effects

The code *Social effects* was identified in nine of the CLDs. There, it was always found on the margins of the CLD, and thereby usually several variables away from the central variable of 'ZEV Mandate'. The code *Social effects* connected to different themes across the CLDs, which means it is not possible to summarise these conversations in a thematic CLD. Instead, the findings are described in writing.

Several groups discussed that the critical materials needed for ZEVs are often extracted under unethical working conditions (A1, C2, S). Group S here also noted that improvements in working conditions might incentivise people to drive their EVs more as they'd feel that they are doing a morally right thing.

The theme of car ownership choices (see section 6.5.4) was connected with concerns for those people less able to adapt and respond to the policy. Participants worried that those who have to give up car ownership have less ability to do things and are less independent (A2, S). This is seen to affect especially older people who might feel more isolated (A2). Where an increase in travel cost is perceived, the participants said that this would limit people's commuting distance and choice of where to work (K1).

Both groups K1 and K2 noted effects on who they referred to as "petrolheads". The conversations in these groups, as captured by the transcripts, revealed that for some people, fixing and upgrading their cars is a social experience, and participants worried that the shift to ZEVs would take this hobby away from people.

Related, group K2 worried that the change to ZEVs would lead to job losses, as not every garage would be able to shift to repairing ZEVs instead of ICE vehicles. Group S worried about a loss of jobs in fossil fuel extraction as less fossil fuels will be required in the future.

Group A2 also discussed people's environmental behaviour: This group said that people tend to do what makes their own lives easier. A change in mindset towards more environmentally

friendly behaviour is desired, while also showing understanding that not everyone is able to change their behaviour.

Group C1 observed that people now travel further as their social networks are spread more, leading to a reduced sense of community.

Group Env found that ZEVs don't have to pay for entering a low emission zone (LEZ). This means fewer vehicles have to pay overall, reducing abuse that shop staff inside a LEZ face.

Group P worried about those relying on motability cars.

This code thus highlights a range of worries of the participants, many of which were connected to fairness. Participants focused on those people who face negative impacts of the ZEV Mandate, and who should thus receive special consideration.

This sits in contrast with the findings from the government documents. "The main place where the government considers the effects of the policy on the wider public is in the Equality Impact Assessment (EQA) of the Cost Benefit Analysis. Here, the effects of the policy on people with protected characteristics are considered. The government concludes that the only effects on protected characteristics are via different incomes" (Ternes, 2025). This thus represents a much narrower discussion than was found in the workshops.

### 6.5.8 Car manufacture and technological developments

The codes of *Technological developments* and *Car manufacture* were mentioned in 6 and 5 workshops respectively. Similar as to *Social effects*, these codes occurred on the margins of the CLDs, several steps removed from the central variable of 'ZEV Mandate'. As they connect to different variables in each workshop CLD, it is not possible to build a thematic CLD here.

Several groups noted that ZEVs tend to be heavier (C2, K2, P) and accelerate faster (EV) than ICE vehicles, posing accident risks and causing pollution.

The theme of batteries, their production and recycling was discussed in relation to environmental impacts (A1, C2, K2) and work conditions (A1).

Around technological developments, there were different opinions across the groups. A1 hoped for technology improvements to reduce the environmental impact of battery production. K1 felt that the policy leads to technology improvements. However, K1 and K2 worried that fewer mechanics would be able to fix ZEVs as they are seen to be more complex. Group P worried that the increased use of technology inside the cars might allow the government to control people more.

Also around the role of manufacturers, perceptions differed between the groups: Group C1 discussed that manufacturers have the power to set prices and technology standards, which led them to suggest government regulation to increase fairness. This group also noted that car manufacturers tend to be located outside the UK, which means other countries benefit from the ZEV Mandate. Group EV found that initially only few manufacturers would be able to produce ZEVs, leading to a monopoly in terms of price and technology. Over time, other manufacturers would catch up, leading to more innovation and competition. K2 found that the ZEV Mandate would lead to more competition among manufacturers, and to economies of scale that will reduce the cost of ZEVs. Group S discussed that manufacturers had to adapt to small UK market whose regulations were perceived to be different than that of other countries.

While the government consultations focused on the feasibility of the ZEV Mandate for vehicle manufacturers, they took a narrower view than the conversations by the workshop participants. The government noted that the expected increase in mileage driven may lead to more accidents, which they costed into the cost benefit analysis, but did not comment on the impact of weight and noise of the vehicles on accident numbers. The government also discussed the prospect of technological improvements.

Differences between government documents and participant views here revolve around the question of “Fairness for whom?”. While the government focused on the impacts on vehicle manufacturers and their ability to adapt, the participants discussed the fairness impacts of the policy on the wider public.

### 6.5.9 Less frequent codes

The codes *Governance and policymaking, Consultation, Citizen involvement, Choice or restriction* and *Trust or resistance* each came up in only few workshops. They all however contain insights into the procedural aspects of the ZEV transition, with participants discussing how they wish to see changes happen. Several groups, particularly those in A1 and A2, commented on the lack of choice that this policy brings, and that there is a perceived lack of freedom. They would have preferred everyone to choose a vehicle that meets their needs. One participant in group P worried about increased government control due to ZEV having more technology in them. In contrast, especially the EV group demanded more leadership from the government and a more coordinated approach. Several groups mentioned that the policy was made by people who are far away from the problem and are thus not aware of the challenges. This leads comments around the need for more consultation and citizen involvement, both around this particular policy and around transport and town planning in general.

Two groups touched upon the level of automatization in a ZEV. Group A2 said that the share of automatic cars in the fleet would increase, however the conversation context suggests that they might have been thinking about automated cars instead. This group felt that having more automatic cars in the fleet would reduce human error, but it would also give people less control over their driving, resulting in less trust into the car. Group K1 felt that an increased level of automation in cars would reduce the number of accidents, and would benefit specifically older and disabled people by being easier to drive.

Four groups discussed the *Effects on businesses*, all of them in a negative context. These groups said that businesses would struggle to afford suitable vehicles. Some participants here drew from their own experiences as working in small businesses, particularly in the trades, and voiced concerns over accessing suitable vehicles for their jobs. Group EV discussed that much of the pressure of the EV transition is put on businesses.

## 6.6 Discussion

The themes and CLDs discussed above revealed rich insights into the public perceptions towards ZEV policy. Here, these findings will be brought back in context with existing literature.

### 6.6.1 Scope of policy impacts considered

Both the government and the public recognised climate change as a driving force behind the policy and noted that there will be related benefits for air quality. The public here also noted wider concerns around the environmental benefits of the ZEV mandate. “While this may partly result from the systems thinking methods used during the workshops, it also highlights that the public does not think in narrow siloed perspectives but wants for policies to consider their overall life situations” (Ternes, 2025). Nayum and Thøgersen (2022) identified mixed effects around the connection of environmental norms and behaviours. In my study, the group of environmentally minded participants didn’t talk about climate and the environment more, but they did discuss themes around social justice in more depth than most other groups.

Beyond the shared recognition of climate as an important topic however, there are differences between the public and the government. The government documents all come from a position of having already decided that ZEVs are essential for decarbonisation. Therefore, the government documents all look at the long term implications of the policy and consider a point in time where the transition is complete. This relates to Henderson’s (2020) finding that the underlying assumption around EVs usually are positively connotated: People assume that EVs

are better, more sustainable and will bring further car uptake. This matches the assumptions shared in the government documents.

In contrast, the public considers the wider impacts of the ZEV Mandate on their overall travel behaviour and the wider transport system. They thus recognise a need not just to change the way we power cars, but also to transform the transport system more widely. Henderson's (2020) work calls for more critical research into the underlying assumptions and politics around EVs, which here matches the public views rather than the government views. Findings made here also disprove an assumptions by Sovacool et al. (2019), who opted to interview experts they found that their theme of justice in vehicle to grid electrification would be too complex for the public. The research in this thesis, by contrast, shows that with a considerate research design, it is possible to have complex conversations with the public.

### 6.6.2 Views and perspectives included

The government documents and interview reveal that the focus of consultation was on industry stakeholders, with no direct engagement taking place with members of the public. Thus, the government documents revealed a narrow focus on the feasibility of the ZEV Mandate for businesses and the impacts on climate change. The workshop participants discussed a much wider range of possible policy consequences and perceived fairness issues. Participants also "spoke about not feeling considered, and feeling like policy is not for them, particularly around the theme of privilege" (Ternes, 2025).

Current thinking on Just Transitions however argues that "policy needs to be responsive to lived experience" (Abram et al., 2022, p.7). But responding to lived experience is only possible if those making policy decisions have knowledge of these lived experiences. In the perception of the workshop participants, this is not the case. That is shown both in participants' direct statements around how policy makers don't understand their viewpoints, but also in how participants had diverse and detailed accounts of how the ZEV mandate will affect different people in different ways. In contrast here, the government mostly spoke of general impacts on 'everyone', without distinguishing between different groups of people. In the absence of knowledge on people's needs and views, the government has to instead cater to 'imagined publics' (Whitmarsh et al., 2025). This describes a situation where the policy makers, in the absence of actual information on what the public needs, assume and imagine these needs and develop policies around these imagined needs (Whitmarsh et al., 2025). However, even the view of experts on public needs can be distorted by the own lived experience of these experts (Ralph and Delbosc, 2017).

This might have tangible consequences: Firstly, it may impact the way consultations are done. Barnett et al. (2012) describe how drawing from 'imagined publics' can influence the design of consultations. This raises the question of whether the diverse perceptions of the public would even find room within the consultation process around the ZEV Mandate.

Secondly, "the decision makers might not be able to adequately address the needs and perceptions of the public" (Ternes, 2025). The different perceptions of government and the public will influence how the policy is received. Indeed, some participants even spoke of resistance to the policy. Had the participants views been understood and included much earlier and had the government discussed the ZEV Mandate more holistically alongside other transport policies, "this would have enabled the government to address these concerns in policy design and communication" (Ternes, 2025). Related here, it is important to point out that the Department for Transport has developed a set of personas, which are designed to capture the diversity of transport users' needs and behaviours (Department for Transport, 2023c). However, it appears that these personas were not used by the government when exploring the consequences of the ZEV Mandate.

However, while these gaps around consultations and resulting consequences are important, it is also worth pointing out that the consultations themselves didn't seem to have a large impact. As table 9 illustrates, the policy ultimately announced in 2024 was different to the one that the government consulted on. At the consultation stage, the policy was as follows: The sale of new ICE cars and vans was to end in 2030, and from 2035 all new cars and vans were to have zero tailpipe emissions. In the policy announcement, it is now described that "80% of new cars and 70% of new vans sold in Great Britain will now be zero emission by 2030, increasing to 100% by 2035" (Department for Transport, 2024). The government justified this change by wanting to put UK regulation in line with that of other mayor economies. However, this change took place after several rounds of consultation on specifically these questions of policy design and trajectory. Specifically, the government officials interviewed here pointed out that the consultation process around the ZEV Mandate was extensive. However, the change in policy design post consultation shows that the consultations had very limited impact on the final policy outcome. This lines up with findings described in chapter 5, where interviewees described the role of consultations as confirming already made policy choices.

### 6.6.3 Connection between perceptions and behaviour

As shown by conversations on privilege, these perceptions can stop people from engaging with a policy altogether. The participants' perception that EVs are just for better off people makes it

less likely that they'll research the feasibility of an EV for their everyday life, unless they see themselves as better off. While previous research observes that positive feedback loops can speed the uptake of EVs, these require an amount of early adopters to trigger further EV uptake (Budnitz, 2024). Public perceptions can also create a different set of choices than was anticipated by decision makers. While the government assumes that second hand vehicles will soon be available for all, participants feel they will have to choose between giving up car ownership or keeping their old car for longer, which would bring larger changes to their lives and which government policy does not cater to" (Ternes, 2025).

"As the distribution justice tenet shows, this lack of consideration of public views has tangible consequences on policy impacts" (Ternes, 2025). These impacts result from a mismatch between perceptions, assumptions and knowledge across the stakeholders. They can be broadly grouped into several types:

The first type is one where the public holds false or incomplete knowledge around the ZEV Mandate, or of ZEVs more generally. For example, as discussed in section 6.5.2, there was wide recognition for the higher upfront cost of ZEV across the groups, but much less awareness of the reduced driving costs. Other examples included participants who didn't know that all EVs are automatic cars, and a story told by one participant about not understanding the difference between EV and hybrid cars. This ties with findings by Bennett and Vijaygopal (2018), found that most people have "little regard for EVs" and argue that due to the public's limited knowledge, marketing should focus on technical aspects and comfort. Participants in several workshops discussed their perception that the larger weight and reduced noise of EVs may lead to more and more severe accidents. Findings by Wadud (2025) however show that EVs are not more likely to cause collisions than ICE vehicles.

The second type encompasses negative or critical perceptions of the public. These are different to the perceptions above in that here the public's perceptions are supported by research evidence. In the workshops, the notion of ZEVs being most beneficial to higher income people was voiced by participants (see section 6.5.2). This matches findings by Guo and Kontou (2021), who found that in California rebates for plug in vehicles mostly went to higher income people. They found that the share of lower income people receiving rebates increased over time and after an income cap was in place. In the here presented study, participants found it unfair that higher income people would benefit more from the ZEV Mandate. By referring to these higher income people as other, third parties, participants indicated that they didn't perceive themselves as people who would benefit from the policy. The public also voiced concerns

around the electricity grid, required grid upgrades and energy security. They perceived that both the cost of required grid upgrades and the consequences of potential grid instability would have to be carried by all people, regardless of whether they have an EV. The need for grid upgrades and risk of consequences on energy costs is recognised by literature (Hopkins et al., 2023). Also Ofgem, the body responsible for regulating energy in Great Britain, recognises this. However, they deem it fair that the costs of grid upgrades are shared by all – a view that most workshop participants would likely disagree with (Ofgem, 2021).

The third type includes perceptions held by the government, who make assumptions around the behavioural response of the public to the ZEV Mandate. This is a consequence of the above discussed gaps in procedural justice and the 'imagined publics' that the policy makers have to draw from in the absence of information on the real public. This is illustrated in the findings by the different perceptions around car ownership behaviour (see section 6.5.4). While the ZEV Mandate assumes that people will continue to buy and drive cars, participants here discussed at length the options of having to keep older cars for longer or giving up driving a car. Also the different perceptions around charging, and particularly around the impacts of charging on daily routines (section 6.5.3) relates here. Both themes illustrate a gap in how the government and the public perceive their available options. It brings the question of what should be done here and by whom. Barnett et al. (2012) observe that where planners draw from imagined publics, they often assume that the public has a need for information and simply has to be informed better. However, this study indicates that the public has a strong awareness of their needs and circumstances, but that these needs are not represented in the ZEV Mandate. This brings the risk of unforeseen consequences in response to the policy. This has fairness implications, as some people will be able to respond better to the policy and integrate it into their lives than others – this in itself was observed also by workshop participants. These findings relate to Budnitz (2024), who points to a research gap on what skills people need to integrate charging into daily practises. The here presented research highlights a wider knowledge gap also around public responses to ZEV policy.

### 6.6.4 Reflections on demographics/characteristics

Several groups were recruited as they share a particular characteristic: Being Parents & Carers, Students, Environmentally minded or EV drivers. So far, their views were discussed under the angles of car ownership and income. However, literature discussed in section 4.5.3 indicates that these groups may have distinct travel needs and behaviours. This section discusses how the group characteristics influenced the discussion.

Interestingly, the Parents & Carers did not discuss anything specifically related to caring or parenting. Other instances where the shared characteristic of the group didn't actually feature in the conversation were discussed above: EV drivers not worrying about the purchase costs of EV, little differences between rural and urban groups, and between home owners and renters.

There are also instances where the characteristics of a group showed up in conversation in unexpected ways: The students talked about ZEVs as something that will happen in their future. While this didn't feature as a direct variable in their CLD, this group spoke about ZEV using more aspirational and positive language than other groups. So instead of being driven by their young age and lower income as barriers to ZEV uptake, they are instead driven by personal growth and thoughts about their future.
The EV group talked at length about the need for a wider transition in transport. As early adopters of EV, it is possible that these participants have spent time researching their purchase options and ZEVs more generally. The Environment group didn't talk about environmental themes more than other groups. However, this group spoke a lot about communities, social justice and inequalities. As participants here were recruited from an active community group, this may explain their answers.

This indicates that it is important to be considerate when selecting focus groups. One's demographics and characteristics on paper may be very different to what a person actually cares about in life and thus brings up in an open discussion. For future research in this field, this means that participants should not be seen only through the lens of the characteristics they were selected to represent, but should rather be given room to themselves identify what matters to them.

### 6.6.5 Reflection on method

The research project on the ZEV Mandate drew from system dynamics methods. Typically, a system dynamics application involves building a full model and using it to test various influences on the system. This research focused on the causal mapping part of system dynamics, using variable elicitation methods to develop CLDs which represent the collective perceptions of each focus group. While it drew from system dynamics methods as they were suitable for the complexity of the research topic and the needs of participant inclusion, the goal was not to build a full system dynamics model. The focus was on elicitation, not systems capture.

During this research, only few feedback loops were identified in the initial CLDs built by the focus groups. This can be partially explained by the facilitation approach taken: Participants

shared their views in the form of linear stories, often lacking the reflexive element necessary for creating feedback loops. As a facilitator I decided to let people talk as freely as possible, making them comfortable in the conversation. This meant also that the conversation was less guided. While participants were asked how their point relates to the wider mindmap, they were not specifically asked to create feedback loops. Thus, the focus of this research was on variable elicitation, not on building a full CLD.

Still, the CLD-based methodology was useful. It allowed the application of tried-and-tested scripts such as the hopes and fears exercise (see section 4.5). It also offers integration with existing system dynamics research. Perceptions are an important part of system dynamics modelling. Thus, the perception-based variables and connections identified in this research can be combined with existing CLDs to better understand how perceptions affect variables around ZEV uptake. Lastly, a CLD-based approach allowed for the aggregation of views across focus groups in the form of thematic CLDs, which visualised the fairness concerns of the public.

Further, it is worth remembering that the value of participatory mapping and modelling approaches is in understanding how people think about a system or a question, regardless of how modellers view the system. Thus, the findings here reveal that feedback loops are not at the front of participants' minds, which gives important insights into how people perceive a policy and its impacts.

### 6.6.6 Limitations

One limitation of this study is that not all demographics were represented equally well. As section 6.3 shows, both women and people aged 30-39 were overrepresented across the focus groups. This may have impacted the data collected, as the views of these people may have been overrepresented in the sample. During data collection and analysis, no effect of this limitation was observed. The here discussed themes were discussed from participants of all genders and age groups. More generally, the aim of this research was not to obtain any statistically significant results, but to study and observe the breadth of views held across the public. However, as discussed in section 6.6.4, some effects of people's demographics and characteristics on the data collected was observed. Future research should thus aim to have a more balanced representation of genders and ages.

A second limitation arises from the focus of studying only government documents which are directly concerned with the ZEV Mandate. This meant that wider views on e.g. public transport

or charging station provision were not represented to the same extent in the government data than they were in the workshop data. This was acceptable in the context of this research, as the goal was to understand the public's perspectives better and to map out how these perspectives on the ZEV Mandate are represented in the actual policy documents. If future research wishes to compare public and government views more generally, this can be accomplished by drawing from a wider range of government documents.

## 6.7 Conclusion

This study investigated the perceptions held by the public around the ZEV Mandate. It compared Causal Loop Diagrams obtained from ten workshops with members of the public with government documents on the policy. The findings reveal gaps in perception between the government and the public, resulting from different recognitions of problems and next steps and from gaps in procedural justice. These perception differences can be categorised into lack of knowledge by the public, negative judgement of the policy, and lack of understanding of public needs by the government. They risk lowering ZEV uptake, bringing unexpected consequences and furthering existing fairness issues in the transport system.

### 6.7.1 Reflecting back on the research questions

By focussing on the views of the public, this study relates to three of the research questions which are discussed below. A wider integration of the findings obtained throughout the whole thesis will take place in chapter 7.

**Recognition justice**

*RQ2: How does the public perceive the role of fairness in transport decarbonisation?*

This study indicated a high awareness of the public around fairness issues. Participants identified a range of fairness variables across the workshops, particularly around who faces the disadvantages of the policy. The participants thus identified various justice issues surrounding the ZEV Mandate, which span across the tenets of recognition, procedural and distribution justice. Many of these themes were brought up before the participants were explicitly asked about fairness, indicating that the fairness impacts of the policy was already on people's minds.

**Procedural justice**

*RQ4: How and to what extent are different voices and different knowledge used in the transport planning process?*

The here studied government documents revealed that consultation and engagement focused on business and industry stakeholders, and no direct public consultation took place. Workshop participants commented that they didn't feel understood by policy maker and pointed to a need for more consultation and wider system change. Thus, this policy has been created based on a limited set of views and knowledges. The lack of public engagement means that policy makers will have had to draw from their own perceptions of public needs. As a consequence of this,

there are gaps between government and public perception. The public not only lacks understanding of the policy, but more importantly it has a negative view of the policy, feels unhappy with how benefits and disadvantages are distributed, and considers different responses to the policy than anticipated by the government.

**Distributive justice**

*RQ6: How does the public perceive the distributional impacts of transport decarbonisation?*

The public perceives the ZEV mandate as a policy that benefits people on higher incomes and those who already are better off. Through the workshops, participants shared views that the benefits of the policy would go elsewhere, but not to them. When speaking about fairness, they listed groups commonly seen as more vulnerable (e.g. the elderly, disabled people and those on low incomes) as those facing disadvantages from the policy. The public thus felt negatively about the distributional impacts of the ZEV Mandate. However, they also spoke about various measures that would improve the fairness of the policy. These include carbon saving measures such as better decarbonised transport and more renewable energy. This indicates that the public has a more nuanced view of fairness in decarbonisation, and that decarbonisation measures that help more disadvantaged and vulnerable people would be perceived as fairer.

# 7 Discussion and conclusion

This chapter summarises the findings obtained across both studies and discusses them in context with the research questions. The key thematic and methodological contributions are outlined. The chapter closes by giving recommendations for policy makers and for future research.

## 7.1 Research aims

This research aimed to explore the role of fairness within transport decarbonisation. Previous academic research focused on theory led research and case studies, however little was the view of non-academics on fairness. In particular, there was a need to study how fairness plays a role in the transport planning sector where the transport systems of the future are shaped, and how the public perceives fairness in the context of transport changes.

This work aimed to study fairness openly and without seeking adherence to existing theories. This is because, as literature pointed out, philosophical theory may still be subject to biases from those developing it. Instead, this research used the Just Transition framework as a lens to guide the exploration of fairness perceptions and definitions. It used a Systems Thinking methodology to honour and explore the interconnectedness of both transport with people's lives, and of the Just Transition tenets with each other.

## 7.2 Summary of research findings

The findings from the two separate studies on transport planners and on the public were already discussed in the respective chapters. This section summarises insights from both studies in order to answer the research questions. It follows the tenet-based structure along with the research questions were set out. As the questions on recognition and distribution justice differ mainly in whether they concern the public or the planners, the findings within each of these tenets will be compared with each other.

**Recognition justice**

*RQ1: How is fairness understood by the transport planning sector?*

The research showed that fairness is not a key theme in transport planning. As discussed in section 5.2, this is characterised by the absence of any institutional definitions or guidance, as well as by a lack of deep engagement with the fairness challenges of transport decarbonisation.

This connects to existing literature (see section 3.3.3), pointing out that fairness considerations in transport are often not explicitly stated, and implicitly aligned with utilitarian views.

*RQ2: How does the public perceive the role of fairness in transport decarbonisation?*

The research found that the public has a high awareness of fairness issues. They were able to look beyond their own needs to discuss groups that would experience benefits and disadvantages of the ZEV Mandate (section 6.6.1). They also identified how fairness and decarbonisation are connected, pointing both to fairness risks of decarbonisation policies but also to opportunities for improving fairness (section 6.6. This links with literature stating that fairness is an important value for the public (Upham et al., 2023; Mehdizadeh et al., 2024).

*Comparison*

The research identified a gap between planners and the public. Planners were mainly bound by the thinking inside their workplace, which fits with earlier findings by Tennøy et al. (2016) who observed that planners tend to learn from communities of practise. In contrast, the public was more acutely aware of fairness questions and was able to reflect on which people would face disadvantages. This gap can have tangible consequences: The planners' views of what the public needs will influence how they engage with the public (Barnett et al., 2012), while the public's views on fairness will influence how they engage with a policy (see section 3.5). Hence, the planners may not know what's important for the public, while the public might perceive the policies as unfair. This mismatch will lead to unintended consequences.

**Procedural justice**

*RQ3: How are fairness concerns incorporated in transport decarbonisation planning?*

Fairness was not systematically included in the planning and decision making process (section 5.2). As the planners did not recognise people's different views on and needs towards fairness, they also didn't seek out to consult the public on this. This sits in contrast with the perceptions of the public, who were aware of a number of fairness questions around transport decarbonisation (section 6.6). Thus, a lack of recognition here has led to a lack of procedural justice concerns, despite the existence of policy guidance (see section 2.4) on equality.

*RQ4: How and to what extent are different voices and different knowledge used in the transport planning process?*

This research points to consultations as an important area where procedural justice concerns materialise in planning. The planners spoke about consultations taking place late in the planning process and with the goal of confirming already made decisions. It is thus not clear how public views have played a role in shaping the outcomes (section 5.2). For the ZEV Mandate, the public was not consulted at all, rather consultations focused on industry stakeholders. The public felt the results of this, as participants described not feeling considered by the policy (section 6.5). They discussed that policy makers don't understand their needs and called for better planning and consultation. This connects to literature on imagined publics (Barnett et al., 2012; Whitmarsh et al., 2025).

**Distribution justice**

*RQ5: How and to what extent are distributional impacts addressed by current plans to decarbonise transport?*

This research found that the planning sectors had partial conversations around how transport and the associated impacts are distributed. While there was conversation on those who lacked transport, this wasn't matched with conversations around those who had too much. The strategies thus only covered a small amount of the fairness concerns recognised by academia (section 5.1.1). When studying the ZEV Mandate as a case study, the policy documents considered revealed only limited awareness of the distributional impacts: While it was recognised that income will affect access to ZEVs, the government believed that this would be remediated by a growing second hand market alone (section 6.5.4). The consideration of injustices which could play out during the transition from the present day to a fully decarbonised future were absent.

*RQ6: How does the public perceive the distributional impacts of transport decarbonisation?*

The public had a more nuanced awareness of the impacts of the ZEV Mandate. They were able to identify that certain groups, including the elderly, disabled and those on lower incomes would be affected negatively by the ZEV Mandate, while those on higher incomes would benefit (section 6.5.2). The participants also identified various measures to improve the fairness of the ZEV Mandate, including subsidies, different planning approaches and better public transport (section 6.5).

*Comparison*

The findings reveal a gap between the planners and the public: While the public is well aware that decarbonisation policies will have different impacts on different people and places, the

planners instead planned for “everyone”, showing only limited consideration of distributional effects. This may have various consequences, as illustrated by the findings on the ZEV Mandate case study. The mismatch in awareness may lead the public to have negative perceptions of a policy, influencing their reaction. It might also result in unintended consequences and policies that are not aligned with the needs of the public.

## 7.3 Key contributions

This PhD contributes to research on fairness in transport decarbonisation. It expands from previous research and literature in several ways.

Fairness was here studied through the lens of a Just Transition (section 3.2). While scholars describe it as a useful analytical approach towards studying complex justice themes (Abram et al., 2022), only little previous work on Just Transitions specifically in transport exists. Most studies instead apply Just Transitions ideas to wider societal transformations, of which transport is one aspect. This research highlights the value of using the tenet based approach as an analytical lens to better understand fairness within a specific thematic context. Especially as Just Transition is becoming a key term in the professional transport sector (see e.g. IPPR, 2019; CIHT, n.d.), further academic research can enrich this debate.

Prior research on fairness in transport focused on distributive considerations (Karner et al., 2020). This research however identified challenges around recognition justice, where large gaps exist in what transport planners and the public recognise as important themes and as fairness issues. These led to limited procedural justice: As the planners didn’t recognise how differently people perceived transport, they didn’t consult on these differences. This matches prior research around the connections between Just Transition tenets (Abram et al., 2022; Wood, 2023). It also highlights the need for more research around recognition and procedural justice of transport decarbonisation.

Secondly, prior work on fairness has focused on developing or applying definitions of what ought to be considered as fair (see section 3.3). However, following research that highlighted the biases of philosophical work (Bernáth and Tőzsér, 2021; Erden, 2021), this research studied perceptions of fairness in an open way and without drawing from or applying existing definitions. The findings revealed a complex and interesting discourse that extends beyond formal definitions of fairness. Especially the workshops with the public revealed nuanced perceptions around fairness in transport, which have implications on how the public views and

engages with decarbonisation policy. These findings support previous work that considers fairness a 'floating signifier' (Kennedy et al., 2024), meaning that the definition of what is fair changes with context, and that different definitions may exist alongside each other. This is distinctly different to research that sought to develop general definitions of transport fairness (see e.g. Martens, 2017). Findings presented in this thesis support a context-based study of fairness perceptions. Further related research will be discussed in section 7.8.1.

This research points to governance questions as important for transport fairness. Aside from Linovski et al.'s work on equity in Canadian transport planning (2018), only little prior research existed around these questions. This research particularly identified the lack of definitions and guidance, resultingly the role of individual views on shaping fairness outcomes (section **Error! Reference source not found.**) and the influence of senior figures, elected officials and external consultants (section **Error! Reference source not found.**). Future research is required to better understand which actor has which influence in transport, in order to address future interventions appropriately. This will be discussed in section 7.8.2.

Prior work on decarbonisation governance also highlighted a mismatch of efforts and responsibility across governance scales (Marsden and Anable, 2021). This work didn't identify differences across scales, but rather across different levels of planning resource availability. Transport planners at bodies of governance with larger planning teams and more agency within their jobs were more able to articulate views on fairness or describe gaps and opportunities in their work (section 5.2). However, as resources in transport planning are distributed unevenly (Verlinghieri et al., 2024), this may lead to uneven outcomes. Indeed, when studying the ZEV Mandate as a case study, it became clear that no consultation with different regions or levels of governance took place. The public however noticed what they described as a 'north-south divide' (section 6.6), indicating a need for more geographically diverse consultation and consideration.

The need to decarbonise was a major motivation beneath this research, and at the time of research design commitments across scales led to the assumption that decarbonisation is a planning priority (section 2.1). However, this research highlighted that fairness and decarbonisation were seen as separate themes in planning (section 5.2). The case of the ZEV Mandate highlights the government's focus on 'improve' type measures and their assumption that these technology changes will seamlessly fit with existing travel behaviours. Findings from the public workshops disprove that, and point to a range of wider changes and challenges perceived by the public. Not addressing these will risk slowing down decarbonisation (section

6.6). Kortetmäki et al. (2025) pointed out the risk that a focus on Just Transitions and the distribution of benefits and burdens might mean that planetary boundaries are ignored, and irreversible environmental harm may occur. The here presented research highlights that the reverse is also true, and that decarbonisation efforts without justice considerations may bring harm to people. This points to the need for more holistic research on how to combine environmental and social needs.

## 7.4 Methodological contribution

This research provided a methodological advancement around the use of System Dynamics and particularly group modelling approaches with lay people. As discussed in section 3.6.3, previous work here has either involved running workshops with professionals, or it has involved extensive methods training of lay people. While these approaches are valuable, they limit who can participate and how many workshops can be held. Thus, this research involved developing a group modelling approach that can be used with minimal training and is suitable for a wide range of participants.

The approach, described in section 4.5, was successful in drawing out rich insights around the perceptions of the public. It brought out novel variables and themes that were not previously considered within the ZEV Mandate, illustrating its potential for variable elicitation. The key finding here is that it is not necessary to apply CLD specific naming and notation conventions within the workshops, and that a conversion from mindmaps to CLDs by the researchers and after the actual workshop is possible without losing detail. This allows for the workshops to focus on open conversations with and between participants.

However, a drawback identified here was that only few actual loops were identified across the CLDs. This limits the ability to study dynamic behaviours. Future research is needed to confirm whether the low number of loops stems from the facilitation approach taken, or whether it is representative of participant views and indicates that they don't often think about dynamic behaviours and feedback loops. In the absence of these insights, the findings made here can be combined with existing literature to understand how public perceptions would interact with known behaviours.

## 7.5 Contextualisation within current politics

Transport decarbonisation, and particularly the ZEV Mandate studied here, are current political topics. As section 2 discussed, this research takes place with a background of societal and political developments that might affect findings. Of course, these developments continued to happen throughout this PhD research. The interviews discussed in chapter 5 were conducted in autumn 2022 and the focus groups discussed in chapter 6 were held in autumn 2024, with content preparation for the groups finishing in summer 2024. Since then, further developments related to the here researched topics took place. This section briefly reflects on developments occurring up to autumn 2025, in the context of the research findings.

**New ZEV Mandate consultation**

In December 2024, the labour government elected earlier that year conducted a further consultation around the ZEV Mandate. Based on the consultation findings, they moved the phase out date of new ICE cars to 2030, meaning all new cars sold from then on have to be ZEVs. The consultation was similar to the previous ones (see 2.3) in that it focused on the technical regulations and policy design. The consultation response highlights that the change of the phase out date was a manifesto commitment of this government (Department for Transport, 2025b).

In the context of fairness, this indicates that the intention to change the phase out date might have already been firmly present, with the consultation seeking to confirm these views. As the interviews with transport planners (chapter 5) found, consultations are generally seen to confirm an existing decision, rather than to bring up new views. This consultation again focused on industry stakeholders, and it appears that no members of the public were consulted. This risks a policy that doesn't match with people's perceptions and needs, and opens room for unintended consequences – similar as found in chapter 6.

**ZEV purchase subsidies**

In summer 2025, the UK government announced the Electric Car Grant, which offers up to £3,750 per car, with new cars costing up to £37,000 being eligible. The grant is applied at the side of the seller, meaning consumers are expected to see lower prices for EVs (UK Government, 2025b).

In the context of the workshop findings (chapter 6), there are several possible views that participants might have on this development. Participants did identify the high costs of ZEVs as a barrier to people, and felt that only those on higher incomes are able to afford a ZEV. This new

grant reduces the cost of EVs, which participants thus might perceive as positive. However, the question is whether participants would say that this grant goes far enough. Participants discussed that they might keep their old cars for longer or give up their car altogether. From the existing research data, it is not possible to say whether this Electric Car Grant would affect people's perceptions on how they would respond to the ZEV Mandate.

**STBs are being defunded**

In October 2025 it was announced that the DfT will end funding for most Sub-National Transport Bodies (STBs) in March 2027. England's Economic Heartland (one of the STBs) will retain its funding, while TfN (the STB covering the regional focus area of the interviews with transport planners) continues to exist but sees its funding withdrawn. With different STBs having different responsibilities and organisation structures, it appears that the focus of the government is on those STBs that are involved in priority transport projects such as the Oxford to Cambridge Growth Corridor (TransportXtra, 2025).

Interviews with transport planners revealed that organisations with a larger transport planning team tended to have more ability to think beyond daily operations and consider broader questions such as that of fairness. This also applies for the STBs included in the research. This indicates a risk in that there will be fewer bodies of governance within transport that have the resources to address themes like fairness in transport decarbonisation.

## 7.6 Personal reflection on research development

This section contains a reflection on how the research project and the researcher evolved. Due to the personal nature of this reflection, the remainder of this will be written in the first person.

I started this PhD with a background in the sciences. Across various roles, I learned to use scientific research and evidence to form advice and provide answers to questions. At the time I believed that there were clear answers to the world's challenges out there, it would only take more research to find these answers. In hindsight I recognise this as a view in line with a positivist research philosophy, but at the time I had not yet learned to question my own attitudes to and expectations towards knowledge production and research.

This background influenced my design of study 1. At the time, one of my goals was to obtain insights on what is considered fair in the transport planning world. While there is indeed a literature gap around the views on fairness held by planners (as I argue in this thesis), I still

assumed that planners do hold views on fairness, that these views are somewhat comparable and generalisable, and that I could therefore provide a tangible definition on the fairness views of transport planners upon which I would have based the remainder of my research. However, these assumptions proved wrong and as described earlier in the thesis, fairness ideas were largely absent from planning.

Reflecting on these findings (or, as it felt at the time, lack of findings) changed my view on fairness. Rather than being something uniform and measurable, I started seeing fairness as a deeply personal view based on one's own experiences and interactions with the world around us. I later recognised this shift in view as an alignment with a more constructivist research philosophy. In designing study 2 I drew from this experience. In that second study, I explicitly made room for different views on fairness by treating every participant as an expert on their own life. How I achieved this is detailed further in section 4.5. My goal was to study the breadth of fairness views to get a better understanding of the diversity here. This approach proved successful in that it revealed a number of attitudes held towards the case study of the ZEV mandate which were not yet identified by previous research.

This unconscious shift in my own research philosophy however made it more challenging to combine insights from the two studies. This shaped the future research needs I describe later in this chapter. Particularly it increases my interest in conducting research that can span across different attitudes to knowledge and that allows for work conducted under different research philosophies to be combined. I believe this is important as (in line with my own research philosophy) people may hold different attitudes to knowledge and different research philosophies, but still live on the same planet and therefore have a need towards policies that fit all their needs.

While a PhD is time constrained and I wasn't able to redo my research with transport planners on the basis of my own growth and development as a researcher, I will draw from this experience in my future career. Particularly I will be much more critical towards my own expectations of the outcomes of future research projects.

## 7.7 Recommendations for policy

**Develop and disseminate formal guidance**

The research identified that planners were not aware of formal guidance around fairness, leading them to draw from their own views and experiences (section 5.2).

Thus, policy makers are encouraged to develop clear guidance on what fairness means to a body of governance, and how this understanding of fairness plays a role in planning processes. Where related guidance, for example on Equality Impact Assessments, already exists, this needs to be better connected with the body of governance's vision around fairness.

**Wider and more open consultation**

Findings of this research (section 7.3) indicate gaps in procedural justice, and show that not all views were considered, which led to dissatisfaction with the policy. Being consulted was important to workshop groups, but a perceived lack of consultation and consideration led to negative views towards the ZEV Mandate.

Wider consultation can thus achieve two things: It can capture wider views and perspectives and generate public support for a project (see section 3.1.4).

**Considering different viewpoints in planning**

Study 2 found that the public felt not understood by policy makers. The results show that the public identified a wide range of people and places who are perceived to experience benefits or disadvantages (section 6.6). This was not mirrored by the actual policy documents though.

Therefore, planners need to consider not just technicalities of the policy, but viewpoint of different people. Wider consultation can help here, as can the use of personas (see e.g. Department for Transport, 2023c). Also, as study 2 shows, planners need to consider not just the technicalities of a policy, but need to also ensure that the relevant policy details are communicated clearly so that they reach the wider public.

## 7.8 Emerging gaps and future research needs

While the findings obtained in this PhD advance the research field, they also point towards further research gaps. This section discusses several potential future research projects which draw from findings made in this PhD and address important research gaps.

### 7.8.1 Operationable fairness knowledge

This research discovered that in transport planning, fairness is not a key theme. Interviews with transport planners revealed that none of the bodies of governance they worked for had any guidance on what fairness means in the context of their work. However, this research also deepened the understanding of how important fairness is for public perceptions. Findings from

the workshops revealed several areas of perceived injustice around the ZEV Mandate, all of which have the potential to limit the uptake of ZEVs and thereby policy success. The gap here is thus that, while the public cares about fairness, transport planners currently have no tools available to better understand public perceptions of fairness, let alone design or communicate policies with these fairness perceptions in mind.

Addressing this gap would mean developing an approach that helps transport planners understand fairness perceptions of residents in their local areas. However, transport planners interviewed reported that they face high work demands within limited time. Especially at lower levels of governance, the focus was often on the day to day operations of transport, leaving limited time to wider strategic themes such as fairness. This means that an approach developed here needs to be efficient: Easy and quick to apply while offering useful insights. The approach developed for the workshops (see chapter 4.5) meets these criteria and proved a successful way of eliciting deeper system insights and perceptions from lay participants. However, it was developed under a constructivist research philosophy and collected qualitative insights. Transport planning, in contrast, is mostly positivist (Lowe, 2021) and modelling tends to draw from quantitative data (Bueno et al., 2015). That means that, if transport planners were to apply the workshop method, the findings obtained would not integrate neatly into existing planning processes.

This opens potential avenues for future research: Either, findings from the workshops (see chapter 6) need to be adapted to suit the needs of transport planners. Existing literature can give insights into how fairness and related themes can be operationalised (see e.g. Arnz et al., 2025; Soukhov et al., 2025). Based on this, a framework can be developed that draws from existing workshop data and can translate them into operationable insights ready to be used in transport planning. Or, the workshop methodology needs to be adapted. Such a process would need to start with defining the desired outputs from the workshops, ideally in conversation with transport planners to be informed by their needs. Then, the workshops would be redesigned so that they elicit the kinds of insights needed by planners.

It should be noted that further philosophical work would not be a suitable solution here. As the literature reviewed in chapter 3 reveals, philosophical work has so far resulted in a range of different views of what should be considered fair. What practitioners however need is a “good enough” definition that is applicable to their local context and planning processes. Given that right now in the absence of fairness guidance any progress towards fairer transport

decarbonisation would be coincidental, even an imperfect but tangible fairness definition would be an improvement.

### 7.8.2 Mapping responsibilities and influence in transport planning

The interviews with transport planners gave insights into the complex pattern of responsibilities and influences within transport planning. For example, the interviewees spoke of the strong guiding role of politicians in the process, and described that consultancies were involved in developing strategies (section **Error! Reference source not found.**). This brings procedural justice considerations. The transport planning literature which I reviewed for this research (see section 3.1) did not discuss the influence of these different stakeholders in depth. Thus, I did not focus the interviews with transport planners around these stakeholders, potentially missing out on procedural justice insights. More generally, a better understanding of the responsibilities and influences in transport planning will support future research with selecting appropriate case studies and interview partners.

Existing research here focuses either on the formal powers of various bodies of governance and organisations (Government Office for Science, 2019; Benson and Reardon, 2025), or it discusses one specific approach such as the Cost Benefit Analysis in more depth (Mackie et al., 2014; Bueno et al., 2015; Hickman and Dean, 2018). What is missing from academic research is a deeper understanding of how transport planning processes work in real life (Marsden and Reardon, 2017), acknowledging that formal processes still leave room for individuals to make value judgments and decisions, and studying where and when actual planning might either deviate from formal processes or might be influenced by actors not currently studied.

This information is necessary for improving fairness within transport planning. From a procedural justice perspective, one needs to know where current responsibilities and influences lie in order to then evaluate their fairness or suggest improvements. Further, any discrepancies in assumed and real distributions of influence may be cause for deficiencies around recognition and procedural justice.

Such a research project can draw from systems mapping techniques such as those discussed in section 3.6. This needs to consider direct input from those involved in transport planning, including the transport planners themselves, those actors already identified through interviews (study 1) such as elected officials and consultants, and any further stakeholders to be revealed by the research. The here conducted interviews showed that planners were aware of constrains

that limited their ability to do more to achieve their overall planning goals. Thus, a systems mapping exercise might reveal areas of opportunity and leverage points that allow these planners to reach their goals within the current system – which offers a potential source of motivation for planners to participate in such a research project.

## 7.9 Concluding remarks

This thesis has investigated the role of fairness in transport decarbonisation. It applied the Just Transitions approach as a theoretical lens, adding to the literature using Just Transitions with a focus on transport. It highlighted that social exclusion and distributive questions of access are still a dominant theme in UK transport planning. Fairness was not frequently addressed as a key theme in planning, and public engagement around planning questions was limited, indicating a lack of attention to recognition and procedural justice respectively. The public however is aware of the fairness implications of decarbonisation policy and wishes to be more involved in procedural questions. This thesis also addressed a methodological gap by introducing a method for developing Causal Loop Diagrams with the public in a limited amount of time. Work discussed here highlights the potential for participatory systems thinking approaches in public engagement and planning.

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# 9 Appendices

## 9.1 Ethics approval for study 1

Dear Vanessa,

**LTTRAN-149 - Understandings of fairness in transport planning**

***NB: All approvals/comments are subject to compliance with current University of Leeds and UK Government advice regarding the Covid-19 pandemic.***

With apologies for the delay, I am pleased to inform you that the above research ethics application has been reviewed by the School of Business, Environment and Social Services (AREA) Committee and I can confirm a favourable ethical opinion based on the documentation received at date of this email.

***Reviewers noted some points on the application that would benefit from your further attention, these suggestions do not affect this favourable outcome. Please find attached an outline of these comments and suggestions. If you do choose to alter any documentation as suggested, then please remember to submit these to this email address for storage.***

1. **The consent form says that participants will not be identifiable. The application and PIS recognise that people might be identifiable. I'm happy with the justification and measures to address the risks of identifiability. But the consent form should be amended - could just remove the clause about identifiability.**

***Please retain this email as evidence of approval in your study file.***

Please notify the committee if you intend to make any amendments to the research as submitted and approved to date. This includes recruitment methodology; all changes must receive ethical approval prior to implementation. Please see https://ris.leeds.ac.uk/research-ethics-and-integrity/applying-for-an-amendment/ or contact the Research Ethics & Governance Administrator for further information researchethics@leeds.ac.uk if required.

Ethics approval does not infer you have the right of access to any member of staff or student or documents and the premises of the University of Leeds. Nor does it imply any right of access to the premises of any other organisation, including clinical areas. The committee takes no responsibility for you gaining access to staff, students and/or premises prior to, during or following your research activities.

*Please note:* You are expected to keep a record of all your approved documentation, as well as documents such as sample consent forms, risk assessments and other documents relating to the study. This should be kept in your study file, which should be readily available for audit purposes. You will be given a two week notice period if your project is to be audited.

It is our policy to remind everyone that it is your responsibility to comply with Health and Safety, Data Protection and any other legal and/or professional guidelines there may be.

I hope the study goes well.

Yours sincerely,

Daksha

***On behalf of Dr Matthew Davis, CHAIR, AREA***

## 9.2 Interview script for study 1

| **Role of interviewee** | |
|---|---|
| **Question** | **Probing** |
| Please tell me about the work you do at [body of governance] | Tasks<br><br>Responsibilities<br><br>Duration of employment |
| I have approached you for this interview because you were involved in creating the latest transport plan/strategy for [body of governance]. Could you tell me more about your work on this? | Responsibilities<br><br>Timescale of involvement – all the way or from a certain point on? |
| **Planning process** | |
| **Question** | **Probing** |
| How did [body of governance] go about creating the transport plan/strategy? | Timeline?<br><br>Which kind of expertise was included in the team working on this?<br><br>Did you get in external agencies, consultancies or other bodies to help? If so, which ones?<br><br>Was the plan/strategy an update of a previous one or created from scratch? |
| What were your key sources of information when creating the plan/strategy? | Whom did you consult?<br><br>Which resources did you use? |
| Could you tell me about the public consultations process? | Who was addressed?<br><br>Who participated?<br><br>What was the setting?<br><br>Where in the process did this take place? |
| How is the information gained in consultations used in the process? | When is it used?<br><br>Who uses it further and in which way? |

| | |
|---|---|
| | Could you give an example of how information from consultation has shaped the plan/strategy? |
| What happens if info from consultations is in disagreement with other information you have? | Give an example, if interviewees can't answer this. E.g. "Imagine |
| Do you think the consultation process manages to capture everyone's views, or are some people's perspectives more dominant? | |
| How is the plan/strategy turned into action? | How do you use it in your day to day work? What about your colleagues?<br><br>What has changed as a result of publishing the plan?<br><br>Which parts of the plan were already actioned upon? How? |
| **Fairness** | |
| **Question** | **Probing** |
| We've talked a lot about the process of creating the plan/strategy. Now let's talk about the plan/strategy itself. What are the key points in it? | Goals<br><br>Priorities<br><br>Guiding principles |
| Earlier, we talked about different goals of the transport plan. What happens if some of the goals are in conflict to each other? | E.g. decarbonising transport and providing access to things |
| The UK government declared a climate emergency in 2019 and set a goal of reaching net zero emissions by 2050. The strategy was published prior to this being set in law, but debates on net zero were ongoing already. How has this influenced the plan/strategy? | Which policies to decarbonise |
| Now let's look at some examples. Fuel prices are increasing in the UK, a litre of petrol now costs 40p more than it did one year ago. What do you think about this? | Is it fair? Why, why not? |
| This summer, Germany introduced a ticket to access country-wide public transport for €9 per month. What do you think about this? | Is it fair? Why, why not?<br><br>The scheme will likely be discontinued. What do you think about this?<br><br>Could it be made better? |

| | |
|---|---|
| These questions already hint at fairness. I am asking this because there are many different definitions of fairness, but I hardly ever found a definition spelled out. Do you have a definition within [body of governance]? | |
| Can you generalise what criteria are needed to consider a transport project or situation fair? | |
| Is a fair process needed for a fair outcome? Or can unfair processes lead to fair outcomes? | |
| This is the end of the interview. We have moved from specific examples to more general views on fairness. Is there anything you feel is missing? Anything you'd like to add? | |

Table 16 - Interview script for study 1

## 9.3 Codebook for study 1

- Insights from INTERVIEWS
    - Balancing different views
    - Relevance of decarbonisation
    - Role and background of interviewee
- CONCEPTS of fairness
    - Accessibility to things, places
    - Benefits for everyone
    - Benefits for people in certain place
    - Different things for different places
    - Equality of opportunity
    - Reduce inequality
    - References to FEASIBILITY
    - Special consideration for some groups
- CURRENT state of transport
    - Are inequalities observed
        - Economic
        - Geographical
        - Health and (dis)ability
    - COVID

    - How does transport affect other things
        - Air quality & pollution
        - Economic
        - Emissions
        - Health
        - Safety
        - Social impacts
    - Moral judgements
    - Politics, decision making, power
- What is transport like right now
    - Connectivity and integration
    - Cost of travel for end users
    - Infrastructure
    - Investments
    - Knowledge
    - Policy, regulations
    - Significance of area
    - Technology, electrification, research very broadly
    - Traffic flows
    - Modal split
    - Traffic volume & capacity
    - What others do
- POLICY suggestions and justifications
    - Broader changes to traffic system
    - Economic
        - Cost of travel for end users
        - Investment
    - Infrastructure
    - Knowledge based
        - Education, information campaign, communications
        - Further strategies, documents
        - Monitoring policies and reflections
        - Research, innovation, finding out stuffs
    - Legal

        - Processes and organisation
        - Regulations and policies
    - Place-based
    - Sounds like policy, feels like vision
- PROCEDURAL and involving other people
    - Asking for support, lobbying
        - From government
        - From private sector
        - Other bodies of governance
        - Undefined stakeholders
    - Consult
        - Public
        - Specific groups of people
        - Undefined stakeholders
    - Give work, power or support
        - Other bodies of governance
        - Private sector, industry
        - Unknown stakeholders
    - Work in partnership
        - Academia, research
        - Government departments
        - Other bodies of governance
        - Private sector, industry
        - Public
        - Specific groups of people
        - Undefined stakeholders
- VISION for transport
    - Accessibility
    - Addressing climate change overall
    - Affordable transport
    - Air quality and pollution
    - Capacity
    - Congestion and road space
    - Connectivity and integration

- Economic benefits and job provision
- Fairness
- Fast, efficient, frequent
- Good, high quality, generic positive
- Health benefits
- Information system for transport users
- Infrastructure & building
- Low or zero carbon or sustainable transport
- Modal split and shift
- Nature and heritage
- People-centred and pleasant places
- Reduction to overall travel volume
- Regulation and support
- Reliable transport
- Resilience
- Safe transport
- Technology uptake and leadership
- Things staying as they are
- Wellbeing, quality of life

## 9.4 Note on data availability for study 1

The interviews and documents analysed for study 1 (results of which are described in chapter 5) were coded using an early version of Nvivo 14. Since then, updates to Nvivo 14 have been released. Opening the project files for study 1 with the newer version of Nvivo 14 leads to backwards compatibility issues: A number of coded documents are missing and inaccessible. Attempts to resolve this have been unsuccessful. As a result, not all coded documents included in study 1 are available for future reference.

## 9.5 Ethics approval for study 2

3 July 2024

Dear Vanessa

**Your research ethics application reference:** 1024

**Your research project:** Understanding communities' mental model on transport policies

I am pleased to inform you that the above research ethics application has been reviewed by the Faculty Research Ethics Committee (FREC) for Business, Environment, Social Sciences which has issued a favourable ethical opinion based on the application submitted. **Please retain this email in your project file as it is evidence of the Committee's approval.**

Matters you should note:

- Ethics approval does not infer you have the right of access to any member of staff or student or documents and the premises of the University of Leeds. Nor does it imply any right of access to the premises of any other organisation, including clinical areas. The Committee takes no responsibility for you gaining access to staff, students and/or premises prior to, during or following your research activities.
- It is your responsibility to comply with all relevant Health and Safety, Data Protection and other legal and professional requirements and guidelines.
- You are expected to keep a record of all your approved documentation, as well as documents such as sample consent forms, risk assessments and other documents relating to the research project. This should be kept in your project file.
- Audits are undertaken on approved ethics applications. Your project could be chosen for such an audit. You should therefore ensure your project files are kept up to date and readily available for audit purposes. You will be given a two week notice period if your project is selected.
- Please always include the above research ethics application reference in any correspondence with the Research Ethics team.

If you need to make **amendments** to the original research project as submitted you are expected to seek approval from the Committee before taking any further action. Changes could include (but are not limited to) the project end date, project design or recruitment methodology, or study documentation. Please go to https://secretariat.leeds.ac.uk/research-ethics/how-to-

apply-for-research-ethics-amendment/ or contact the Research Ethics team for further information at Research Ethics.

I hope your research project goes well.

Yours sincerely,

Ms Taylor Haworth, Phoenix Lead, Research Ethics, Secretariat, University of Leeds

On behalf of Professor Paul Glover, Interim Chair, BESS+ FREC

## 9.6 Pre-screening questionnaire for prospective workshop participants

**Introduction**

You are being invited to register your interest in participating in a research study titled 'Understanding communities' mental models of transport policies'. This study is being done by Vanessa Ternes, PhD researcher at the University of Leeds.

The purpose of this research study is to understand how people think about transport decarbonisation policy. If you are eligible, you will be invited to join a focus group, where you will participate in a structured group discussion together with six to eight other participants. The focus group will take 2h.

No prior knowledge is required to participate! We are keen to understand the views of all residents.

Please fill in the form below to register your interest. If you are eligible for participation in the study, we will be in touch with more details soon.

Your participation in this study is entirely voluntary and you can withdraw at any point until the end of the focus group. You do not have to answer any questions you do not want to.

We believe there are no known risks associated with this research study; however, as each focus group includes multiple participants, those participants will know your responses. To the best of our ability your participation in this study will remain confidential, and only anonymised data will be published. Further information is available by contacting Vanessa Ternes at ee16vt@leeds.ac.uk.

**Section 1**

Contact details

We will use your name and contact details only to share more information about the research with you. Your name and contact details will be kept confidential.

1.Name. (Required to answer. Single line text.)

2.Email address. (Required to answer. Single line text.)

3.I am available to join a focus group in [location] on the following days: (The exact location will be shared with participants later) (Required to answer. Multiple choice.)

- I am available on [time of first focus group]
- I am available on [time of second focus group]
- No, I am not available on these dates.

**Section 2**

About you

We will use your responses below to check your eligibility to participate in the research project, as well as to understand the composition of the focus group. Your responses will be anonymised before being used in the research project.

4.How old are you? (Required to answer. Single choice.)

- 18 - 20
- 21 - 29
- 30 - 39
- 40 - 49
- 50 - 59
- 60 - 69
- 70 and over

5.What is your gender? (Required to answer. Single choice.)

- Female
- Male
- Non-binary / other
- Prefer not to say

6.What is your ethnic group? Choose one option that best describes your ethnic group or background? (Required to answer. Single choice.)

- Asian / Asian British
- Black / African/Caribbean / Black British

- White
- Mixed / Multiple ethnic groups
- Prefer not to say
- Other

7.What is the first half of your postcode? (Required to answer. Single line text.)

8.Which option best describes where you live? (Required to answer. Single choice.)

- Private rented accommodation
- Own property
- Living with family
- Other

9.Which option best describes the kind of building you live in? (Required to answer. Single choice.)

- Flat, in a building with multiple other flats
- Terraced house
- Semi-detached or free standing house
- Other

10.Which of these best describes your employment status? (Required to answer. Multiple choice.)

- Full time employment
- Part time employment
- Self-employed or freelancer
- Student
- Unemployed
- Other

11.What is your income per year, before tax? (Required to answer. Single choice.)

- £0 - £9,999 per year
- £10,000 - £19,999 per year
- £20,000 - £29,999 per year
- £30,000 - £39,999 per year
- £40,000 - £49,999 per year

- £50,000 - £59,999 per year
- £60,000 - £69,999 per year
- £70.000 or more per year
- Prefer not to say

12.Do you own a car? (Required to answer. Single choice.)

- Yes, I own a car
- No, but I have regular access to a car (e.g. via a family member or someone you live with)
- No, I don't have a car

13.If you have access to a car: What type of car is it? (Required to answer. Single choice.)

- Petrol or diesel car
- Plug in hybric
- Other type of hybrid car
- Electric car
- I don't know
- I don't have access to a car
- Other

14.Do you have caring responsibilities for at least one other person? (Required to answer. Multiple choice.)

- Yes, for at least one person under 18
- Yes, for at least one person with a disability or health condition
- Yes, for at least one elderly person
- No
- Other

## 9.7 Longlist of policy options considered for study 2

| **Policy** | **Details, from CCC** (Climate Change Committee, 2020) | **Currently on policy agenda?** | **Effect on decarbonisation?** | **Interesting for focus group?** | **New and interesting research?** | **Fairness implications?** | **Overall suitability as focus group topic?** |
|---|---|---|---|---|---|---|---|
| ZEV mandate and phase out dates | Implement regulation on ZEV mandate, at least as ambitious as given in Transport Decarbonisation Plan, monitoring of delivery against target Clear definition of which cars can be sold after 2030 still | Is put into legislation, but the phase out date has been pushed back again | Large as majority of emissions is from cars. But only in medium to long term, as people will continue using petrol cars for many years after the deadline | Yes as this is tangible and also people who don't drive will have some thoughts on this | Yes. There are papers on car dominance and automobility, and some limited work on how we're overlooking the fairness impacts of EV's. But no research so far on what the public thinks on the fairness of a ZEV mandate. | Yes. Continues car dominance and associated fairness issues. Might affect cost of new vehicles and provision for older petrol cars. Non-drivers might feel left out. | High - EV's are seen as key decarbonisation tool and there's little conversation on the fairness implications of this |
| Plug in grants and taxation gradients | Unsure about what this means for plug in hybrid Taxation based on weight/size/emissions | Unsure | Taxation can incentivise purchase of smaller, less emitting cars | Medium - taxation will not mean much to people who don't drive. | I don't know enough about taxes, or about research on taxes, to judge this. | Yes. Different types of taxation, and the transport outcomes they incentivise, can be fair or unfair to different groups of people | I don't know enough about taxation to fully judge this, or to get excited about this policy. |
| UK battery and car manufacture | Local production, more resilient to global markets (report finds battery cell prices is slightly off track, slightly too high) | | | Too far away from people's everyday life experience for focus group | | | Not suitable. |
| Innovation funding + zero-carbon trials | ? | | | Too far away from people's everyday life experience for focus group | | | Not suitable. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| EV infrastructure strategy | Strategy about charging infrastructure<br>Report observes that some regions have much higher chargepoint density than others<br>Roll out of rapid chargers on major roads network<br>Legislation on better reliability, accessibility, interoperability of public chargepoints<br>Monitor reliability of chargers<br>Reduce cost of public chargers compared to at home charging | Some of this, but I don't know if the government is following CCC recommendations here | Good charging infrastructure needed for EV uptake | Medium - EV chargers would be less interesting for people who don't drive. They might need some priming to think about how this would impact their lives | No. Already lots of research on charger distribution and accessibility, I don't think I'd be able to add much here | Distribution and cost inequalities affect fairness | Low - doesn't fill any research gap |
| Chargepoint grants and support | To increase number of chargepoints | Unsure of whether government plans match CCC recommendations | Good charging infrastructure needed for EV uptake | Medium - EV chargers would be less interesting for people who don't drive. They might need some priming to think about how this would impact their lives | No, already lots of research on charger distribution and accessibility | Distribution and cost inequalities affect fairness | Low - doesn't fill any research gap |
| Enabling private-sector investment | Investment in what? | | | Too far away from people's everyday life experience for focus group | | | Not suitable. |
| Local authority charging plans | How is this different to EV infrastructure strategy?<br>Work towards target of min. 300,000 public chargers by 2030 | LA's are considering charging network. Unsure about whether there's government guidance for them | Good charging infrastructure needed for EV uptake | Low - other charging-related policies would affect people's lives more directly | No, already lots of research on charger distribution and accessibility | Distribution and cost inequalities affect fairness | Low - doesn't fill any research gap |
| Renewable Transport Fuels Obligation | ? | | | Too far away from people's everyday life experience for focus group | | | Not suitable. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Vehicle CO2 regulations | Regulates on the amount of CO2 that a vehicle can emit - increase ambition here. Incentives to reduce vehicle size for manufacturers | Regulations are in place, but CCC calls for more ambition | Yes, but unsure of the magnitude. Surely electrification would have a much larger impact? | Low - CO2 regulations might be too far away from life experience of people who don't drive | Medium | No big controversies here I'd argue? Would anyone other than the car lobby think that these regulations would be unfair? | Low - not interesting or controversial enough |
| Scrappage schemes | ? | No | Would this really make a difference on emissions, given manufacturing emissions of cars? | Yes - I can see how this might be controversial (i.e. why should car owners get money to scrap their cars when non-car owners get nothing) | No, there's probably research on other scrappage schemes already (haven't yet checked though) | Yes, as car owners and non car owners are treated differently | Low, it's not on the policy agenda and I've got doubts over whether this saves emissions if you consider the full life cycle |
| Investment in local and national public transport | Improves network, reliabilty, price Rail electrification | Yes, but probably not enough | Medium, depends on scale of rail electrification and mode shift achieved | Medium. Sounds vague, would need to specify a lot in order to make this accessible for focus group, make lots of assumptions | Medium. This policy covers lots of different themes that surely have been researched on (e.g. size of PT network, reliability) | Depending on where and what for the investments are made. | Medium, and depends on details of investment |
| Fare structures | Lower, more transparent fares for public transport (report observed large price increases in last years) | In parts (e.g. £2 fare cap) | Medium, depending on how much mode shift is achieved | Yes, as this is close to people's everyday lifes, so easy for participants to talk to. | Medium, there already is research on effect of costs on PT use | PT fares have increased more than the cost of driving has | Medium - has fairness implications but isn't the most impactful decarbonisation policy |
| Active travel infrastructure | More infrastructure for walking and cycling | In parts | Low, as short journeys don't contribute as much to emissions as longer journeys | Medium. People might have thoughts on this, but I don't expect this to reveal interesting new insights when I ask for people's | Medium, there's already research on fairness and active travel infrastructure | Medium, as you need to decide where to put infrastructure and as not everyone can cycle | Medium, has fairness implications but isn't the most impactful decarbonisation policy |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | hopes and concerns around the policy | | | |
| Local traffic zones | ?<br>Does this mean low traffic? | Unsure what this policy means? And no details given in CCC report. | ? | ? | ? | ? | ? |
| Rail freight growth | Set a growth target, put in place policies (report says neither of these exist so far) | | | Too far away from people's everyday life experienc e for focus group | | | Not suitable. |
| Car sharing schemes | ?<br>Report mentions trend towards lower car occupancy | | This policy alone will have only little impact on decarbonisation | | | | Not suitable. |
| Multiple-occupanc y lanes | ?<br>Report mentions trend towards lower car occupancy | | This policy alone will have only little impact on decarbonisation | | | | Not suitable. |
| Freight consolida tion | Report mentions increase in van traffic (higher increase than for any other vehicle type) | Don't know much about freight but I think it is | Medium - freight transport is a significant contribution to emissions and this would address some of it | Low, as freight transport isn't directly related to people's everyday lifes | Unsure about state of freight research. But I don't think there's much work on freight and fairness | Low. Some issues around location choice for consolidatio n centres (externalities like noise and traffic) but otherwise unlikely to affect people in ways that could be seen as unfair | Low, as it's not related to people's life experiences |
| Road pricing | Report says that government has no plans for this currently, which risks a mix of different local schemes | Not in legislation but effects of EV uptake on fuel duty income is being discussed | Medium, would depend on cost of driving and on how many trips are avoided or shifted to PT | Medium, this would be interesting for drivers but not for non-drivers | Unsure about state of research here. | Yes, as costs of driving will be distributed differently - this could incentivise different travel patterns and modes | High, as this would affect decarbonis ation and fairness. But would need to make it interesting for focus groups. |

Table17 - Longlist of policy options, derived from recommendations by the Climate Change Committee (2020). Assessed for suitability to the research by the researcher.

## 9.8 Longlist of ZEV mandate policy documents

| Document | Release date | Notes |
|---|---|---|
| UK plan for tackling roadside nitrogen dioxide concentrations: An overview | 2017 | Dates first mentions of ZEV policy to 2011.<br>Reconfirms ambition to end sale of ICE vehicles in 2040. |
| Consultation on ending the sale of new petrol diesel and hybrid cars and vans | Feb 2020 | Consultation on "bringing forward the end to the sale of new petrol and diesel cars and vans from 2040 to 2035, or earlier if a faster transition appears feasible, as well as including hybrids for the first time." (Department for Transport, 2021a). Cites Climate Change Committee advice as motivation to bring the end date forward. |
| Outcome and Government Response | 2020 | Outcome of the consultation from February 2020. Describes that, following consultation responses, the end date for the sale of new ICE cars and vans will be brought to 2030, and from 2035 all new cars and vans need to have zero tailpipe emissions. |
| Ten point plan for a green industrial revolution | Nov 2020 | Describes the shift to zero emission vehicles as one of ten key policy areas to rebuild the economy in a greener way following the pandemic. |
| **Green Paper for a New Road Vehicle Regulatory Framework in the UK** | 2021 | Introduces a consultation on details of the ZEV policy design. The consultation seeks input, among others, on the technical and emission standards that vehicles have to meet to be eligible for sale after 2030. |
| **Outcome and response to ending the sale of new petrol, diesel and hybrid cars and vans** | Apr 2022 | Outcome of the consultation from 2021. Describes that from 2024 onwards, manufacturers have to sell an annually increasing percentage of zero emission vehicles. |
| Technical consultation on policy design features | Apr 2022 | Consultation on technical policy features, including uptake trajectories for ZEV vehicles and trading, banking and borrowing of ZEV certificates between manufacturers. |

| | | |
|---|---|---|
| Government response and outcome to technical consultation on zero emission vehicle mandate policy design | Mar 2023 | Outcome of the consultation from April 2022, describing technical details of the policy. |
| **Zero Emissions Vehicle Mandate and non-ZEV Efficiency Requirements Consultation-stage Cost Benefit Analysis** | Mar 2023 | Formal cost benefit analysis of the proposed policy. |
| **Consultation on a zero emission vehicle (ZEV) mandate and CO2 emissions regulation for new cars and vans in the UK** | Mar 2023 | Describes proposed ZEV regulations alongside CO2 regulations for non ZEV vehicles. Consults on policy design features as they emerged from the April 2022 consultation. Most questions are phrased as yes/no questions, seeking approval of the proposed policy details. |
| **Zero emission vehicle (ZEV) mandate consultation: Summary of responses and joint government response** | Sep 2023 | Summary of responses to March 2023 consultation. Describes that, following consultation, "The ZEV mandate scheme's function is unchanged." (Department for Transport, 2023e) |
| **Zero Emission Vehicle Mandate and $CO_2$ Regulations Joint Government Response Cost Benefit Analysis** | Oct 2023 | Final cost benefit analysis following consultation from March 2023. |
| **Pathway for zero emission vehicle transition by 2035 becomes law** | Jan 2024 | Official announcement of ZEV mandate policy.<br>Here, the policy content suddenly changes: Previously, the sale of new ICE cars and vans was to end in 2030, and from 2035 all new cars and vans were to have zero tailpipe emissions. In the policy announcement, it is now described that "80% of new cars and 70% of new vans sold in Great Britain will now be zero emission by 2030, increasing to 100% by 2035" (Department for Transport, 2024). |

| | | |
|---|---|---|
| Consultation on Phasing out sales of new petrol and diesel cars from 2030 | Dec 2024 | Consultation on moving the phase out of ICE vehicles back to 2030. Done under new Labour government. |
| Phasing out sales of new petrol and diesel cars from 2030 and supporting the ZEV transition: summary of responses and joint government response | Apr 2025 | Outcome of consultation from December 2025. Confirms ambition of government to phase out the sale of new ICE vehicles by 2030. |

Table 18 - Overview of government documents detailing the development of ZEV policy. Documents in bold are analysed in this research.

## 9.9 Workshop facilitation script

- **Useful bits of information**
- Always approach people by name
- Have a little seating chart ready. Add names, and one thing they said, so I've got something I can use to directly ask a participant a question
- Have name badges, fun pens and fidgety things like pipe cleaners, plasticine, post its on all tables
- Do things with confidence and the group will follow along
- Instructions can be easier for people than open questions. E.g. "describe, take me through, tell me about…". Avoid "why, how…" at the beginning

- **Preparing myself before workshop**
- *Reminders to myself*
- I am leading this group.
- I am allowed to interfere and direct the group.
- I can be confident.
- I've got this.
- People might say things that don't align with my views or values. That's great actually, I'm here to capture that. I stay neutral.
- *Preparation before each session*
- Review the research goals
- Remind myself that I'm prepared and capable
- Set aside quiet time for myself

- **Preparation – at the venue**
- Set up tables and whiteboard
- Put group rules on the wall (see rules below)
- Set up snacks and drinks
- Put stationery and fidgets on the table

- **Welcoming participants**
- Greet everyone as they come in
- Introduce myself
- Invite them to grab snacks and drinks, have a seat
- Once I start the focus group, greet everyone and kick off the session

- **Housekeeping**
- To tell to participants:
- If you need to grab a drink or snack, or go to the bathroom, you can do so any time. If you need anything else, please talk to me.

- As I said in the invite, this will take 2h so we'll finish at xx:xx. I know you might have other things to do so I'll moderate the workshop to make sure we stay on time and can leave at xx:xx. Does that work for you?
- Confidentiality: Everything we discuss here stays in this group. Please don't tell other people about what others have said here.
- What will happen today
- Go over plan for the session step by step
- Explain that each participant has a booklet to make notes in at any time
- Explain that there is stationery on the table for people to use

- **Group rules**
- The rules are as follows:
- We'll create and hold space for everyone to contribute.
- Your contributions really matter and I came here because I'm really keen to hear from all of you. To give everyone the chance to contribute, I'd like to invite you to speak. You can always say "I don't know".
- I am capturing everyone's views. If one view doesn't resonate with you, that's okay. You can then add your own view too.
- While I'm writing, you have thinking time. Then I can give you full attention once I'm done writing.
- Focus on your own story.
- Ask group if they want to add rules. Then ask if they all agree with these.

- **Consent forms**
- Explain that we will now go over a consent form to comply with university regulations
- Hand out forms, go through them with group, give participants a few minutes to read and sign

- **First exercise**
- (Shortened for this document)
- Participants get presented with some information, then they have a few minutes to write ideas on post it notes.
- I gather their post its and cluster them.
- While I cluster them, I ask participants to chat to their neighbour about how they travelled to the focus group today.
- Mindmapping
- Add the largest cluster onto the mindmap, invite participants to explain why this connects to the theme in the middle of the mindmap
- Add connections as they are being brought up
- Refer to conversation tools below where needed

- **General conversation tools and strategies**
- *Someone goes into a long monologue or makes a contribution that feels very unrelated to the topic (or both)*

- Rule for me: I will interrupt people when I don't understand how their contribution relates to the research question.
- Approach
- Start with puzzled look and gesture
- "[name}, can I just interrupt you here" (British indirectness is okay here) Alternative: "I'd just like to interrupt you here"
- When I need to hold more power
    - "There's a lot of detail here. I'm looking for a short phrase I can put on the mindmap. How would you summarise this?"
- When I want to give power to participant
    - "I don't see how this connects to the mindmap. Could you explain how this connects?"
- When they repeat themselves: Try really hard to find something relevant to add to the mindmap. Check with participant, say "I'd like to summarize this as …" while looking at them, then write it down.
- If they continue monologue
    - Interrupt again (same strategy as above)
    - Body language, turn away from the speaker
    - Option to take power away from speaker: "Does anyone else want to comment" (or similar)
        - Look for body language, does someone want to speak. Bring them in, mention their name
    - Option to stop rant, as a last resort "I can see how this is really important to you. However in the ground rules we said that I'll keep this workshop to time, and there are more contributions to the mindmap I'd like to hear. Let's chat more after the workshop"

- *Someone interrupts other participants*
- Approach
- Gesture alone can work here, lift hand to interrupter and look at speaker.
- Immediate response: "Hold on, I want to hear the full point that [name] is making"
    - Direct interrupter to notebook: "If you want to be sure that you remember your point, you can write it down
    - "I want to finish listening to [name] now and capture their point on the mindmap"
- Smile!
- For enthusiastic people: Appreciate their energy and contribution. Direct them to notebook.
    - "It's great that you have so many thoughts. Please could you make a note of them for now and I'll get back to you after I listened to [name]"
- For disagreement: Body language! Face and smile at person that was initially speaking.

    - Quickly bringing attention back to initial speaker: “I can see you’re not in agreement and we’ll come back to that”. Go back to capturing initial speaker’s point
    - If more interruptions happen, I can use gesture and body language. Show confidence!!!
    - Once initial speaker has made their point and I captured it, I can call a quick break if needed. In the break, I can have a quick word with the interrupter, to remind them of the ground rules.

- *Someone disagrees with someone else (is precursor for some other scenarios here)*
- Approach
- If there is an interruption, deal with that first (see above)
- “My research is about views and perceptions, so every view is welcome and valid.”
- “I’m here because I’m curious about all of your views on this topic. [name], you view is this [summary]. It sounds like you [other name] have a different view – great, more for us to put on the mindmap. What do you think?”
- If there is disagreement on some objective facts, I can bring in my knowledge, make reasonable assumptions, or direct the conversation away from it. If I am unsure, I can explore both possible answers.

- *Someone disagrees with me*
- Approach
- For genuine helpfulness attempts:
    - Ask them to email me later. “Thank you. If this feels important to you, could you please email it to me after the focus group?”
    - “We know that…” / “Research has shown that…” “There are open questions on xxx but they don’t influence this research”
    - “I’m not here to gather facts, but to listen to all of your thoughts”
- For point scorers:
    - Remind myself that I hold the power and they are insecure. Knowing smile
    - If this happens during the mindmap: “You tell me how I can put this into the mindmap”. Afterwards “It’s great to hear lots of different views here. Who else would like to share their view?”
    - If this happens when I set out my policy: “The goal of my research is to study your reactions and thoughts on this policy scenario. So I will first set out the scenario, and the rest of the workshop will be about your views.” Go back to explaining the policy.
    - Expect them to zone out a bit or continue with their games. Imagine them as an annoying kid in scouts.

- *Someone is rude*
- Approach
- Observe reaction of group to gauge what is and isn’t acceptable

- If there's another "issue" with the statement, I focus on resolving that (e.g. someone interrupts someone else)
- If participants are rude through e.g. sighs, attitude, body language
    - Can ignore single instances
    - Body language, puzzled look at them
    - "[name] is there something you want to say?"
- If someone gets defensive and says "I'm entitled to my opinion". "Yes, you are entitled to your opinion. And [name] is entitled to their opinion too. So I'll finish listening to this person, and afterwards you can share your view"

- *Someone says things that are strongly against my values, that are derogatory*
- Approach
- For things that are sort of on the edge of what's okay: Invite people to talk about their own life and experience. "Can you explain to me how this relates to your life", "Can you tell me about an experience you had here"
- For very negative statements: "I'm just pausing here as this is an opinion that might hurt other people. I don't know you all well, but I want to be careful." Refer back to ground rule of holding a space for everyone.
    - Either refer back to previous point, ask about impact to their lives. "Can you give me an example of how this has affected your life?"
    - Or side step, ask what other things come to mind for them. "I'll write this down on here for now and we might come back to it later. For now, could you give me another thought you have around this topic?"

- *Someone leaves midway through session*
- Approach
- Acknowledge the situation. Depending on what happens "Life doesn't always go to plan" or "I'll give [name] a few minutes to themselves"
- Direct the group back to the mindmap "We just looked at this point and [name] said that… Who wants to add to this?"
- If group is worried about the person, I can say that I'll contact them afterwards

- **Wrapping up the session**
- If there is lots of energy when we're approaching the end, invite participants to leave notes in the notebook
- If the energy fades a bit early, it's okay to wrap up the session a bit earlier too
- Thank participants for their time and contribution

## 9.10 Age and gender distribution of participants

| Characteristic | Survey response option | Share of participants |
|---|---|---|
| Age | 18-20 | 1.9% |
| | 21-29 | 22.6% |
| | 30-39 | 28.3% |
| | 40-49 | 17.0% |
| | 50-59 | 17.0% |
| | 60-69 | 7.5% |
| | 70 and over | 5.7% |
| Gender | Female | 60.4% |
| | Male | 35.8% |
| | Non-binary/other | 3.8% |

Table 19 - Age and gender distribution across all participants. Information retrieved from pre-screening survey.

## 9.11 Raw data obtained from workshops

### 9.11.1 Photograph of a diagram developed during a workshop


Figure 12 - Photo of the diagram developed during the workshop with the Environment group

### 9.11.2 Digitised diagrams from the workshops

The diagrams were digitised after the workshops. Please note that the diagram from the student workshop looks different as a different software was used.

In the Student diagram, variables brought up during the initial discussion are marked in yellow, in the other diagrams they are marked in blue. In all diagrams, the fairness variables are marked in pink.

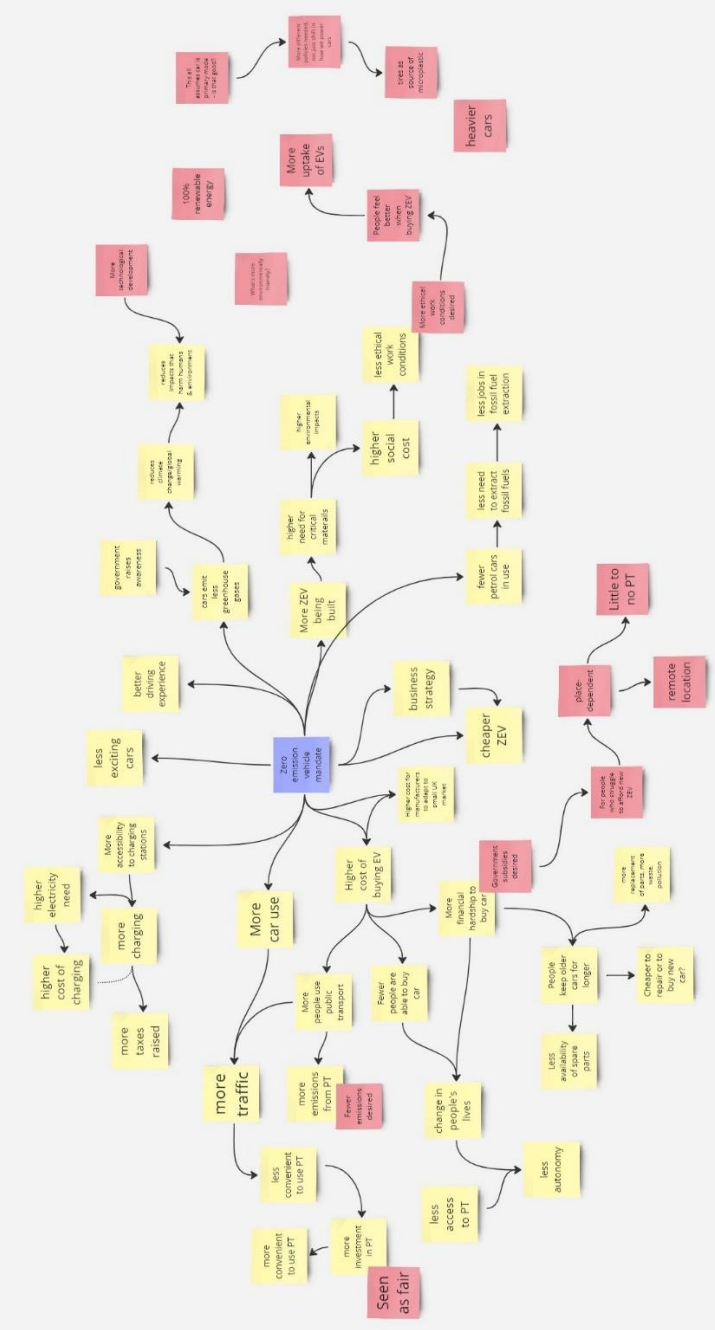


Figure 13 - Diagram from workshop with Students

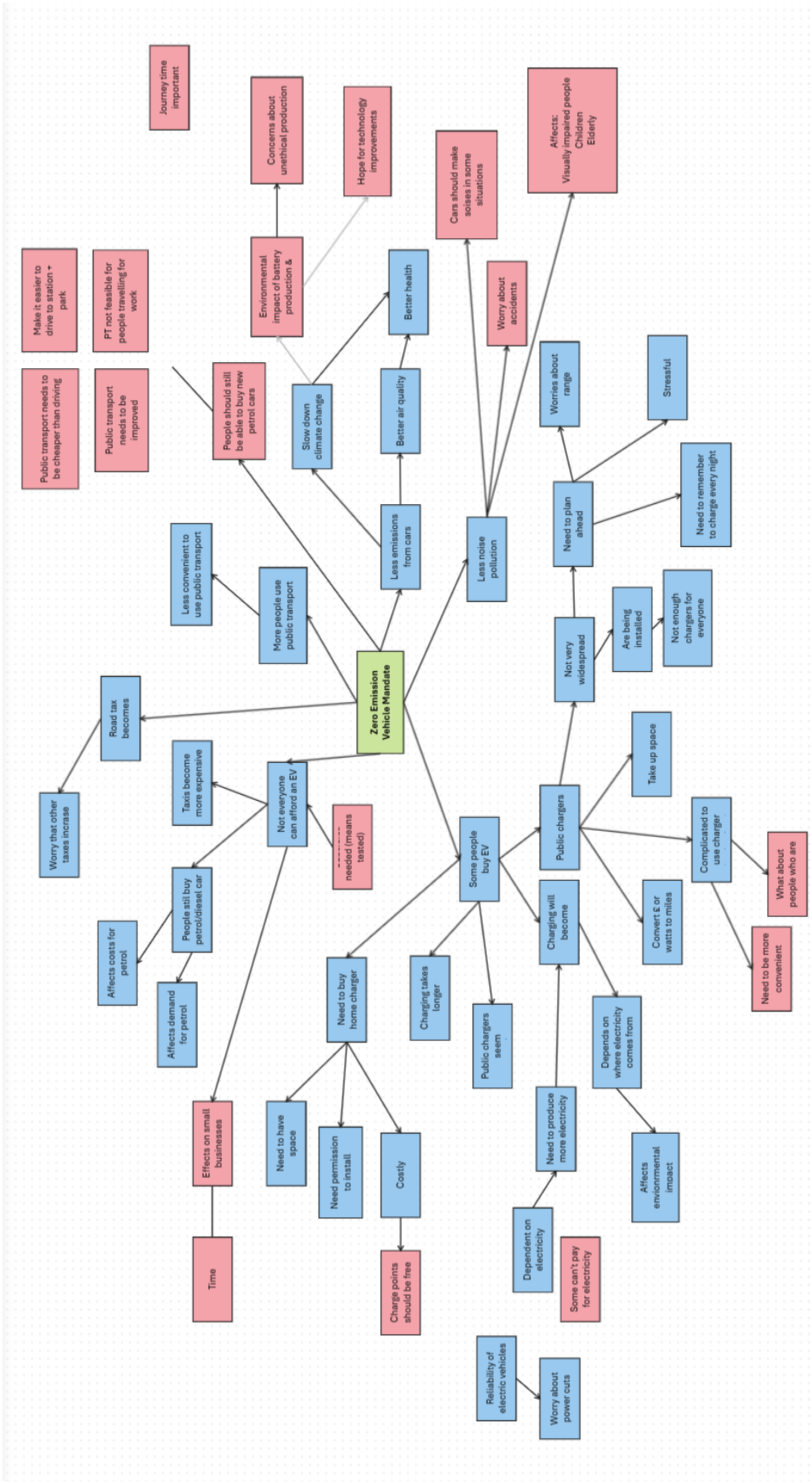


Figure 14 - Diagram from group Alwoodley 1

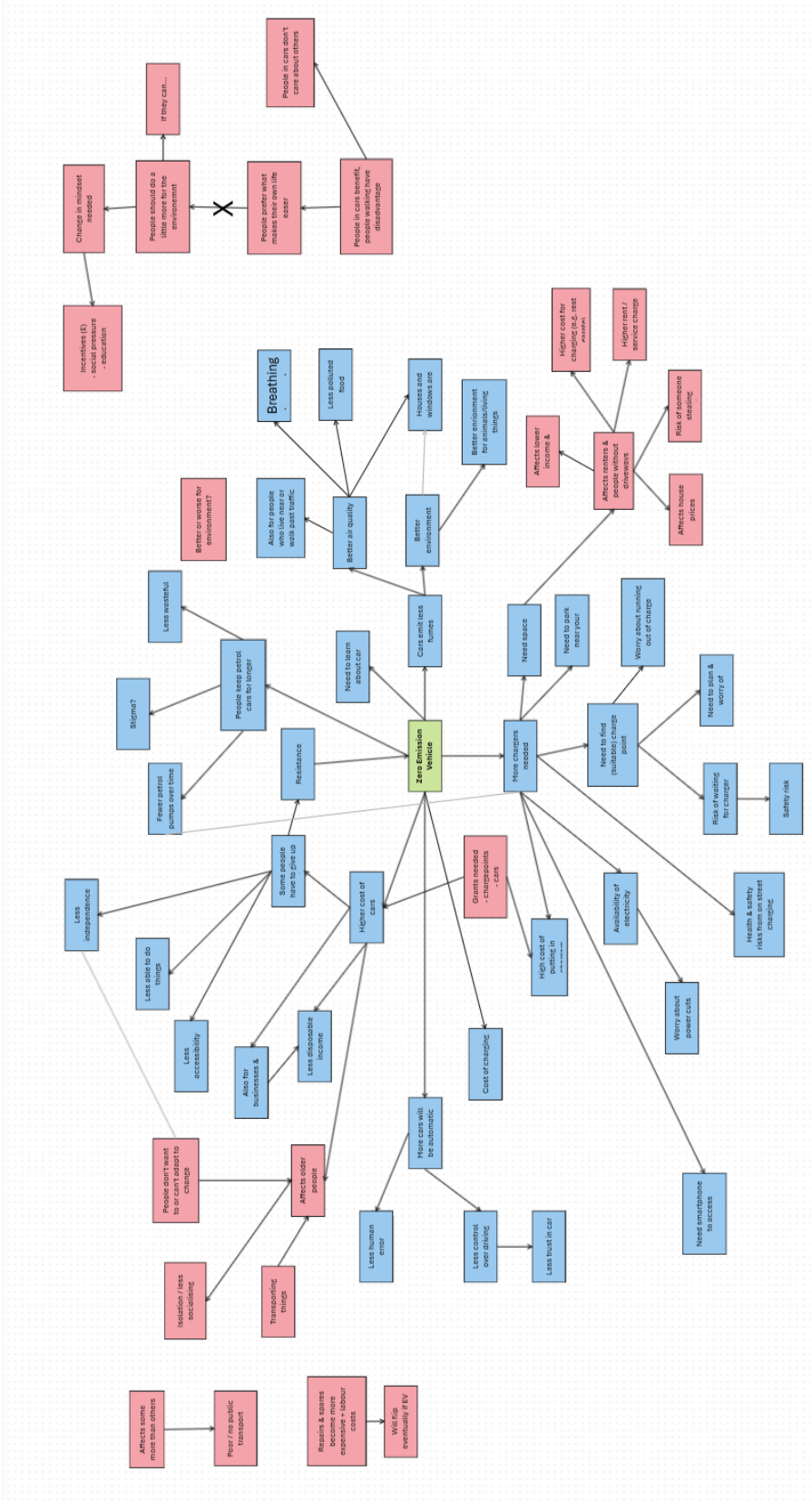


Figure 15 - Diagram from workshop Alwoodley 2

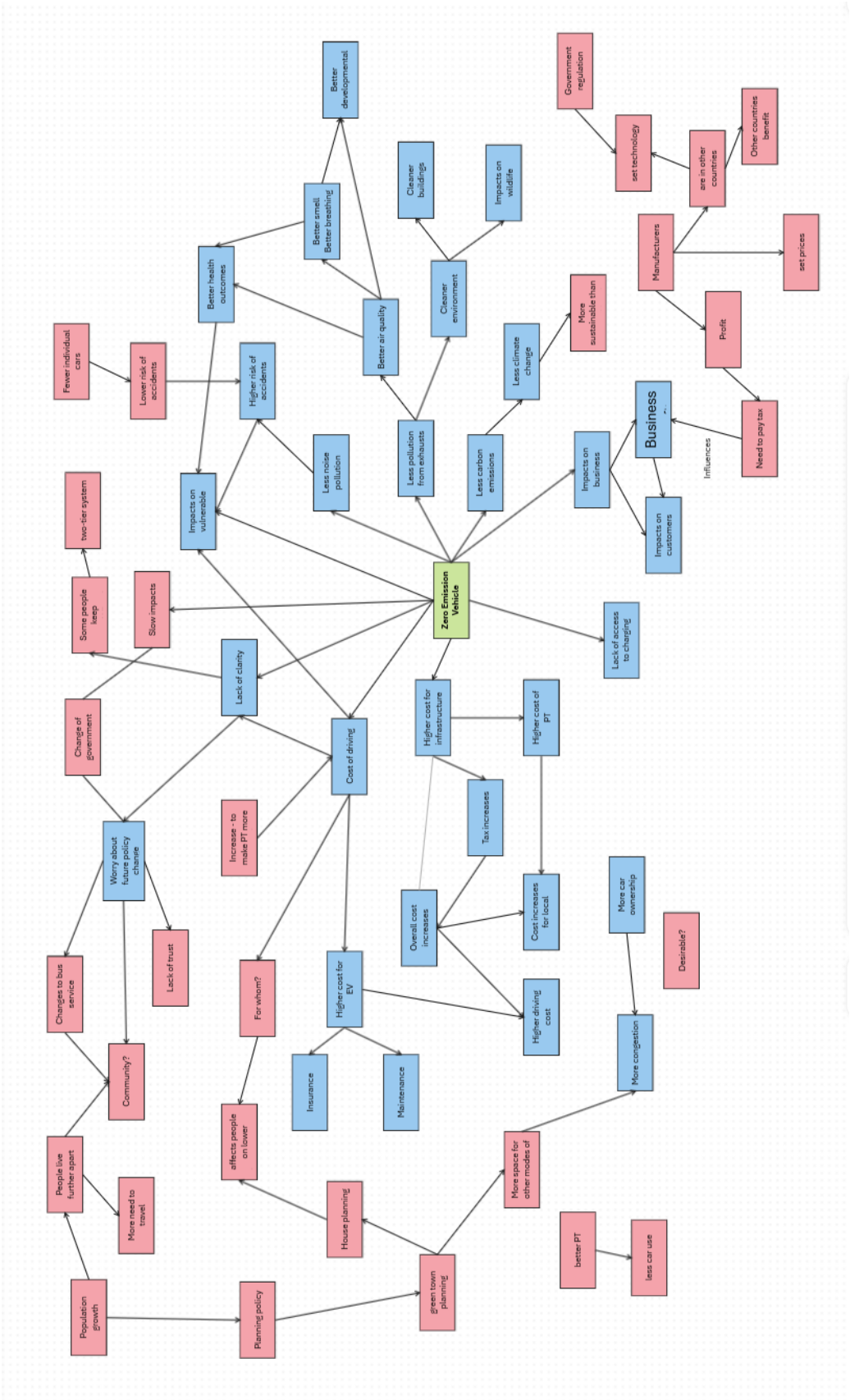


Figure 16 - Diagram from workshop City Centre 1

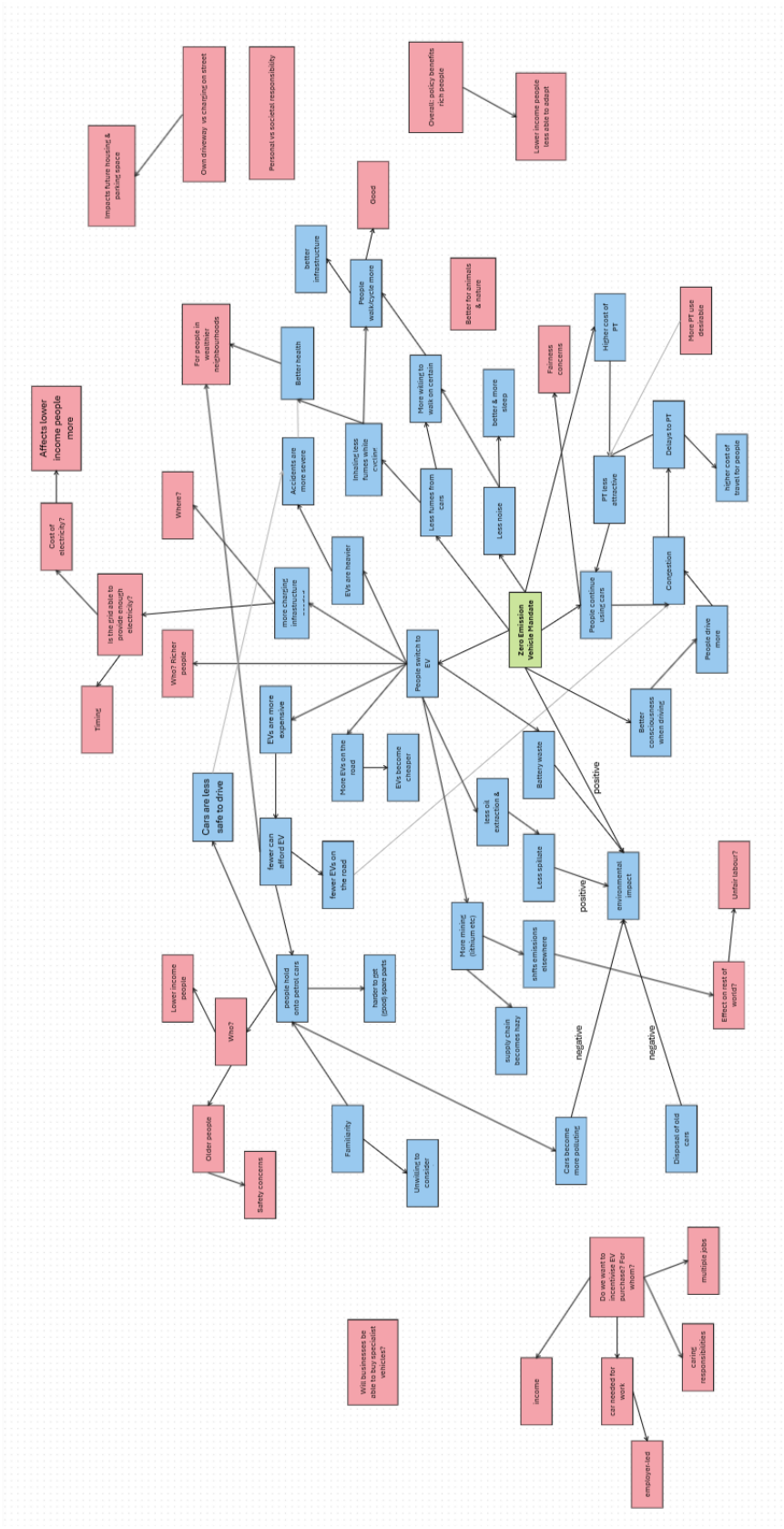


Figure 17 - Diagram from workshop City Centre 2

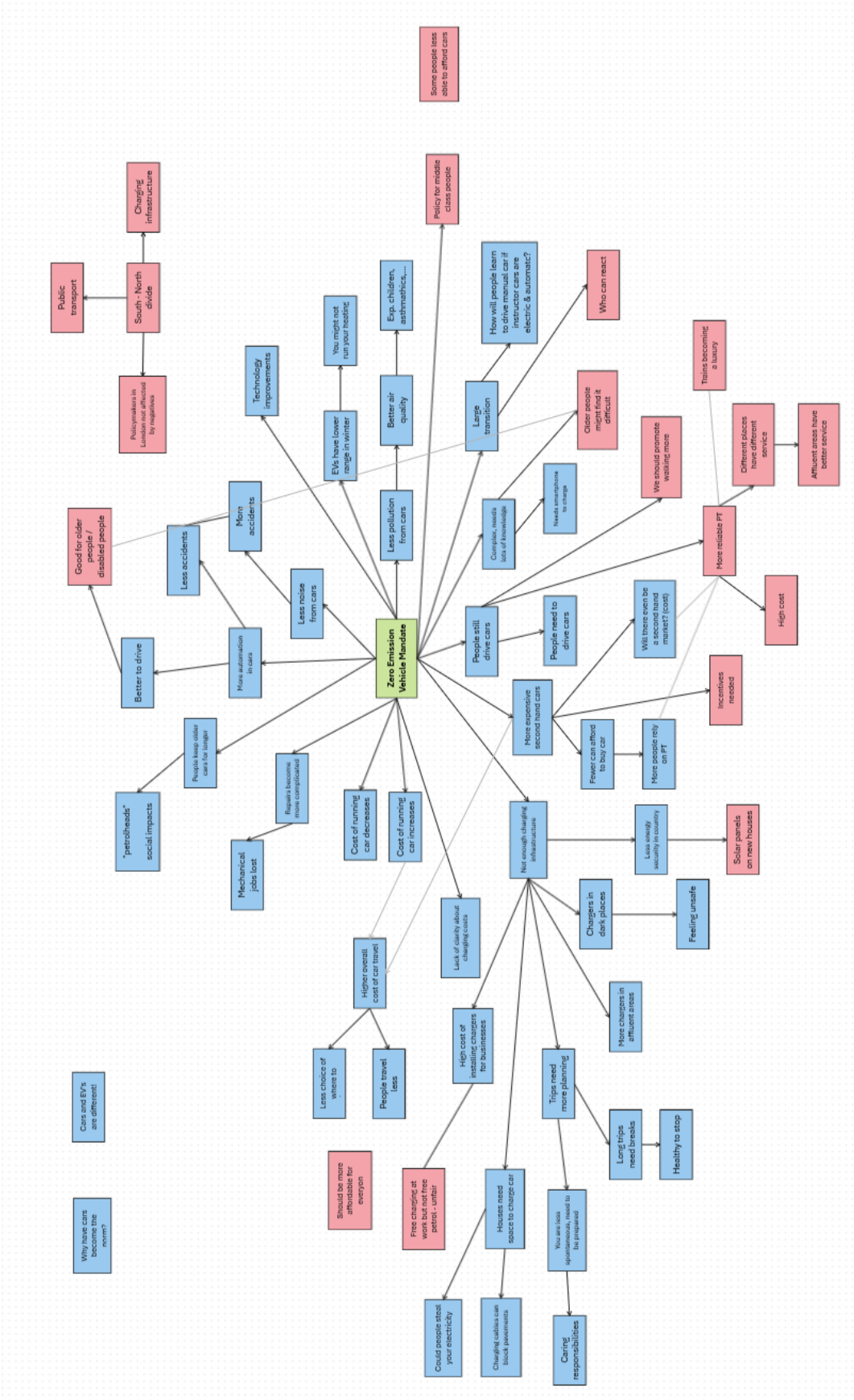


Figure 18 - Diagram from workshop Kippax 1

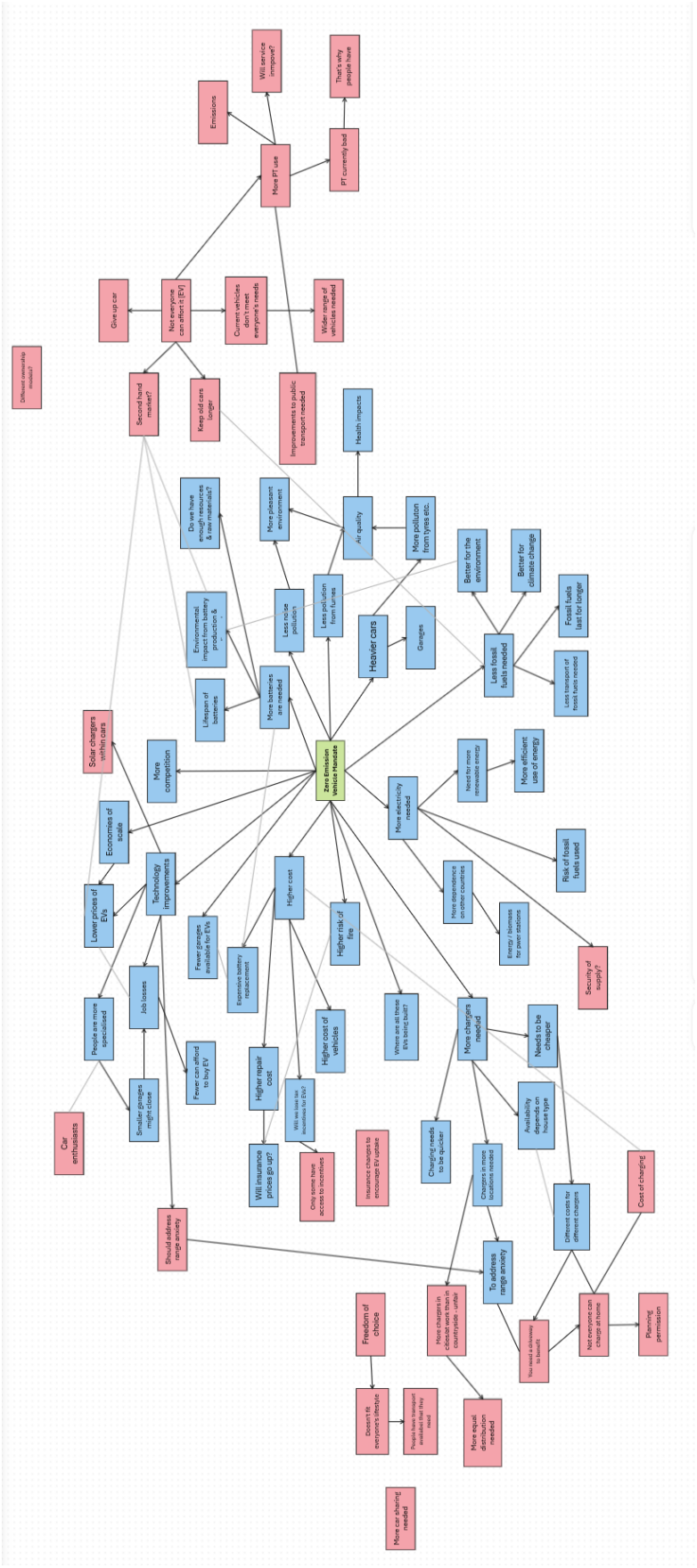


Figure 19 - Diagram from workshop Kippax 2

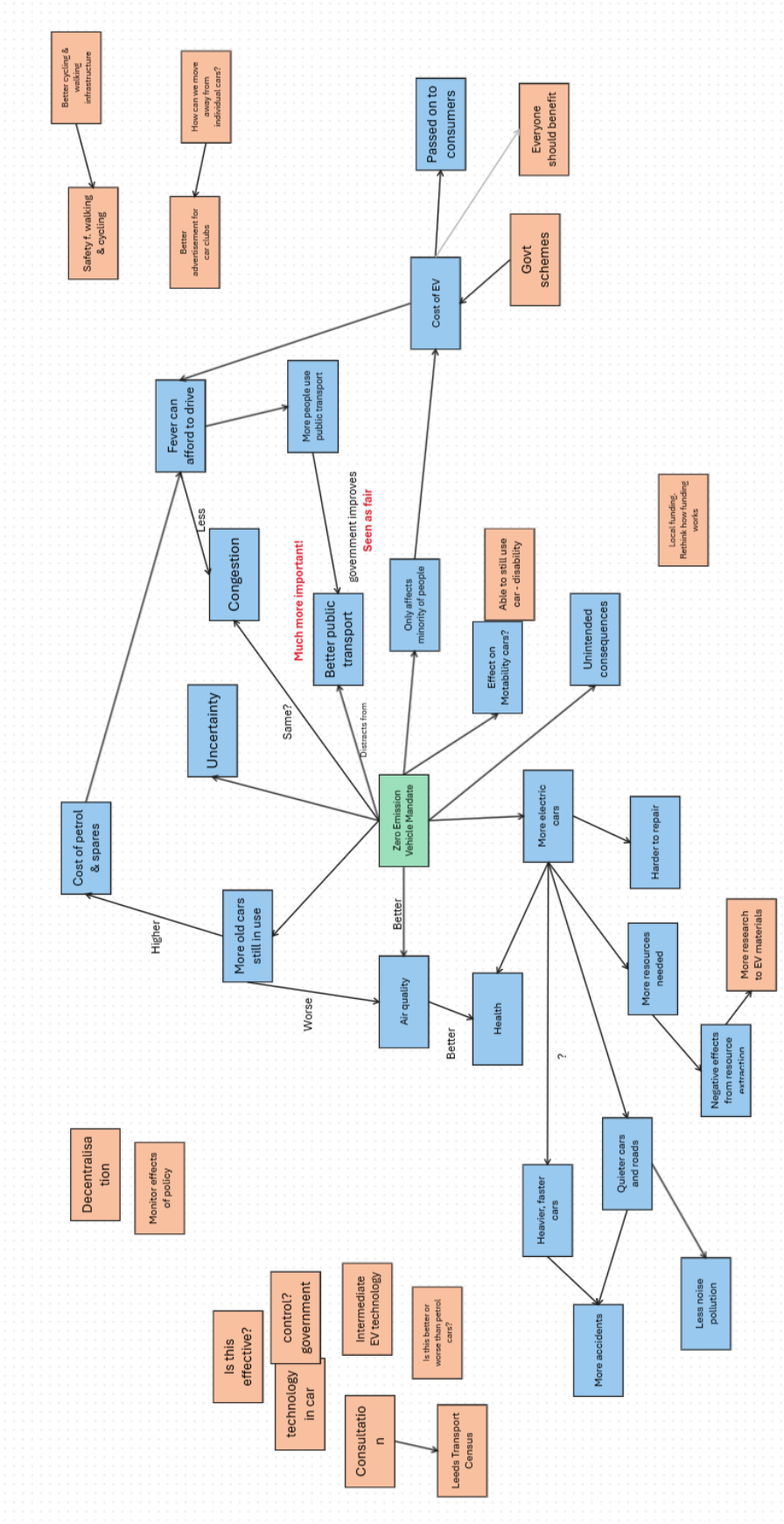


Figure 20 - Diagram from workshop with Parents and Carers

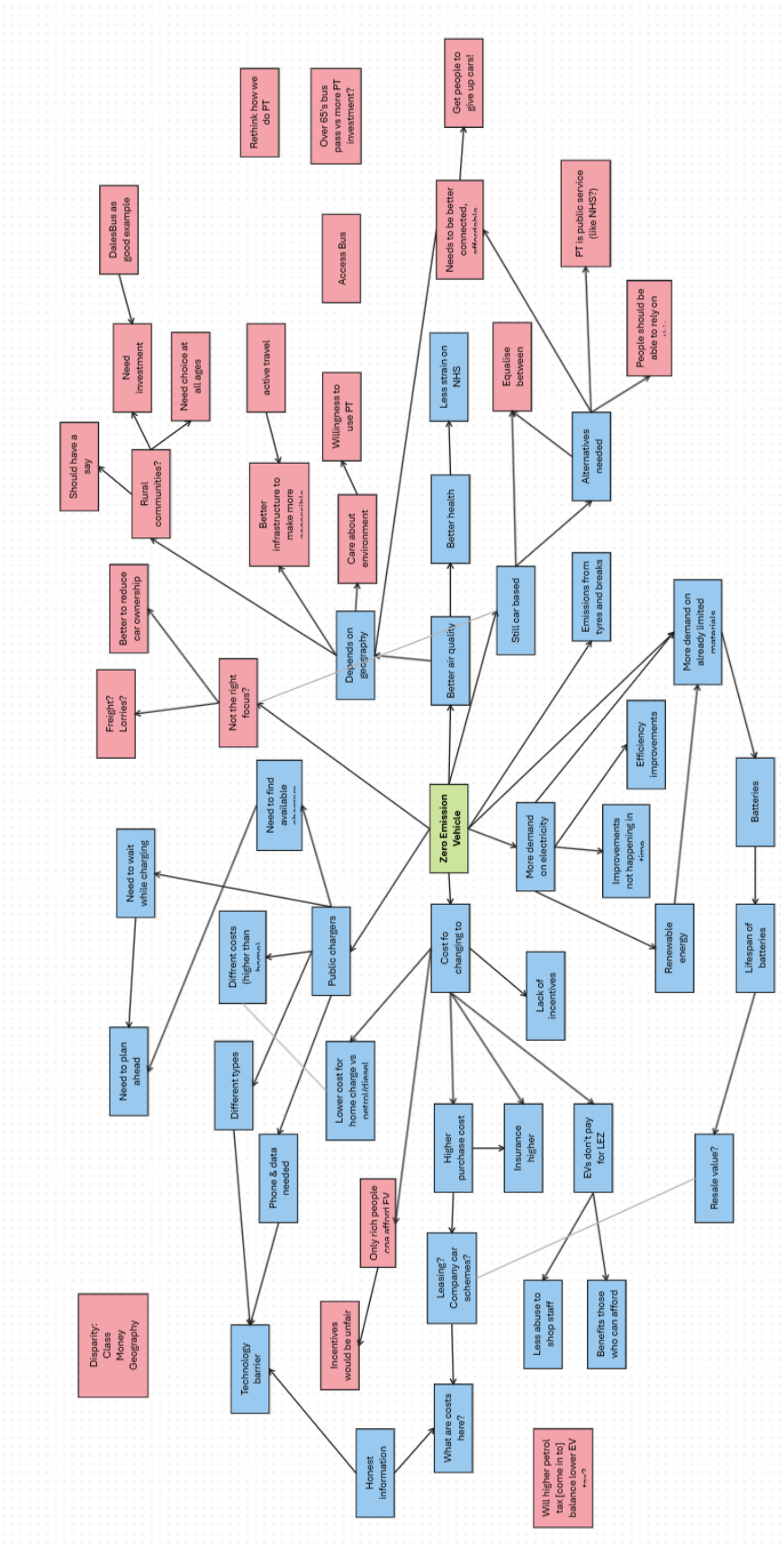


Figure 21 - Diagram from workshop with Environment group

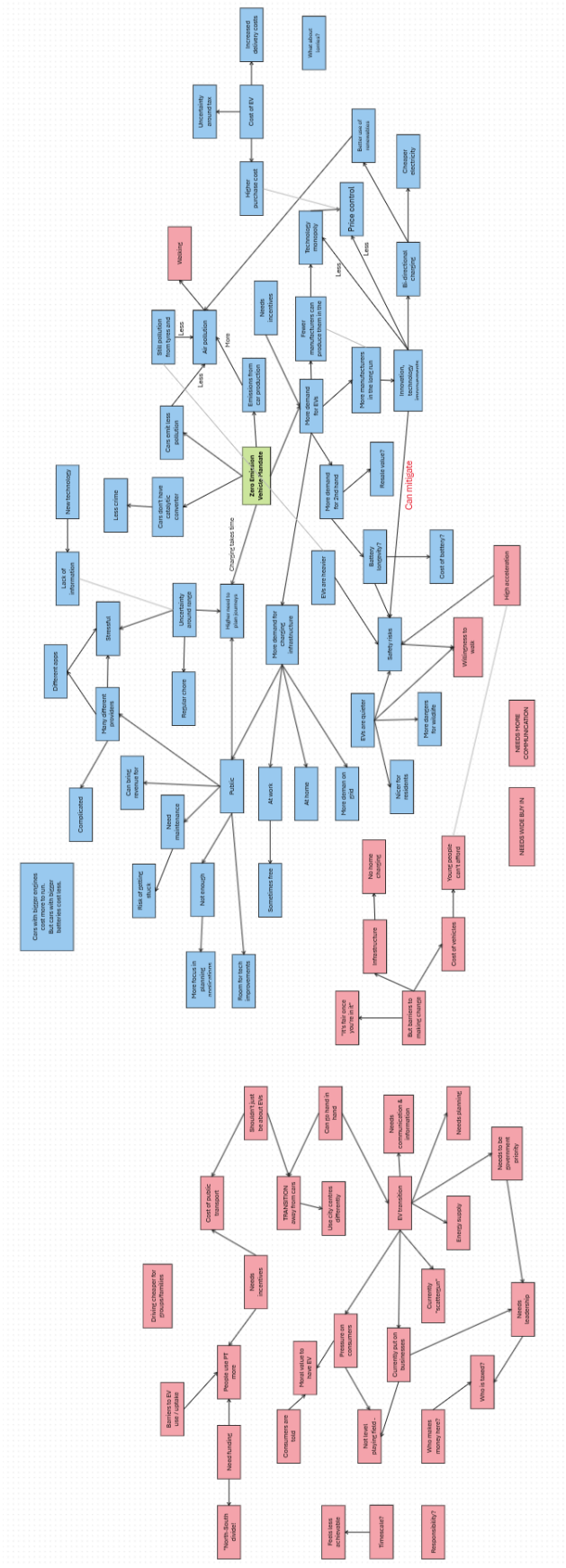


Figure 22 - Diagram from workshop with EV drivers

## 9.12 Causal Loop diagrams obtained from workshops

### 9.12.1 Alwoodley 1

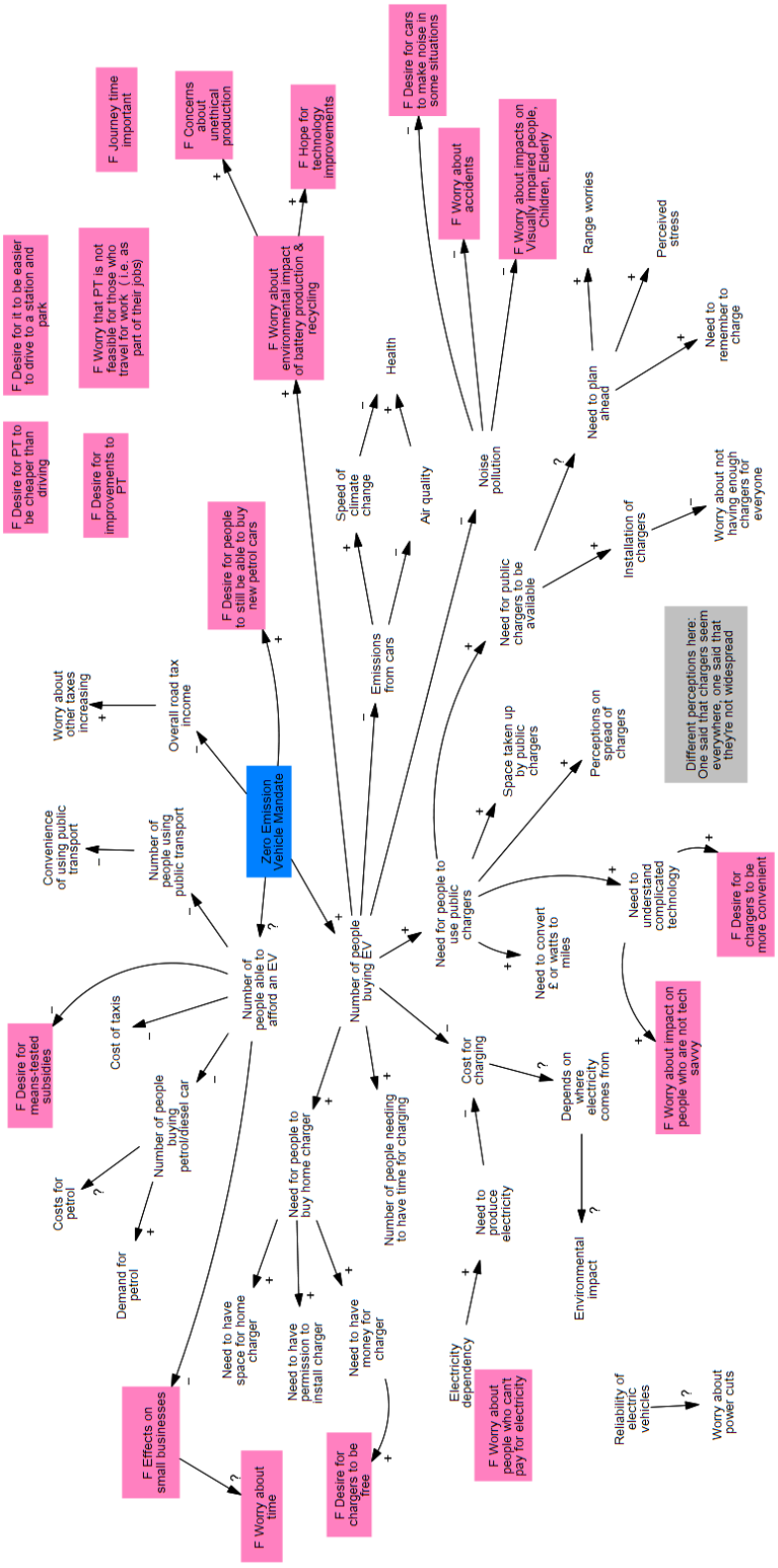


Figure 23 - CLD from workshop Alwoodley 1

## 9.12.2 Alwoodley 2

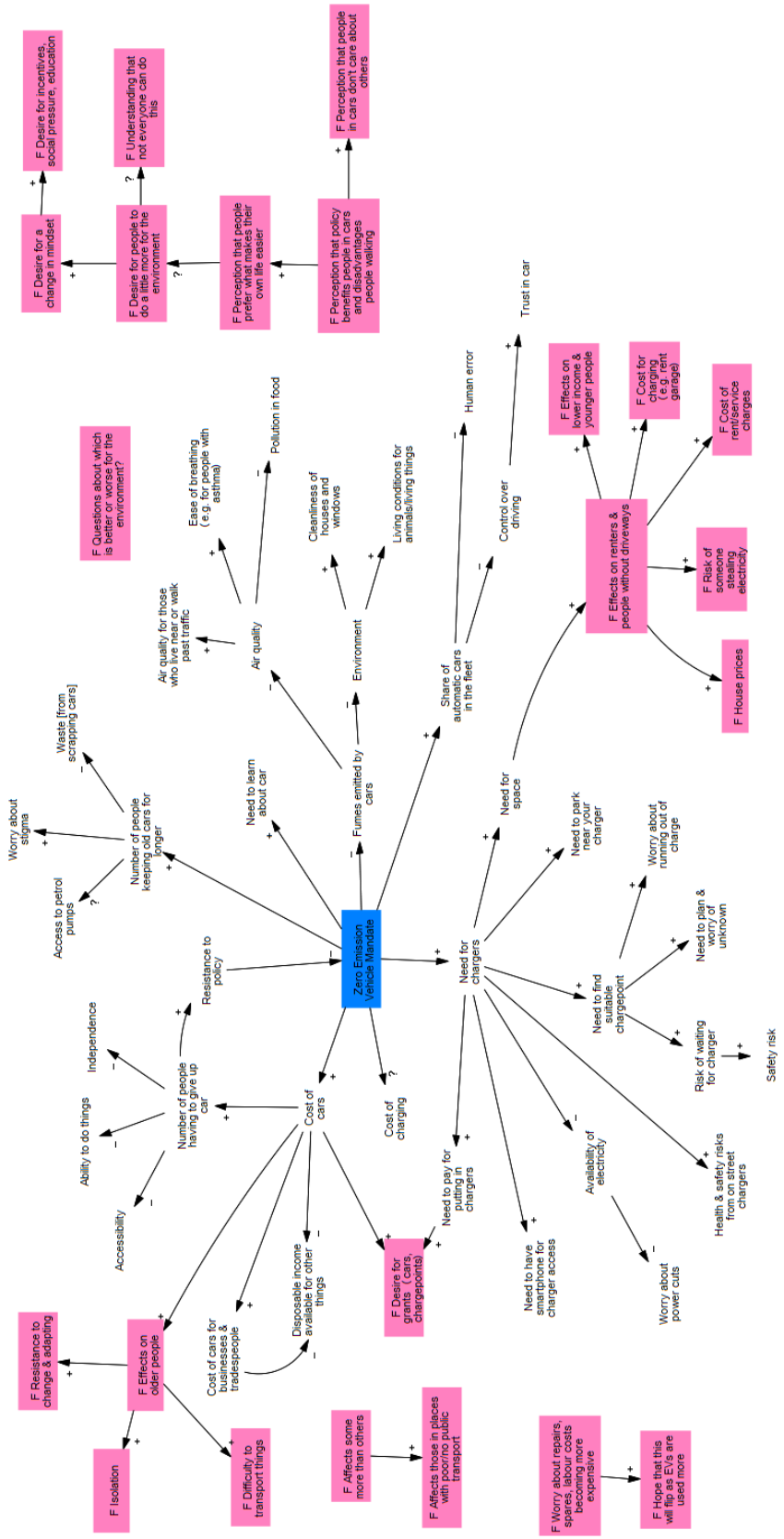


Figure 24 - CLD from workshop Alwoodley 2

## 9.12.3 City Centre 1

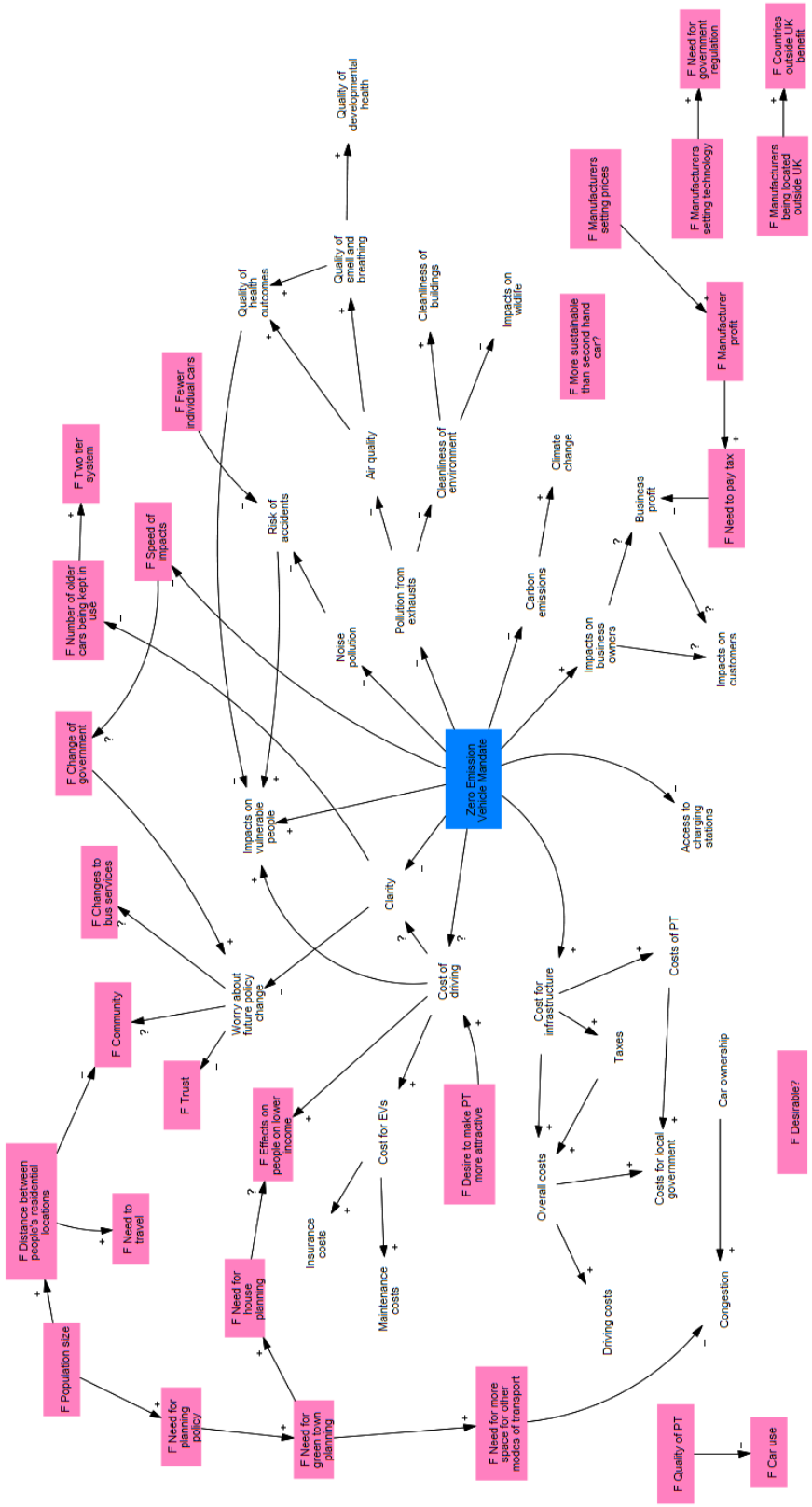


Figure 25 - CLD from workshop City Centre 1

## 9.12.4 City Centre 2

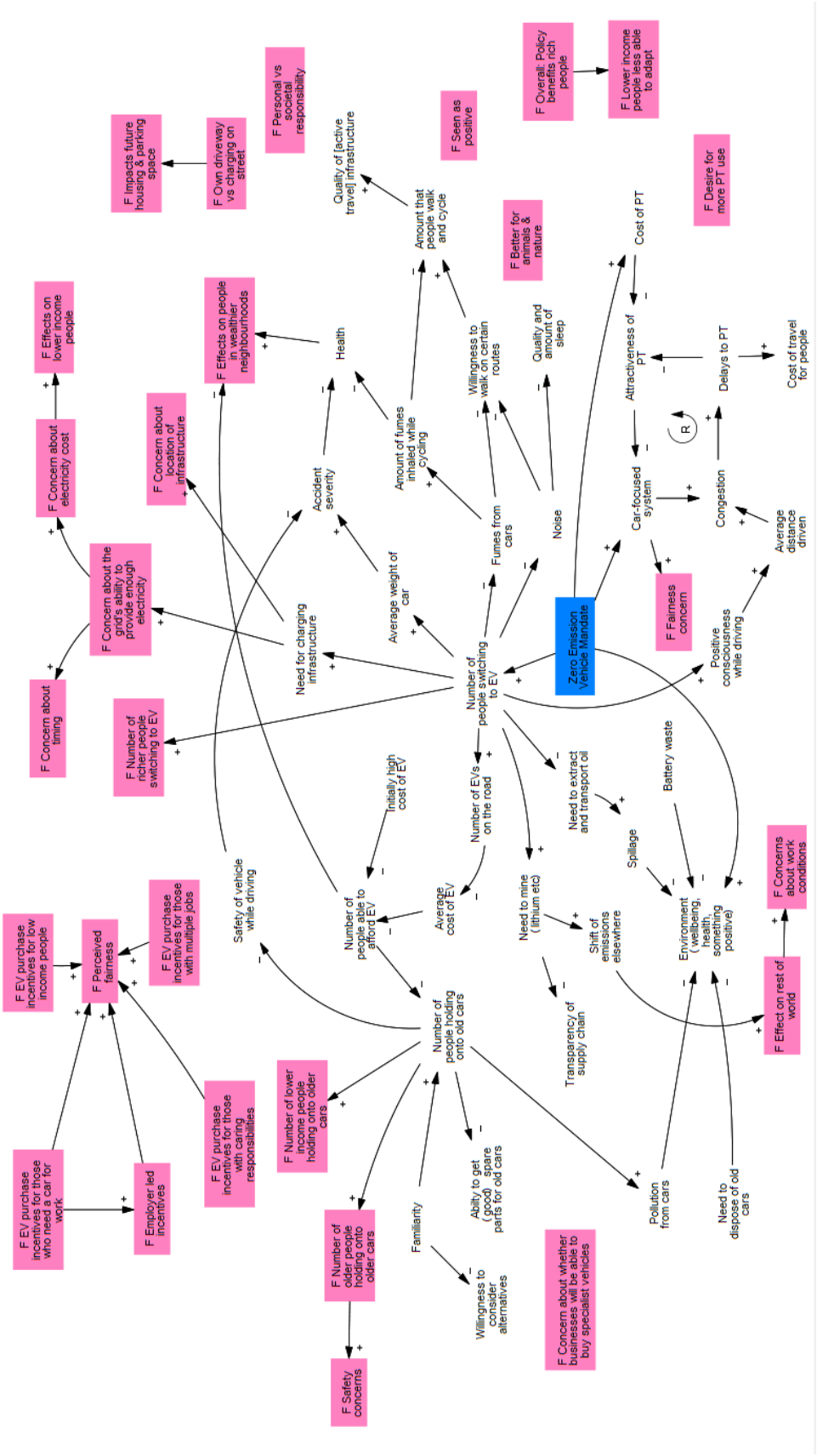


Figure 26 - CLD from workshop City Centre 2

## 9.12.5 EV group

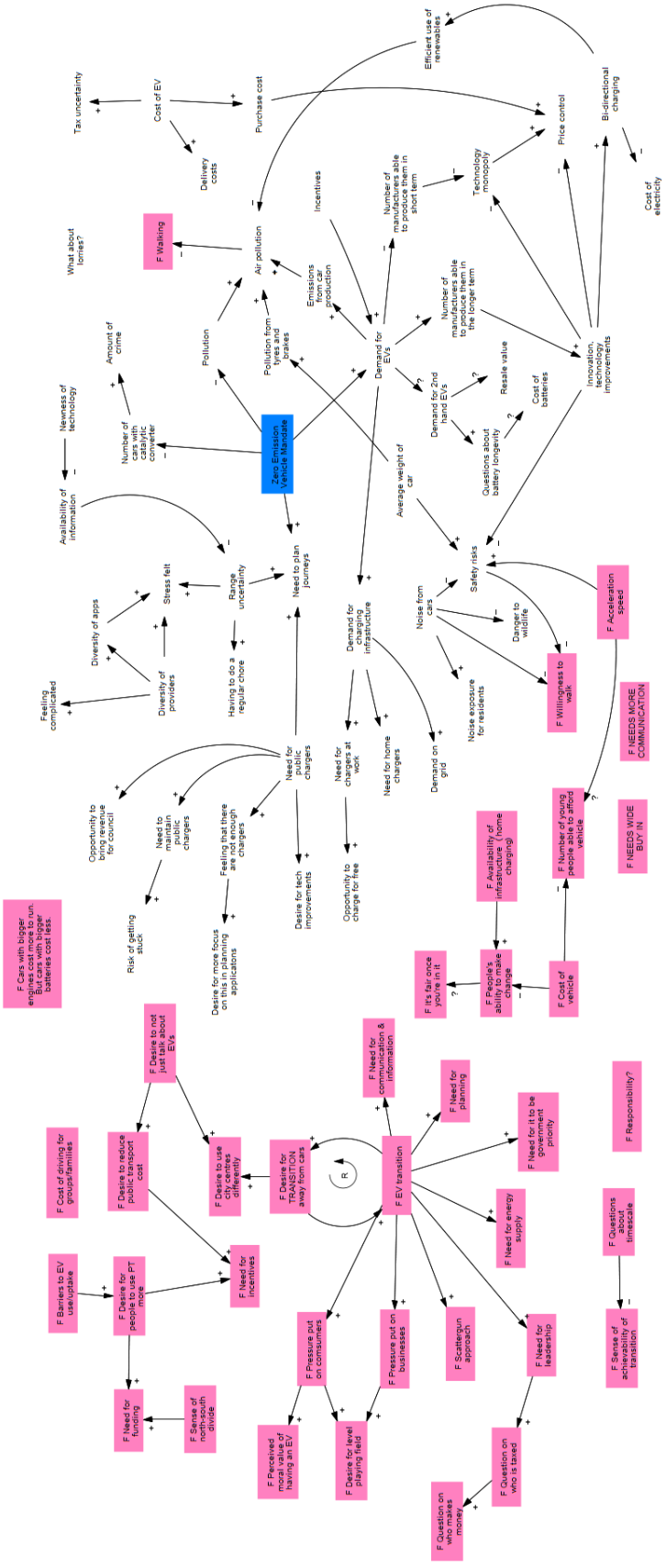


Figure 27 - CLD from workshop with EV drivers

## 9.12.6 Parents and Carers

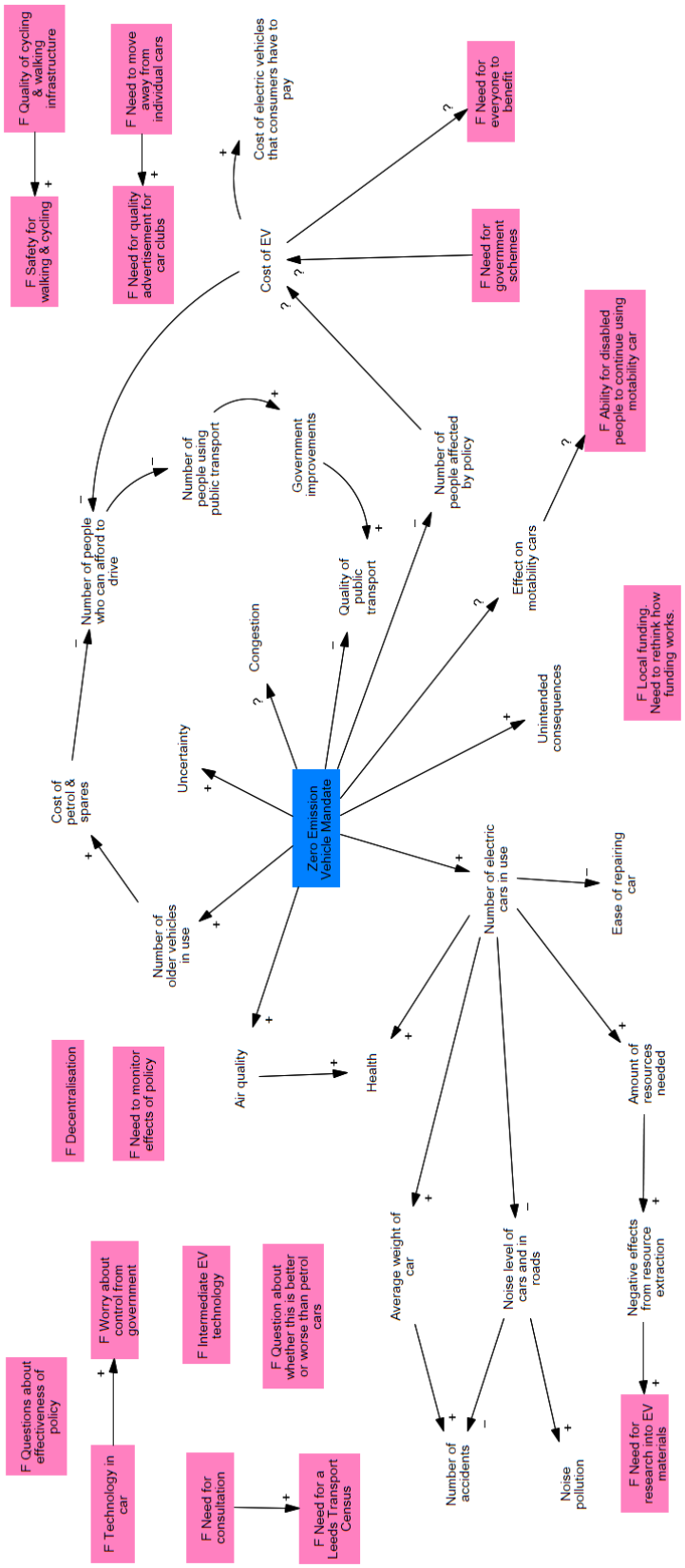


Figure 28 - CLD from workshop with Parents and Carers

## 9.12.7 Kippax 1

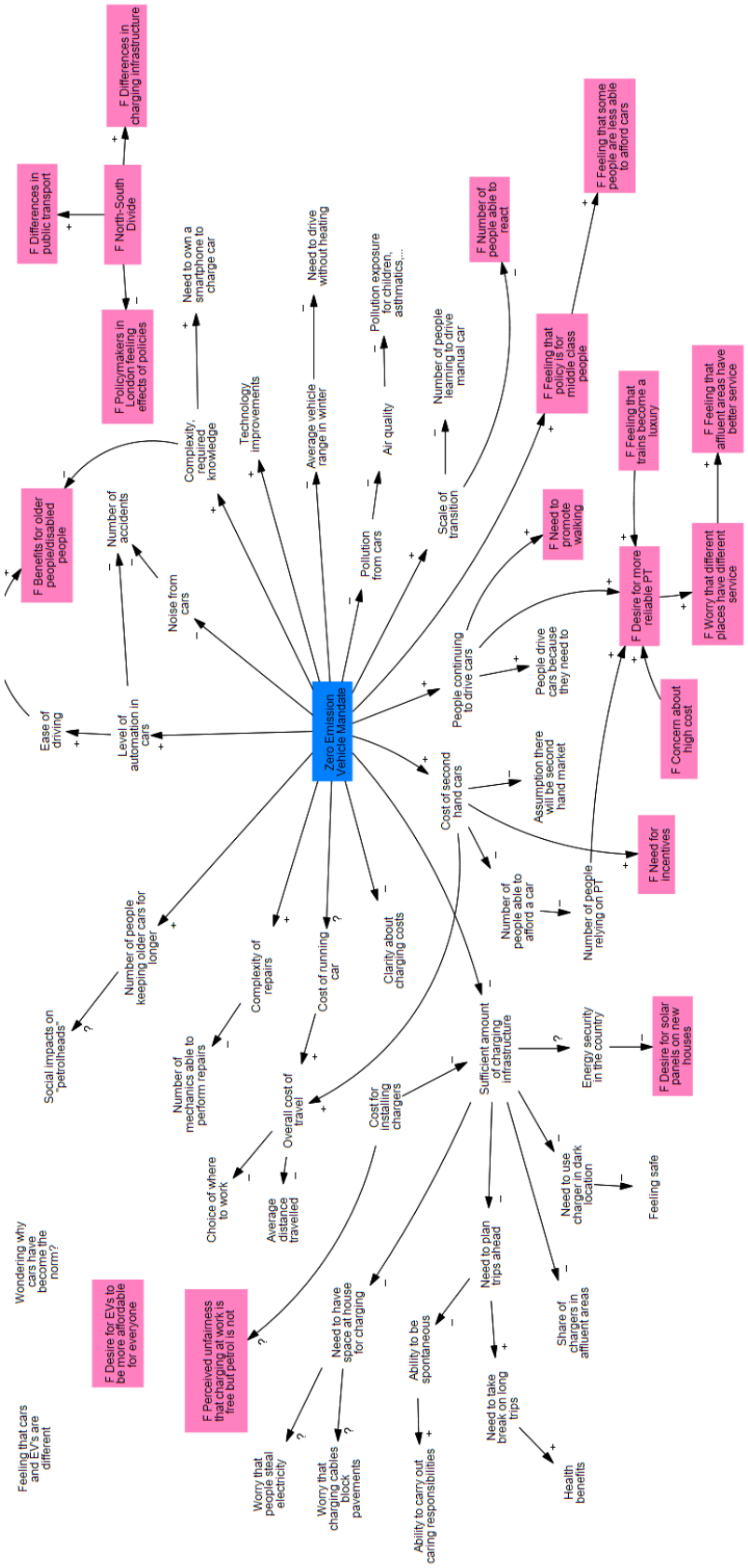


Figure 29 - CLD from workshop Kippax 1

## 9.12.8 Kippax 2

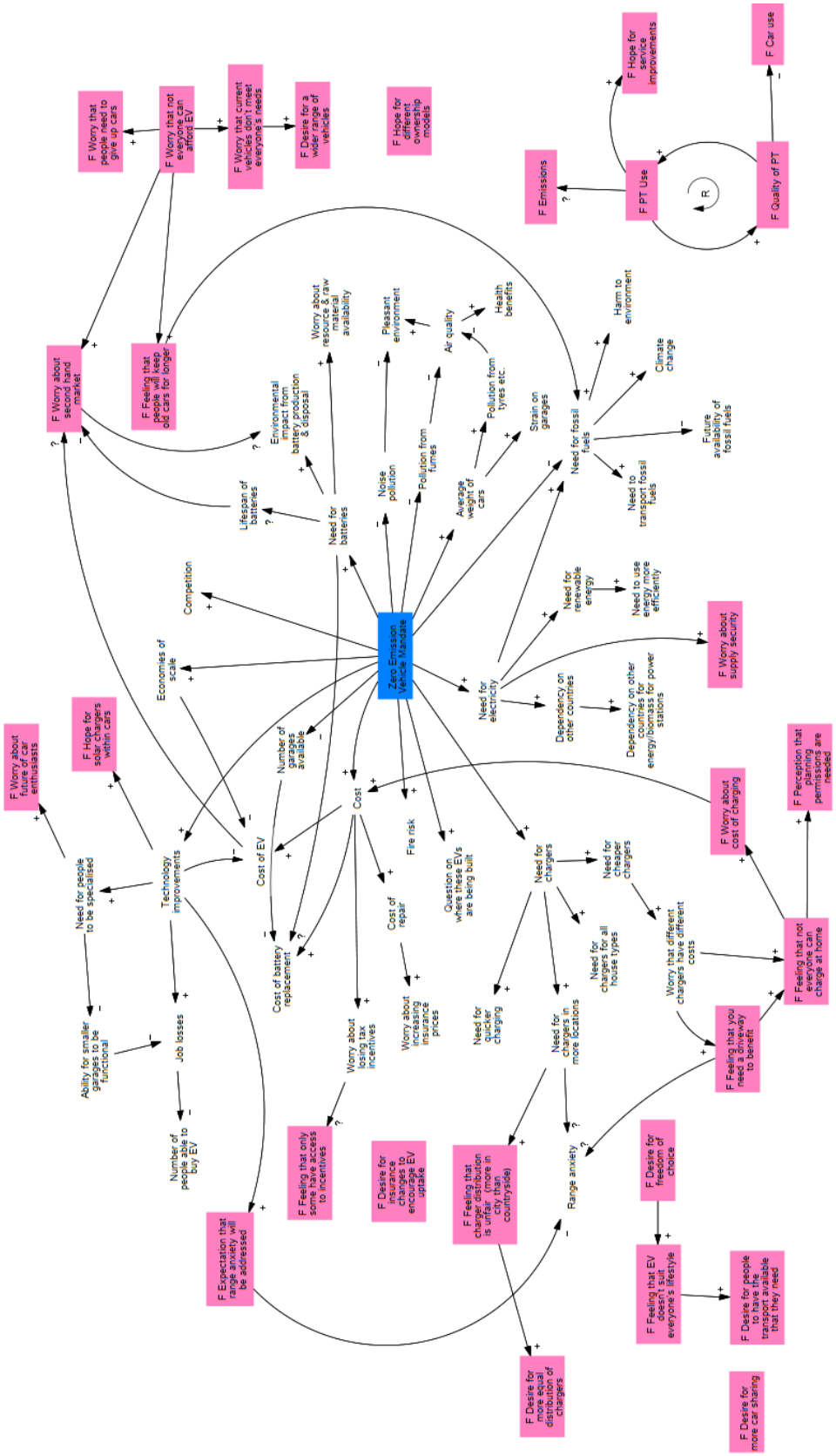


Figure 30 - CLD from workshop Kippax 2

## 9.12.9 Environment group

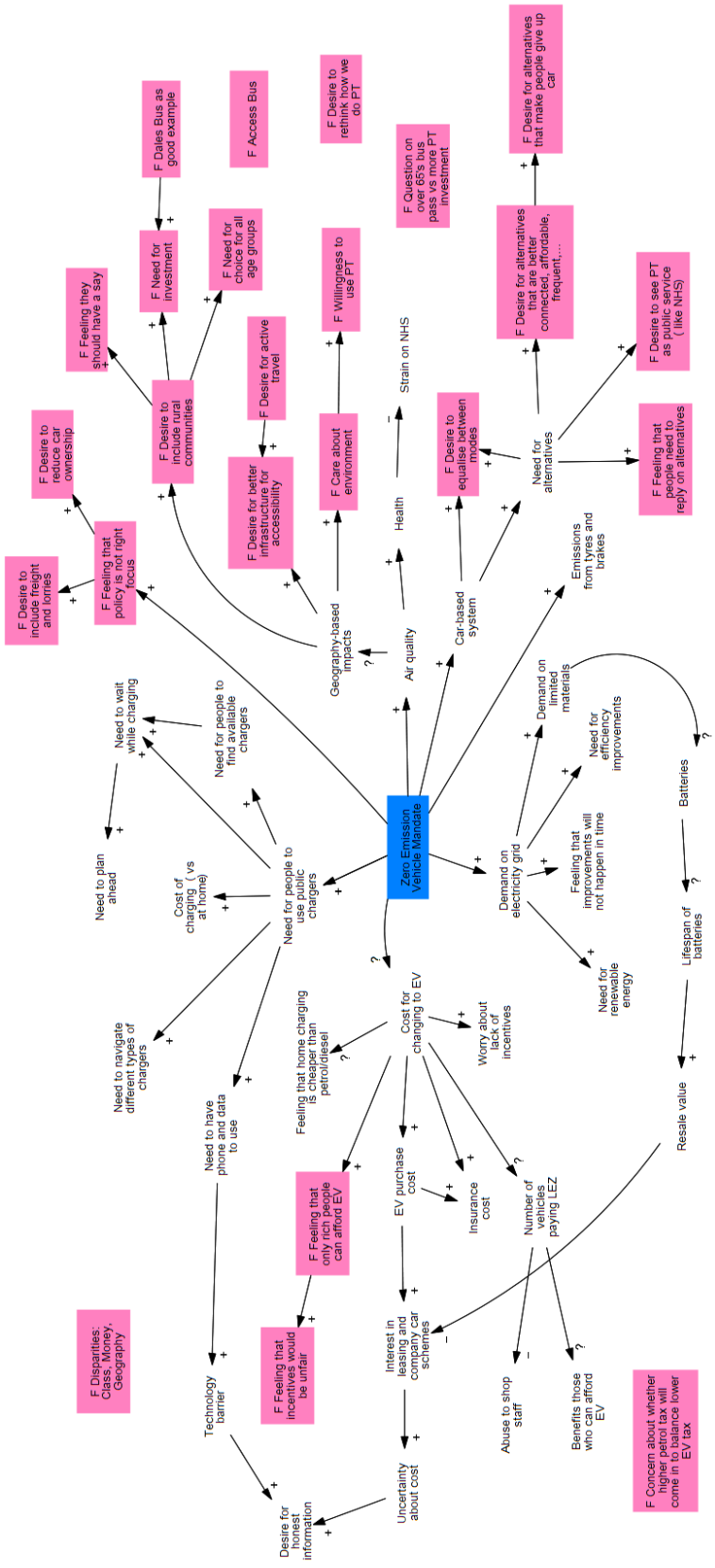


Figure 31 - CLD from workshop with Environment group

## 9.12.10 Student group

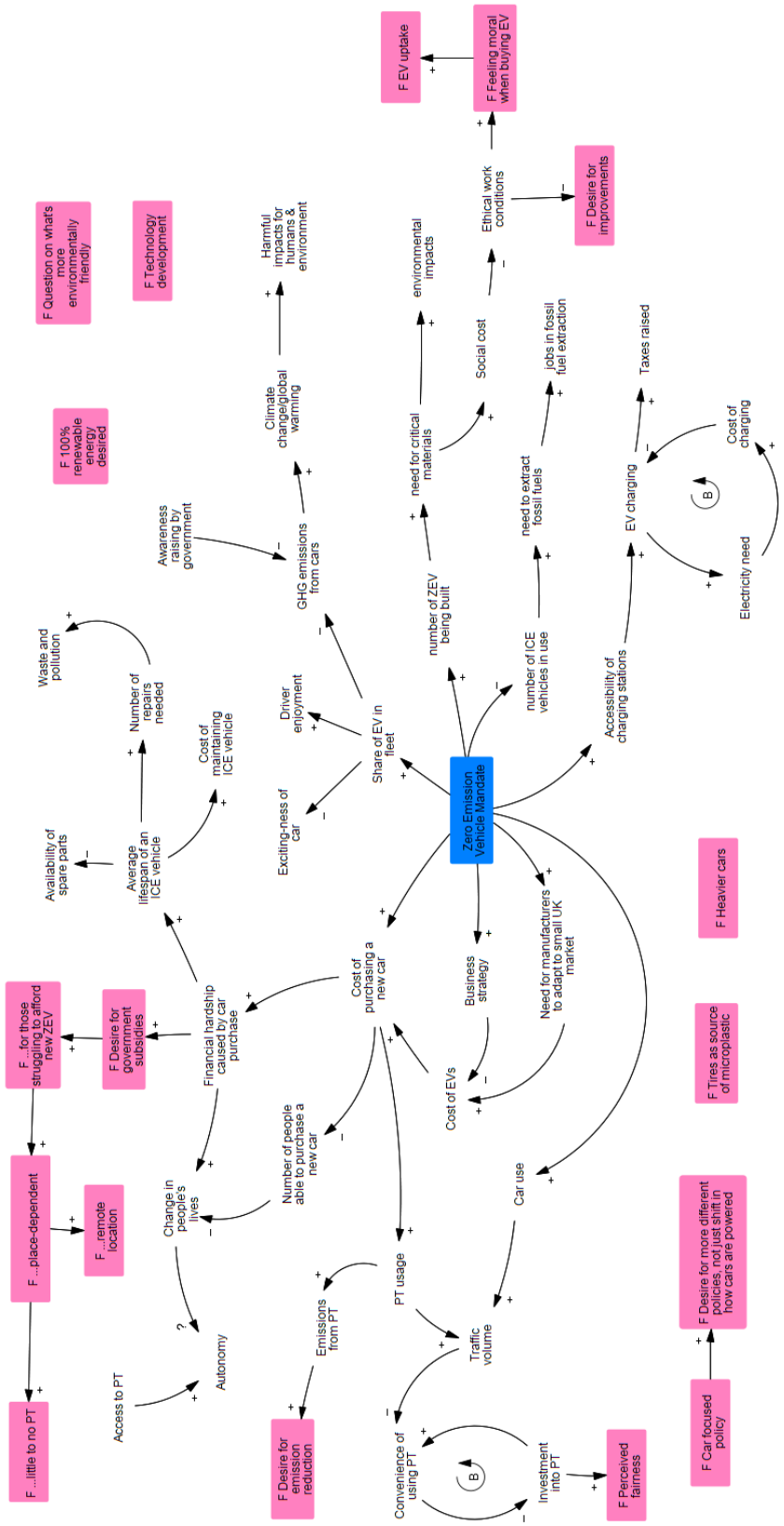


Figure 32 - CLD from workshop with Student group