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Designing the Streets of the Future: The Avenues Programme, Glasgow.

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Submission in fulfilment of the requirements for Doctor of Philosophy.

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Abstract

There is a pressing need to transition urban areas towards a more sustainable way of life, but the scale of the challenge is significant. Streets are the foundation of a city's urban fabric and play a critical role in the transition to urban sustainability. The aim of this research was to investigate the processes taking place during the conceptualisation and design of a contemporary street, and to examine what the implications of these processes are for longer-term transitional change. The thesis makes theoretical contributions to the transitions and urban design governance literature, as well as methodological and practice-oriented contributions in the form of a novel analytical framework for the design and analysis of mixed-use streets of the future. The focus of this research was the Avenues Programme in Glasgow: a transformative investment programme seeking to regenerate a network of streets across the city centre. The pilot project was completed in 2019 on Sauchiehall Street, a busy, mixed-use retail street and movement corridor. Sauchiehall Street thus offered an ideal location to examine how the process of conceptualising and designing a street can shape the infrastructure that is constructed, then in turn how the design of the infrastructure can shape the instinctive behaviour of those using it. This research takes the form of a mixed methods case study. An initial process (qualitative) phase comprised document analysis and semi-structured 'elite' interviews. This was followed by an observational (quantitative and qualitative) phase capturing instinctive behaviour at key pieces of street infrastructure. The creation of a novel analytical framework, an original contribution based on socio-technical transition theory, provides the means to analyse not just how this particular street is functioning, but the implications of street design more broadly for enabling behavioural transitions in the future. This thesis argues that contemporary mixed-use streets are key to bringing about sustainable urban transitions but that to do this, they must be designed to enable not just 'place' and 'movement', but also thriving public life. Creating these streets of the future requires those entrusted with the design and construction of them to be 'knowing' and aware of their disciplinary biases. A regeneration 'champion' can be instrumental in ensuring effective urban design governance, but urban design and engineering must be properly integrated in conceptual and written form to ensure that infrastructure design is not inadvertently undermined.

Acknowledgements

This thesis is first and foremost for Glasgow, with my utmost gratitude for your constant companionship, for being unashamedly who you are, for your brokenness, your inspiration, and your everlasting intrigue. I will gladly spend all my days just walking around your streets.

I am hugely indebted to my supervisors James, David and Mark, not just for your academic rigour, attentiveness and support, but also for the camaraderie: the laughter, bike rides, walks, and rants about cycling. Not forgetting Zoom Pub, which became my only link back to Glasgow for all those endless weeks of lockdown. Your supervision and friendship certainly took the edge off the more challenging parts of PhD life, and I am grateful for all you've given me.

Talking of lockdown, I also owe a great debt of gratitude to my parents. You've been there throughout this journey, always supportive, always interested. There is nowhere I would rather have accidentally spent the whole of the first lockdown. And no two people who I would rather have spent it with.

And Chris, my PhD widow(er). "You knew what you was getting into…" You are my rock, or perhaps my recycled lamp column, or equivalent lump of solid metaphorical support. During this project I have gained three teenagers and a small place near the sea to call extended home, as well as more love and support than I can possibly account for. I very possibly couldn't have done this without you – but either way, I wouldn't have wanted to.

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Lastly, this research would not have been possible without the financial support from the College of Social Sciences, my interview participants who gave up their time, as well as the good folk – and pigeons - of Sauchiehall Street, some of whom were even sitting on benches.

List of acronyms

AQMA – Air Quality Management Area

BID – Business Improvement District

CIHT – Chartered Institute of Highways and Transportation

DB32 – Design Bulletin 32

DfT – Department for Transport

DMRB – Design Manual for Roads and Bridges

DSA – Driving Standards Agency

EIIPR – Enabling Infrastructure Integrated Public Realm

FLCT – Footway-level cycle track

GCC – Glasgow City Council

LOS – Level of Service

LTN – Local Transport Note

MAPS – Microscale Audit of Pedestrian Streetscapes

MHCLG – Ministry of Housing, Communities and Local Government

MLP – Multi-level Perspective

MORE - Multimodal Optimisation of Roadspace in Europe

PERS - Pedestrian Environment Review System

RIBA – Royal Institute of British Architects

SNM – Strategic Niche Management

SNP – Scottish National Party

SNPM – Strategic Niche Policy Management

SRET – Side Road Entry Treatment

STT – Socio-technical Transition Theory

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Author's Declaration

"I declare that, except where explicit reference is made to the contribution of others, that this dissertation is the result of my own work and has not been submitted for any other degree at the University of Glasgow or any other institution."

Printed Name: Rebecca Cox
Signature:

Chapter 1: Introduction

> "There is a distinction, or more accurately a continuum, between those who consciously see themselves as urban designers … and the much wider array of development actors whose interventions affect design quality, even if by their unconscious acts." (Adams and Tiesdell, 2013, p.13)

> "You know all the words, and you sung all the notes, but you never quite learned the song." *The Hedgehog's Song* by the Scottish outfit The Incredible String Band.

The past decade or so has been characterised by several key themes and events that have disrupted, and therefore redefined, how cities and citizens go about everyday life. Perhaps the most obviously disruptive of these has been the COVID-19 pandemic, which had far-reaching implications for local economies and individual mobility, as well as focussing a renewed lens on public health. These impacts were felt particularly acutely in cities due to their density and spatial flows (Lai et al., 2020; Wolff and Mykhnenko, 2023) including notable implications for the future of public space (Honey-Rosés et al., 2020).

But even prior to the global pandemic, environmental sustainability and climate change were already defining policy agendas in the UK and more widely. Scotland became one of the first European nations to declare a state of climate emergency, adopting the Climate Change Act in May 2019 (Scottish Government, 2019). Scotland's Climate Change Plan (Scottish Government, 2020a) commits to net zero emissions by 2045, with an interim target of a 75% reduction in emissions by 2030 compared to the 1990 baseline. The Plan notes that to achieve the necessary reduction in greenhouse emissions, it will be necessary to reduce the kilometres travelled by car by 20% by 2030, alongside phasing out new petrol and diesel cars by the same date. Mechanisms for achieving this include investing in liveable neighbourhoods, increasing active travel, including the availability of e-bikes, and investing in infrastructure to enable sustainable mobility (ibid.).

The economic health of cities is another theme that was already rising to prominence prior to the pandemic. The failing state of UK high streets and

future of physical retailing in cities has long been a policy concern (Portas, 2011). The global pandemic acted as a catalyst for existing trends, further increasing the share of online retailing, whilst also encouraging the decline in city centre footfall due to businesses closing for extended periods. It also exacerbated lingering concerns around physical health (Wieland, 2023). Indeed, mobility patterns have changed more broadly with fewer commuter trips now being made compared to pre-pandemic levels, particularly by public transport modes (Magriço et al., 2023). Meanwhile, Scotland has one of the highest obesity rates in the world with 30% of adults being classified as obese in 2021 (Scottish Government, 2022). Whereas this rate has remained fairly constant since 2008, 47% of adults in Scotland reported gaining weight since the start of the COVID-19 pandemic due to reduced physical activity (including commuting) and increased consumption (Obesity Action Scotland, 2022).

The built environment is a cross-cutting thread running throughout each of the defining themes discussed above. The extent to which people move around, and how they choose to do that, is heavily influenced by the spatial layout of cities, as well as the availability of shops and services within a distance that can be travelled sustainably (Leach et al., 2019; Scottish Government, 2023). Streets, in particular, are the lifeblood of cities, and their design can, likewise, heavily influence whether people choose to spend time in cities, how they arrive there and how they move around (Jacobs, 1960; Gehl, 2010). Indeed, the concept of the liveable city starts with the design of its streets. But many UK cities consist of an urban fabric that has systematically prioritised the movement of private vehicles over people moving around by active travel modes (Taylor and Filmer-Sankey, 2002; Hebbert, 2005). Glasgow is a textbook example of this with a grid-based city centre allowing the movement of vehicles along almost every street, as well as the M8 motorway cutting through the heart of the north and west of the city. Consequently, the city has the largest traffic volume of Scotland's local authorities (Glasgow City Council, GCC, 2017).

Contemporary urban street design, in Glasgow and elsewhere, must therefore both overcome the hurdle of an established carbon-intense and obesogenic urban form, as well as providing a new attractive and enabling environment. This work is not without challenge. A significant onus of responsibility is placed on those conceptualising and designing streets to ensure that they enable

behavioural change but in a manner that is inclusive and accessible to all potential users. There is also a need to understand more clearly how streets play a role in enabling a wider (just) transition towards a sustainable way of living in urban areas (Scottish Government, 2019).

Cognisant of this need, this research takes a major urban regeneration programme in Glasgow, Scotland, as a case study for analysing the conceptualisation and design of a contemporary street. It combines a longitudinal study of design governance with on-street observation of naturalistic behaviour to analyse the impact of the design of the street on the public life of the street. The adoption of a novel framework, based on socio-technical transition theory (Geels, 2002), provides the means to analyse not just how this particular regenerated street is functioning, but the implications of street design more broadly for enabling behavioural transitions in the future.

This first chapter introduces this mixed methods research and the researcher. It starts by outlining the overarching focus of the research and grounding it within the broader socio-environmental context in which it sits. Section 1.1 introduces the mixed-use street and the concept of urban transitions. Section 1.2 details the Avenues Programme and Sauchiehall Street, which forms the focus of the case study. It discusses the definition of active travel and introduces the place and movement function of streets. Section 1.3 discusses street regeneration more broadly, including a focus on other projects in the UK. It then briefly introduces the conceptual framework, socio-technical transition theory. Section 1.4 lays out the research aims, followed by a summary of the theoretical, methodological and practice-oriented contributions made by this research in Section 1.5. The chapter concludes with an outline of the thesis structure in Section 1.6.

1.1 A case-study of a mixed-use street

The focus of this research is the regeneration of a mixed-use commercial street in the city of Glasgow, Scotland. Mixed-use, also sometimes known as high streets in the UK, refers to “the range of mixed commercial streets that bisect traditional cities and that encompass retail streets of strategic significance” (Carmona, 2015, p.3). The street in question, Sauchiehall Street, forms the pilot

stage of a city centre-wide regeneration programme known colloquially as the 'Avenues'. The Avenues Programme involves the regeneration of a network of streets in the city centre through the transformation of the streetscape and public realm, including the introduction of infrastructure to encourage active travel. The reconstruction of Sauchiehall Street commenced in 2017 and the Programme is intended to run until 2028 (GCC, n.d.).

The Avenues Programme is taking place in a time where an increasing amount of attention is being paid to the role of the built environment in meeting objectives relating to the health and sustainability themes discussed above, not least the 'climate change emergency' (McHugh et al., 2021). Indeed, the Avenues Programme itself is guided by a range of aims including making Glasgow "greener" and "more sustainable", as well as more "economically competitive" (GCC, n.d.). These aims relate at one end to the physical design of individual streets, and at the other end to the recognition that streets can be an enabler of these broader transitions towards a more sustainable urban environment. The Avenues therefore provides an interesting case study of the use of an ambitious public realm and street infrastructure improvement programme to meet these wider objectives.

Given the importance of the behavioural component of urban transitions (Geels, 2002), addressing this overarching question requires a more detailed look at how Sauchiehall Street came to look as it does and how people are behaving on the completed street as a result of the design. Through a combination of interviews and observational techniques, the research starts by following the design journey from the perspective of the network of individuals - 'agents' – forming the design and delivery team. Having identified potential points of contention in various infrastructural components of the completed street, the research then heads out onto Sauchiehall Street armed with a clipboard and pen to capture the instinctive behaviour occurring on the street. The analysis is framed by a socio-technical transition framework (Geels, 2002), with ultimate intent to discuss whether, and how, projects such as the Avenues Programme can bring about wider sustainable transitions.

Mixed-use streets, or high streets, are particularly challenging because of the requirement to balance high place and high movement functions. Surprisingly, there has been very little research focussed specifically on the design

requirements of mixed-use streets, particularly more recently from the perspective of introducing cycle-specific infrastructure. Jones and colleagues provide two relevant case studies (Jones et al., 2007; MORE, 2022), which are reviewed in Chapter 3. Carmona has also proposed theory relating to mixed-use streets and undertaken some empirical work to test these theories (Carmona, 2015). But generally, methodological discussions are underdeveloped in this domain and there is no established framework for conceptualising and measuring mixed-use streets, despite their ubiquitous presence throughout UK urban areas.

This lack of integrated theory is also reflected in design guidance. For instance, whereas Scotland's primary urban design policy *Designing Streets* (Scottish Government, 2010) draws attention to the importance of balancing place and movement functions in busier streets, the policy defers to its companion guidance *Cycling by Design* (Transport Scotland, 2011) for detail relating to the design of cycle-specific infrastructure. However, even the recently updated *Cycling by Design* guidance (Transport Scotland, 2021), describes infrastructure on a type-by-type basis, rather than from the more holistic perspective of where it might be installed. As such, the 'place' elements of streets still tend to be addressed by urban design guidance, whereas the 'movement' aspects are dictated by engineering (or transport) design guidance, but there is no guidance as to how to integrate these so that they meet the requirements of place and movement. This disconnect is further compounded by the tendency of urban design governance literature to be either substantially theoretical (e.g. Carmona, 2017) or aimed at a broader spatial scale than the individual street (e.g. Carmona, 2021).

Given the prevalence of mixed-use streets in the UK and the importance of creating streets whose place and movement functions complement, rather than undermine, each other, there is a need firstly to develop a cohesive conceptual framework to capture and measure mixed-use streets. The built environment is key in meeting the pressing socio-environmental needs discussed at the start of this chapter. As such, this framework also needs to address the potential of streets as both canvas for, and agent of, sustainable transitions (Nielsen and Farrelly, 2019). Several gaps are therefore addressed by this research, including the lack of research focussing on mixed-use streets, such as Sauchiehall Street,

which have prominent place and movement functions, as well as requirements to enable thriving public life.

This research adapts traditional observational methods (e.g. Whyte, 1980) to derive insight into the nature of public life on a contemporary mixed-use street. In doing so, it combines theory from public life (such as Whyte, 1980; Gehl, 2010; Gehl and Svarre, 2013; Mehta, 2019) and engineering literature (Furth, 2017; SWOV, 2018; Furth 2019) to derive novel insight into the potential for active travel infrastructures, generally considered only in terms of their movement function, to contribute to the public life of the contemporary street. The addition of a socio-technical transition framework, adapted from Geels, 2002, and applied in a novel setting in this research, contributes applied learning to this theoretical field by conceptualising a mixed-use street as an enabler of wider transitional change.

1.1.1 The researcher

My interest in the project stems from several years spent working throughout the UK in the field of planning and the design of active travel infrastructure prior to commencing the PhD. Whilst delivering a series of active travel projects with local authorities, as well as facilitating design training, I encountered the same phenomenon: good design intentions, often carried out by skilled practitioners, nevertheless resulted in compromised street design. This sparked an interest in understanding not just how to design streets, but how to understand the nature of forces surrounding the design of streets.

The outbreak of the COVID-19 pandemic a mere 5 months into this research project has affected it throughout its lifetime. The national lockdown and ‘social distancing’ restrictions that commenced in March 2020 continued to affect Glasgow for nearly 18 months and this necessitated several alterations to the research strategy. Much of my time working on the project was carried out in an even greater degree of isolation than might normally be expected for doctoral research. This impacted my mental health and reduced the opportunities to learn from my peers and seniors. The project is therefore very much a ‘child of the pandemic’ and while it is difficult to precisely quantify what that means, it would be remiss not to note its impact. It is without doubt, however, both a

privilege and challenge to be entrusted with research pertaining to something so personally important. This research reflects this sentiment by aiming to advance theoretical knowledge but also remain relevant to a practitioner audience.

1.2 The Avenues Programme

The ‘Avenues’ in Glasgow is a £115 million programme which, according to Glasgow City Council (GCC), “will result in a transformation of the city centre's streetscape and public realm - making it more "people-friendly", more attractive, greener, more sustainable and more economically competitive” (GCC, n.d.). It is a council-led investment programme aiming to redesign and physically regenerate a network of seventeen streets in Glasgow city centre in a sequential series of ‘blocks’ (Figure 1). The Programme commenced in 2017 with the pilot street, Sauchiehall Street, and was originally intended for completion by 2025. This deadline has since slipped to 2028. At the time of writing, only Sauchiehall Street is complete, and whereas work is scheduled to commence on two more streets in 2023, other future phases are either stalled or delayed due to rising construction costs (ibid.).

The Avenues Programme is a colloquial name for the more formally termed ‘Enabling Infrastructure Integrated Public Realm’ (EIIPR) programme, one of 27 projects funded through the Glasgow City Region City Deal. City Regions have gradually emerged in the UK since their original inception as part of the Localism Act (2011) and there are now six in Scotland. They are part of a longstanding programme of partial devolution of power from national government to cities and regions, based on the premise that locally tailored policy interventions will be more effective than centralised policy at the local level (Waite et al., 2018). The Avenues therefore has its roots in an intention to enable economic regeneration specifically through the medium of physical infrastructure regeneration.

The EIIPR programme intends to create a network of connected streets “redesigned to protect and prioritise space for cyclists and pedestrians, improve connectivity, introduce sustainable green infrastructure through attractive streetscapes and [enhance] biodiversity and improve the way public transport is accommodated” (GCC, n.d.). Whereas the detailed design of each street will

differ, one of the core aims is to install a network of connected routes to encourage transport by sustainable modes. This includes reallocating carriageway space to allow for widened footway and installation of cycle lanes on each Avenue, along with the installation of trees and benches. There is also intent to redesign the spaces where proposed Avenues intersect with existing carriageways, with the aim of lessening the priority of vehicles and making these locations safer. Given the urban grid morphology of Glasgow city centre and current level of vehicle penetration, these intersection points are numerous (Figure 1).

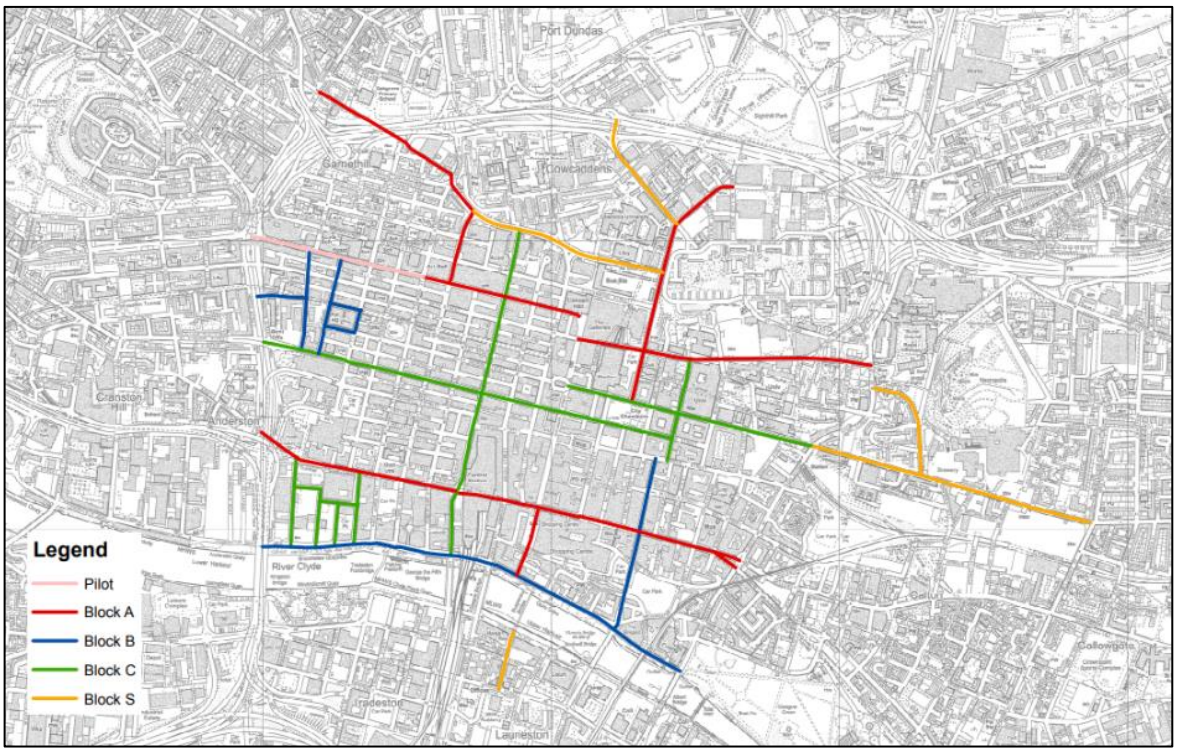
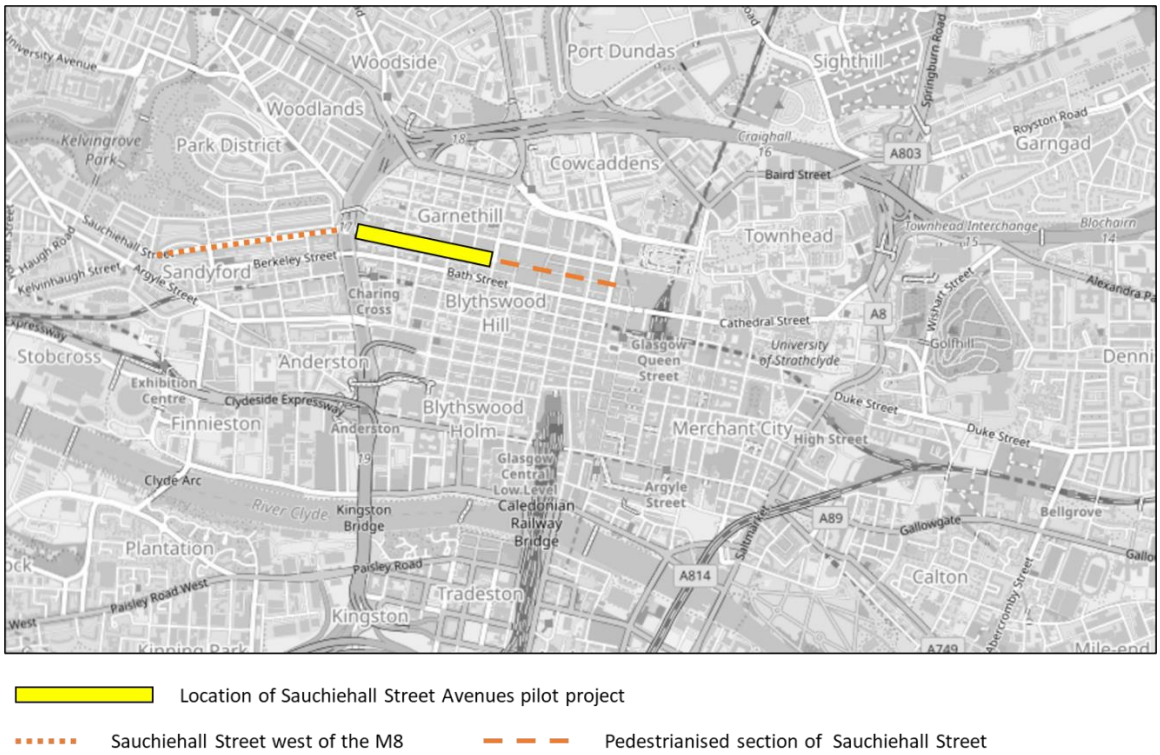


Figure 1: Phasing map (first published by GCC in 2017) showing the network of streets included within the Avenues Programme. Future phases are divided into 'blocks', to be completed sequentially, each of which are being put out to tender separately. Image © Glasgow City Council. Permission to reproduce this image has been granted by Glasgow City Council.

1.2.1 Sauchiehall Street

Sauchiehall Street is an important mixed-use commercial street and transport corridor in Glasgow city centre. It is this street, along with the Avenues Programme in general, that form the focus of this research. Sauchiehall Street runs for a total of 1.6km from Finnieston in the West End to Buchanan Street in the city centre and has three notably different character areas (Figure 2).



Location of Sauchiehall Street Avenues pilot project

Sauchiehall Street west of the M8

Pedestrianised section of Sauchiehall Street

Figure 2: Location of Sauchiehall Street Avenues pilot project within Glasgow city centre. Map © OpenStreetMap Contributors. Annotations added by author.

The eastern portion of the street, east of Rose Street, has been pedestrianised since 1972 (The Glasgow Story, 2004) and forms part of Glasgow's Core Path Network, meaning that is protected, in planning terms, for access by non-motorised modes. Indeed, at its eastmost point, the street leads directly into the grand entrance to Glasgow's Royal Concert Hall, a prominent cultural building in a city renowned for its musical heritage. Further west, Sauchiehall Street is bisected by the M8 motorway at Charing Cross, which runs through a cutting and requires multiple signalised crossing stages to cross the motorway at street level (Figure 3). The westernmost portion of the street, west of the M8, is therefore all but segregated from the city centre and has a notably different feel, primarily residential in nature with some offices, but very little commercial space.

Figure 3: The three character areas of Sauchiehall Street. Left: The newly regenerated 'middle' section east of the M8 and west of the pedestrianised section. Top right: The pedestrianised section east of Rose Street. Bottom right: Looking across to Sauchiehall Street in the distance, demonstrating the gap created by the M8 motorway, which runs north-south underneath this section. All photos © author.

It is the middle section, west of Rose Street and east of the M8, that forms the focus of the Avenues pilot project. This section was formerly four lanes of eastbound carriageway with relatively narrow footways and no dedicated cycling facilities. It has long been renowned as one of Glasgow's nightlife hotspots and prior to the regeneration, it consisted of several nightclubs, larger music venues, fast food takeaway outlets, and several cafes and restaurants. As part of the regeneration, an emphasis was placed on encouraging 'street café' style premises, and the widened footways makes this possible. Many of the older institutions have remained open on the street after the regeneration and it has therefore retained its character as a hotspot for nightlife, alongside the additional daytime premises. As discussed in Chapter 7, Sauchiehall Street has also suffered several major fires in the past decade, including two fires at the Glasgow School of Art in 2014 and 2018. These have left a physical (and emotional) impact with some buildings still closed in the vicinity of the Art School.

As detailed in Chapter 6, the regenerated street now consists of widened footways, a bi-directional cycle track parallel to the footway, street trees, benches, new lighting, and a version of continuous walking and cycling priority at side roads along the street. This reflects the recognition of, and intent to improve, both the 'place' function of the street – its role as a destination that is a pleasant place for people to dwell – and also its 'movement' function – its ability to cater for several different modes of transport, including walking, cycling, public transport and private vehicles (Jones et al., 2008). This has been achieved by re-distributing two lanes of carriageway into space for these new features. However, two lanes of eastbound carriageway have been retained, which provide movement space for several bus routes, as well as private vehicles. Because of the commercial nature of the street, a notable proportion of the vehicles using it are either taxis or delivery vehicles. No public parking bays have been installed, meaning that these modes are theoretically the only vehicles permitted to stop on the street, and only in marked taxi and loading bays.

Some of the active travel infrastructures being designed into the regenerated Sauchiehall Street are relatively novel in the UK context. The footway-level cycle track (Department for Transport, DfT, 2020), for example, is a version of a shared-use path, but one along a busy city centre street, therefore attempting to clearly demarcate how people should use it. The design of the footway and cycle track at the side roads along the street is an example of an attempt to install 'continuous footway', which theoretically gives priority to people walking and cycling over people driving. There are a few other examples of continuous footway in the UK but none of these are standardised (Living Streets Scotland, forthcoming). Recent guidance in the form of the DfT's *Local Transport Note 1/20* (DfT, 2020) includes reference to the design of these infrastructures, however, this guidance was published after the Sauchiehall Street pilot took place (a point which is reflected on in more detail in Chapter 6).

Inherent within the Avenues Programme objectives is also the intent to enable the public life of the street, i.e. the social dimension that occurs where place and movement functions encourage people to linger and enliven the street. This is also an important component of economic regeneration on a mixed-use street, in that the longer people spend using the street, the more likely they are to

spend money. Place and movement functions have tended to be considered separately (Jones et al., 2008) and whereas the concept of placemaking is inherent within public life studies, movement functions have not tended to be directly linked to public life. This thesis argues, however, that despite the physical segregation of walking, cycling and driving on streets such as Sauchiehall Street, contemporary design approaches, such as those seen in the regenerated Sauchiehall Street (DfT, 2020), blur the traditional ideas of movement and place by physically combining walking and cycling in space. Further, it is argued that infrastructure such as continuous footway at side roads, perhaps generally considered as 'movement' infrastructure, should also be evaluated in terms of its potential to contribute to the overall public life of the street. This is an important conceptual departure from the traditional dichotomy of place and movement.

This also reflects the blurring of traditional disciplinary backgrounds where highways engineers are increasingly required to design for these 'place-oriented' active travel and micromobility modes (Section 1.2.2), and urban designers increasingly need to be cognisant of the challenges of designing movement into streets (Transport Scotland, 2021). Traditionally the domain of highways engineering, but increasingly included within urban design-led projects, these novel infrastructures potentially need to meet success criteria pertaining to urban design (e.g. aesthetic appeal) but also road safety. This thesis argues that contemporary mixed-use street design is introducing infrastructures that transcend traditional place-movement categories. This adds further weight to the requirement outlined above to frame new ways of researching the success of these infrastructures using criteria that capture their novel place-movement and public life functions.

1.2.2 Defining active travel

The term 'active travel' infrastructure is used in this research to describe the physical elements that have been introduced in Sauchiehall Street ostensibly to make it more attractive to walk and cycle, such as widened footways and a new bi-directional cycle track. Cook et al. (2022), however, note that active travel is a contested concept. The term emerged from public health and has only recently become widely used within transport literature, primarily to refer to

walking and cycling. The authors suggest, however, that it should be widened to include all travel modes where “the sustained physical exertion of the traveller directly contributes to their motion” (Cook et al., 2022, p.154). There is also considerable overlap with related terms, such as micromobility modes, which refer to lightweight personal vehicles (Figure 4).

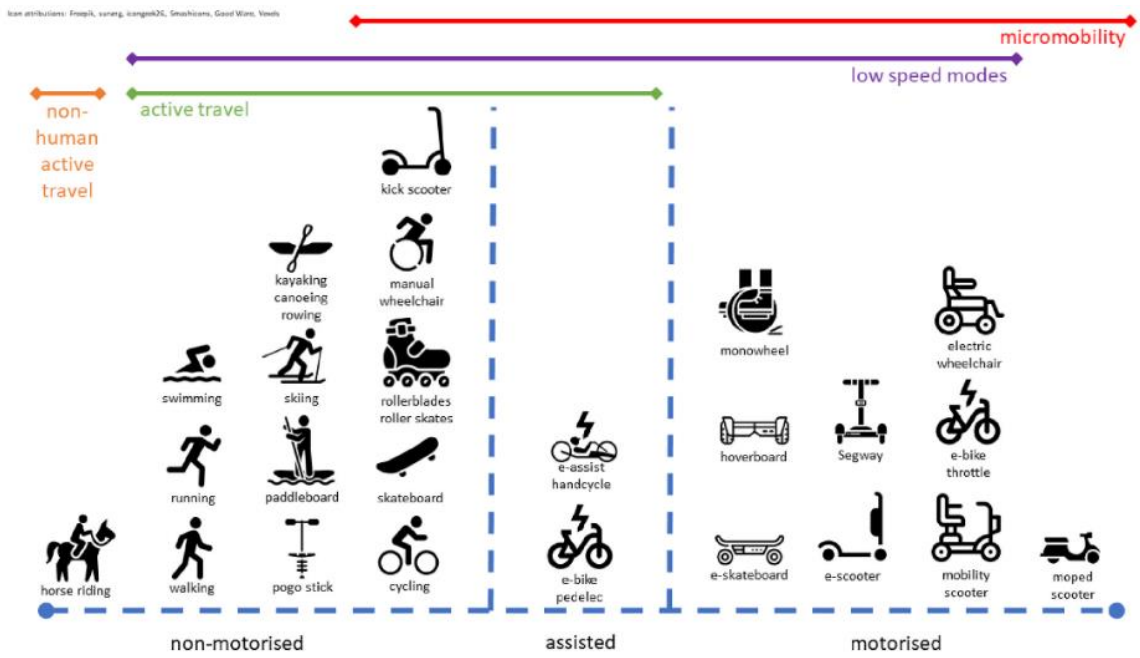


Figure 4: Taxonomy of active travel modes and related categories (Cook et al., 2022, p.155). Image reproduced under Creative Commons CC-BY licence.

Where active travel is referred to in the analysis sections of this research, it tends to refer to walking, wheeling and cycling, because these were the primary modes observed on the street. Where the broader conceptual idea of designing for active travel is discussed, however, this should be understood to refer to the wider definition suggested by Cook et al. (2022). Indeed, infrastructure that is designed well for walking and cycling should, in theory, also be useable by people using a variety of other modes and ‘future-proofed’ for the increased use of micromobility modes as these become more mainstream.

1.3 Street regeneration projects in the UK

Street regeneration programmes with similarities to the Avenues Programme have taken place in other UK cities and towns, particularly over the past 10

years or so. Many of these include the construction of new infrastructure designed to enable increased rates of cycling and walking, as well as improvements to the public realm. Notable examples include the London Cycle Superhighway and Quiet Route networks, the Mini Holland programme, also in London (Figure 5), Greater Manchester's "Bee Network" (Figure 6) and the Connecting Leicester programme (Figure 7). Each of these programmes aspires to a range of objectives, including those relating to increasing rates of active travel, decreasing private vehicle usage, improving public health outcomes, and creating environmental benefits.

Figure 5: Francis Road, Walthamstow, London. The street was regenerated as part of the Mini Holland programme to reduce vehicle dominance, increase footway space and facilitate cycling in the main carriageway. Image © author.

Figure 6: Oxford Road, Manchester. This busy transport corridor is a key route in the 'Bee Network'. It was re-profiled to introduce segregated cycle tracks (red tarmac) and widened footway. Image © Google Images.

Figure 7: Granby Street, Leicester. This street was one of several regenerated as part of the Connecting Leicester programme, which aimed to regenerate a network of streets across the city. It introduced contraflow cycling in the carriageway, widened footway and reduced vehicle dominance. Image © author.

Another element that these programmes have in common is objectives relating to their place and movement function (Jones et al., 2008). Contemporary streets, especially those with mixed-use retail, commercial and residential premises, are often required to marry together the potentially conflicting requirements of place and movement. One of the challenges is that the physical

design of streets tends to be well established, leading to behavioural norms on the part of street users. Drivers are used to having priority over people walking and cycling where these modes interact, business owners expect parking spaces close to their businesses, and people walking expect to do so relatively unhindered on the footway and do not always expect to share the space with people cycling.

These inbuilt expectations are examples of what Hommels (2005) describes as a state of 'obduracy', which he defines as the inertia and resistance that occurs in the face of efforts to alter existing behavioural norms. Latham and Wood (2015) expand this to the idea of infrastructural obduracy, i.e. that it is challenging to overcome the status quo of well-established movement and place functions on streets. These street regeneration projects can therefore be framed as attempts to effect behavioural change by overcoming personal obduracy. However, to do this, they must contend with the challenges of infrastructural obduracy. Furthermore, these regeneration programmes tend to be large and complex, requiring the cooperation of individuals from multiple professional disciplines to achieve a wide array of objectives. This research utilises a transitions framework, derived from socio-technical transition theory (Geels, 2002, see Section 1.3.1) to allow these important themes to be drawn out through the analysis. Despite the stated intention to bring about wider transitional change in many street regeneration projects, there is a gap in the literature concerning the application of a transitions lens to this context.

1.3.1 The theoretical lens: socio-technical transition theory (STT)

STT is a theoretical framework for analysing long-term, systemic change (Geels, 2022). The most widely used iteration of the framework is the Multi-Level Perspective (MLP, Geels, 2002; Geels and Schot, 2007), which suggests that transitions be conceptualised as occurring across three levels. At the top is the socio-technical landscape, consisting of long-term trends, external to any specific transition but shaping and constraining them. They are relatively stable but will change gradually over time. Examples might include broad political coalitions, economic growth and environmental issues. Beneath the landscape level are the socio-technical regimes, described by Geels as "the semi-coherent set of rules carried by different social groups" (2002, p.1260). These are the

belief systems or prevailing practices that tend to govern the behaviour of individuals or groups at a given time. Indeed, the framework has at its core the idea that technological innovation on its own has no power, but that it is the social agency surrounding it that enacts change (ibid.).

The lower level of the MLP consists of technical 'niches': radical technological innovations (Schot, 1998). Socio-technical change, it is hypothesised, occurs where a niche is suitably protected and can 'break through' to exert pressure on the incumbent regimes surrounding it. Various mechanisms are posited but these have in common the idea that where a niche exerts sufficient pressure, regimes can shift and reform, eventually altering the landscape level of the model and enacting sustainable change.

In this research, the Sauchiehall Street pilot, including the novel infrastructures introduced into the street, is treated as a socio-technical niche. As STT theory relates to longer-term transitions, the more applied theory of Strategic Niche Management (Kemp et al., 1998; Kemp et al., 2001) is used to assess how the niche is performing as a technological innovation. STT theory is used as an overarching framework to frame the analysis and discussion relating to the potential for a street to bring about longer-term transitional change. The framework is discussed in more detail in Chapter 4.

1.4 Research aims and questions

The overarching aim of this research is to investigate the processes taking place during the conceptualisation and design of a contemporary street, and to examine what the implications of these processes are for longer-term transitional change. The objectives are three-fold:

1. To interrogate how new street infrastructures intended to enable active travel and enhance public life are designed, planned and constructed.

2. To evaluate the extent to which such interventions result in the intended use of the street.

3. To theorise how the design of future city streets within the context of urban governance and engineering can best enable sustainable transitions.

The research questions (RQs) pertaining to these objectives are as follows:

1. **How was the design of the Sauchiehall Street Avenues pilot project shaped by the conceptualisation, delivery and construction process?**
    a. What were the forces shaping the design of the street?
    b. What was the original design intent?
        i. Were there philosophical underpinnings evident in the design?
    c. What were the pivotal events and agents along the way?

2. **Is the design of Sauchiehall Street enabling and encouraging the intended behaviours?**

Are people using the street as intended in terms of its place function, movement and public life functions?

3. **What learning does Glasgow's Sauchiehall Street Avenues pilot offer for designing the streets of the future?**

As detailed in Section 1.1, the Avenues Programme provides the opportunity to address RQ1 and RQ2 using a live case study of a complex street regeneration programme, before identifying the wider implications for theoretical and practice-oriented learning through RQ3. With Sauchiehall Street having been completed relatively recently in 2019, this case study provides the opportunity to retrospectively trace the journey of the design and its implementation through the eyes of the individuals involved. Observational methods then provide a means for capturing the live experiences of people using the newly designed street. Physical infrastructure projects inevitably require a transition period of 'bedding in' and this must be borne in mind when considering the effect of the street design on some aspects of behaviour. However, it is argued that infrastructure for active travel, which must be designed such that movement behaviour occurs safely, should function instinctively for people using it, i.e. regardless of whether users are used to the design. These infrastructures should be able to function immediately, therefore, and not rely on a period of bedding in.

Overall, the Avenues Programme and Sauchiehall Street pilot project provide a unique opportunity to investigate the implications of the *process* of conceptualisation and development for the physical manifestation of the street. This is followed ultimately by analysis of the implications of this design for people using the street. Given that Sauchiehall Street is the first of many streets to be regenerated as part of the Avenues Programme, this research offers an opportunity to provide learning for the design of future blocks in the Avenues Programme, as well as for other cities undertaking similar programmes.

1.5 Theoretical, methodological and practice-oriented contributions

As discussed in Section 1.1, this thesis addresses several gaps in the literature and makes theoretical, methodological, and practice-oriented contributions. The main gap that is addressed is the lack of theory within urban design and engineering relating specifically to mixed-use streets, or urban movement corridors. There is a corresponding lack of an integrated framework that incorporates the place, movement, *and* public life functions of mixed-use streets, especially in the contemporary context where modes such as cycling must be retrofitted into existing streets. Currently, Scottish urban design and infrastructure design guidance defer to each other in the domain of mixed-use streets. These streets are required to fulfil key place *and* strategic movement functions, alongside an additional requirement to enhance public life. In theorising a conceptual framing of a contemporary mixed-use street, the research also addresses a methodological gap concerning the *measurement* of contemporary street infrastructures that must enable safe and equitable movement, whilst also contributing to the public life of the street. The main contributions are outlined below.

1.5.1 Theoretical contributions

This thesis provides a case study of the regeneration of a mixed-use street in the UK through a programme which explicitly intends to introduce active travel infrastructure as a means of meeting objectives relating to wider sustainable transitions. Having adapted the transitions framework and applied it to the analysis in the project, the research concludes with the presentation of a novel

analytical framing of the mixed-use street as a contemporary urban movement corridor, where retrofitted infrastructure, such as pedestrian priority at side roads, must cater for both movement and place-oriented functions. This is intended for use by both academics and practitioners for designing and analysing mixed-use streets in the future. Designing such streets necessitates bridging the gap between urban design and engineering (active travel) design guidance, with implications for urban design governance and the design process.

This thesis therefore also contributes to the urban design governance literature by applying theory posited by Carmona (2014) and Carmona et al., (2003), concerning the place-shaping continuum, in a case study setting. It identifies the actions of key agents of change in this street regeneration project, contributing to urban design governance and transitions literature in this area. It also discusses how governance might be undertaken where the urban design in question relates to the design of individual streets, rather than larger urban scales or purely theoretical contexts.

The main contribution, however, concerns the adaptation of the existing socio-technical transition framework (Geels, 2002) to enable its use for framing the Sauchiehall Street pilot. The novel application of a transitions framework in the context of urban street regeneration allows both for analysis of how the street is influencing current behaviour, but also the implications of the design for bringing about a sustainable urban transition in the future.

1.5.2 Methodological contributions

In developing an approach to measure the impact of infrastructure design on place and movement behaviour, the research adapts traditional observational methods (e.g. Whyte, 1980) for use in this contemporary context. The thesis argues that the use of in-person methods is important for capturing the qualitative aspects of the public life of the street, however, it is also key to identifying quantifiable metrics that can be observed and analysed in different contexts, and over time. Three adapted methods for data collection are therefore presented. These relate to bench occupancy, walking and cycling behaviour in locations where these modes share the same street space, and behaviour at side roads.

In adapting the research so it could be carried out online due to the COVID-19 lockdown, it was also necessary to adapt existing mobile methods (walking interviews) so that these could be performed using video-conferencing software. A novel 'virtual walking interview' method is therefore also presented.

1.5.3 Practice-oriented contributions

Finally, the research synthesises learning from the Sauchiehall Street pilot to make practical recommendations concerning the design of street infrastructure, the content of design guidance, and the approach which might be taken in future for training local authority officers (and others) who are entrusted with the management and delivery of such pivotally important design projects. This contribution reflects the researcher's prior experience with delivering this sort of training across the UK in a context where officers were either willing but overwhelmed by the scale of the task at hand, or where conceptual differences between disciplinary backgrounds undermined the final project designs. These practice-oriented contributions therefore relate to future streets within the Avenues Programme, but also more broadly to design practice elsewhere.

1.6 Thesis structure

This thesis contains eight chapters. Chapter 1 introduces the research project, the research aims and the conceptual themes surrounding the research. Chapters 2 and 3 provide a review of literature relating to the main disciplinary areas underlying this work, of which there are several. Chapter 2 charts the conceptual and theoretical development of street design, ultimately leading to the creation of contemporary mixed-use streets, such as Sauchiehall Street. It contends that these mixed-use streets evolved rapidly in the mid-twentieth century to incorporate an increasing degree of movement function in response to modernist planning ideals, before experiencing a more recent (re)turn towards their place function (Tibbalds, 1992). This historical movement function was centred primarily around motorised vehicles and whereas walking (and

occasionally cycling) was acknowledged as an additional movement function, priority was given to driving, both in conceptual and physical terms.

Chapter 3 presents a review of the measurement of streets, including more of a focus on transport and engineering. Following the themes identified in Chapter 2, the chapter focuses on the measurement of movement, place and public life. Ultimately, it draws out a conceptual gap relating to the understanding of novel active travel infrastructures as a means for contributing to the public life of streets. Chapter 4 introduces the theoretical framework for the research, drawing together the themes from chapters 2 and 3, and discussing literature relating to the transitional potential of urban streets. Together, chapters 2, 3 and 4 present the "so what?" element to this research: why it matters and how it relates to the real-world issues of contemporary urban street design.

Having set the context for the thesis and grounded it in theory, Chapter 5 outlines the methodological approach adopted to carry out the research. This chapter details both the process (qualitative) and observational (quantitative and qualitative) phases, with supporting material included in the appendices. The thesis then proceeds to presentation and discussion of the results of the analysis in chapters 6 and 7. Chapter 6 primarily addresses RQ1, focussing on discussion of the processes that took place during the project and the network of agency that shaped the design and construction. Chapter 7 relates more to RQ2, presenting and discussing the results of the observational phase of the research. Contributions to existing theory are posited in both chapters and discussion relating to socio-technical transition theory is woven throughout.

The thesis concludes with a discussion of the cross-cutting themes identified throughout the research. This final chapter presents a novel analytical framework for the design and analysis of mixed-use streets in the future. It concludes with an evaluation of how successful the Sauchiehall Street pilot project has been as a socio-technical niche, both in terms of its immediate behavioural impacts, but also the potential for the project to play a role in bringing about longer-term transitional change. The chapter highlights implications for practice and theory, including methodological contributions, and suggestions for future research.

Chapter 2: The shaping of urban street design

2.1 Introduction

Contemporary streets are physically and conceptually complex, encapsulating a multitude of often contested functions and requirements to meet multifaceted objectives. Their development could be charted along a variety of different courses, however, this chapter focuses specifically on how key movements within urban design and transport engineering praxis have historically shaped street design. The first half of the chapter outlines key theoretical influences within urban design, followed by key influences within highways engineering, reflecting the dominant rhetoric of the latter during the modernist period when mass motorised vehicle use commenced. The second half of the chapter focuses on how these theoretical influences are manifested through the mechanisms of urban governance, including policy and guidance. Having set this context, the chapter concludes with a review of the policy and guidance landscape as it was at the time when the Avenues Programme was being developed.

2.2 Shaped by design: urban design's influence over street development

Hillier (1996) argues that places are just moments within the larger-scale city and that the concept of place can only be understood by also understanding that cities make places, rather than places making cities. As such, this chapter starts with a review of key movements within urban design theory as it relates to the development of larger scale urban places. Later sections focus more specifically on individual streets.

2.2.1 The emergence of street design from the late 1800s to 1960s

Some theorists posit that the emergence of what might now be termed 'urban design' can be traced back to the beautifying efforts of the late 1800s, as manifest in the City Beautiful Movement in the United States (Monclús and Medina, 2018). A key premise within this movement was that design cannot be separated from social issues, which promulgated a focus on civic pride and engagement. The City Beautiful Movement offers an early example of the

explicit intention to effect social change through the manipulation of the built environment using public art and greening in response to what were perceived to be overly industrialised environments.

This same social change motivation can also be traced through to Howard's Garden City Movement, which dominated design thinking in the early twentieth century and beyond with its focus on decentralisation and access to open space. Howard's vision was to build a series of self-contained satellite towns based on concentric patterns offering residents the benefits of urban living but with ample access to green space and surrounding countryside (Howard, 1946). Criticised as being the antithesis of the city by authors such as Jane Jacobs (1961), this critique was not specifically levelled against the prescriptive nature of the movement but rather that it was failing to recognise what could be good and life-giving about cities. Rather than promoting regeneration, it was advocating for sprawl.

A key development point in urban design history was the powerful modernist movement that emerged after the Garden City Movement, which presented a radical departure from established approaches to planning. This not only shaped design thinking but also social thinking for much of the middle of the 20th century. Led by prominent architects such as Le Corbusier (1967), modernism spoke explicitly in terms of the use of design to promote urban *reform* [of citizens], rather than just social change. In design terms, this reform was expressed as functionality; the development of structured, practical, yet ultimately segregated spaces in which people could carry out their everyday lives according to what were deemed to be the emerging priorities at the time (automobiles, separation of life and work, and adequate housing, among others).

The design philosophy of modernism can still be seen in cities across the world, including Glasgow, where individual high-rise buildings stand in isolation, surrounded by large swathes of green space, often located far from local amenities (Urban, 2018). Free, fast movement of motorised vehicles is another key design principle of modernism that has left a legacy in cities, such as Glasgow, where a legacy of segregated urban motorway systems and vehicle-dominated city centres persist. Indeed, cities shaped by the separatist principles of modernism and their focus on brutalist architectural form have faced decades

of criticism for their lack of social or civic life (Jacobs, 1961; Sandercock, 2003; Ellin, 2011).

The earlier Garden City Movement had already attracted criticism from Marx and others, who declared them 'social utopias': noble causes but lacking any grounding in reality (Paden, 2002). However, it was not until the emergence of modernism and the physical works of architects such as Le Corbusier that more widespread criticism was levelled at the deterministic nature of urban renewal (Williams, 2005). The city that is the focus of this research, Glasgow, experienced a turbulent journey of slum clearance and mass re-housing as it attempted to regenerate as a post-industrial city heavily shaped by modernist design principles (Patrick et al., 2019). This turbulence continues today as the city deals with a legacy of road domination, relatively poor public transport and associated car dependency (Docherty, 2019). Analysis of any regeneration within the city, even at the level of an individual street, must therefore be couched within this broader historical context.

2.2.2 Post-modern theories of urban design

Jarvis (1980) identifies the emergence of two distinct, but related, approaches to design between the 1950s and 1980s: those appearing to focus more heavily on the detail of physical design (Cullen, 1961; Hillier et al., 1976; Alexander, 1977) and those focusing more on the social usage of space (Lynch, 1960; Jacobs, 1961; Gehl, 1987). Some of these theorists, including Lynch (1960), Cullen (1961), Alexander (1977), and Jacobs and Appleyard, (1987) were also seeking to theorise the link between human perception and the physical built form (Jarvis, 1980). These early attempts to bring together social usage and physical design hold relevance for understanding the physical design of contemporary urban streets and as such, they will be outlined in more detail below.

Alexander's theory of the *Pattern Language* (1977) describes the relationship between built forms. He suggests that a coherent individual experience of the built environment occurs as specific physical items relate to each other at a vast array of spatial scales (from a few items of furniture, through to a house of rooms, a street and even an entire city). Criticised as being "utopian, utterly

impractical, and [requiring] society to be reinvented" (Cuthbert, 2007, p.219), there is perhaps a useful link with contemporary street design in that it involves the assemblage of a series of individual design components to create an overall cohesive experience of a street.

Describing how the 'pattern language' relates to individual behaviour, Alexander talks about 'tendencies' (observable patterns of behaviour), suggesting that these can be shaped by design that suppresses one or more of them or by design that allows them to carry on unhindered (Alexander, 1977). This is arguably an important theoretical component of mixed-use street design, where designers must use physical design to promote (or dictate) safely functioning streets by managing the natural desires of everyone to behave how they want. In contrast to earlier modernist approaches, the Pattern Language is not specifically suggesting the exertion of control through design, but rather seeking to understand how design can promote ease of movement and the enjoyment of public space.

Two other key theorists who sought to theorise the relationship between urban form and perceptual experience were Lynch (1960) and Cullen (1961). Both were writing their seminal texts, *The Image of the City* and *Townscape* respectively, around the same time in the 1960s, having trained during the period where modernist thinking was exerting heavy influence over schools of architecture and planning and thus the physical form of cities. In *The Image of the City*, Lynch (1960) identifies five physical aspects of the built environment (nodes, paths, edges, landmarks and districts) that he considers essential for creating an 'imageable' environment: one for which individuals can create a mental map, which in turn helps create a sense of place and of navigability. He therefore places deliberate emphasis on the importance of individual perception within design. Despite being perhaps one of the best known and widely cited theorists, Lynch, in reflecting on his original work two decades later, noted his disappointment that it had not influenced public policy as he intended. He also noted, however, that despite missing that target, the work had met others, including a significant influence over the development of environmental psychology as it relates to urban design (Lynch, 1984).

Cullen is more often described as a visual aesthetic theorist (Jarvis, 1980) with his focus on describing the importance of physical form and how objects in space

relate at a larger spatial scale than those described by Alexander. His work is more abstract, leading Cuthbert to describe his theories (and those of Alexander) as lacking a relationship to social reality (Cuthbert, 2007). However, within this abstraction is a sense of the early roots of environmental psychology, generally attributed to Lynch's work, whereby Cullen seeks to explain the perceptual experience of moving through space. For example, his observation that a long, uninterrupted view can invoke feelings such as monotony, formed the basis for later psychological work on design for safety, based on the observation that an uninterrupted view can also promote a feeling of security due to a lack of hiding places (Day, 2011).

Lynch originally applied the imageability work at the macro level, across the scale of the whole city. Jacobs, in contrast, focuses much of her observation at the level of the individual street. While she did not focus on street design per se in *The Death and Life of Great American Cities* (Jacobs, 1961), her theories include reference to how elements of street and building design, such as porches and overlooking windows, come together to create the whole perception of a street. A strong advocate for viewing streets through a 'liveability' lens and 'function before form', Jacobs emphasises the use of public realm design to create congenial spaces where people naturally come together, leading to the development of social networks (Jacobs, 1961). Jacobs was also a strong proponent of inductive design, working from the particulars of a street up to the theoretical level, rather than applying wholesale top-down design theory (Whiston Spirn, 2011).

Towards the end of the twentieth century, these socially-oriented design ideas became encapsulated within the concept of place-making. Indeed, Aravot (2002) suggests that the concept of urban design is synonymous with place-making, having been introduced in the 1970s in direct opposition to modernist urbanism, "to give people back that which modernist sterility, abstraction, mechanisticity, redundancy, uniformity and minimalism had taken from them. The outcome of modernist urbanism was placelessness. Urban design was directed towards placemaking" (p.201). Place-making came to dominate urban design and continues to do so, at least to the extent that it is "embedded in the consensus of practice" (ibid., p.204). The next sub-section explores the concept in more depth.

2.2.3 Place-making and the emerging focus on public realm design

Carmona et al. (2010) define place-making as the bringing together of the visual-artistic with the social use, with a focus on functionality. Madden (2011) expands this to incorporate health and economic angles, suggesting that "placemaking aims to create places in cities that can invite greater interaction among people, while fostering healthier and more economically viable communities" (Madden, 2011, p.654). Madden also draws attention to the 'bottom up' nature of place-making as a process, describing it as a 'dynamic human function'. A core tenet of place-making, supported by many proponents of the approach (Carmona et al., 2010; Gehl, 2010; Ellin 2011; Adams and Tiesdell, 2013), is robust, authentic community consultation and even co-design.

Madden also draws attention to the difference between space and place, defining places as multi-functional spaces that provide reasons for people to be there and spaces, conversely, as non-activated places (Madden, 2011). Gehl likewise draws attention to this difference, criticising traditional planning practice for providing too much space, and space that is too big or not thought through. Instead, he refers to the public life of a street, suggesting that liveliness is a function of effective places, and that people lingering (an effect he terms 'staying psychology') is an effective measure of place success (Gehl, 2010). This concept will be returned to in Chapter 3.

The Avenues Programme makes explicit reference to utilising a place-making approach (GCC, n.d.). This perhaps poses something of a philosophical challenge for a project that is attempting to create a sense of place whilst relying heavily on technical design to create a safely functioning *space*. Despite the Avenues project being carried out on streets with existing local communities, the need for technical design is imperative in attempting to safely incorporate the movement of people walking, people cycling, and vehicles along the street, thereby lessening the opportunity for public, non-technical input. This creates a potential challenge in contemporary street design of balancing technical (top-down) design with community-driven (bottom-up) involvement (Carmona, 2021).

The move towards place-making brought with it the requirement to focus much more specifically on the details of street design, such as the public realm. With a few notable exceptions, most reference to public realm in the design

literature had been at a relatively conceptual level until the late 1980s, with little reference to the physical design detail of the street. Jacobs and Appleyard's paper *Towards an Urban Design Manifesto* (Jacobs and Appleyard, 1987) is considered a turning point in this regard (Banerjee and Loukaitou-Sideris, 2011) as the authors attempted to define how liveability might manifest in physical street design.

In focusing on density, enclosure, integration of uses and public space, Jacobs and Appleyard's work, in many ways, merely synthesises existing theory into their new manifesto. However, it is noteworthy for their explicit stance against motorised vehicle dominance, which had largely been absent from design theory until that point. Despite there being far fewer cars on the road than today, even in California where they were writing, Jacobs and Appleyard made the pivotal observation that places designed for people could not sit comfortably alongside the increasing domination of streets by motorised vehicles. Thirty years later, this same thesis forms the core rationale of the Avenues Programme, which additionally purports to place urban design-led planning and a focus on place-making at the heart of infrastructure decisions (GCC, n.d.).

2.3 Shaped by movement: motorised vehicles and the influence of engineering

This sub-section reviews the influence of the development of mass motorised movement on street design over the past half century, a period during which streets increasingly became the domain of engineer-led design. Key influences within design thinking are reviewed, including the transfer of international practice into the UK.

2.3.1 The impact of modernism

To fully appreciate the development of the movement function of mixed-use streets in the UK (and elsewhere), it is necessary to return briefly to the modernist period and ensuing years. The earliest streets were paved with the intent of enabling movement, albeit primarily by horses and other non-motorised modes. The advent of the motor, even before the mass development of private

vehicles, altered the function of streets which became the conduits for new public transport, such as motorised trams (Geels, 2005; Geels, 2007b; Emanuel, 2019), and the modernist theories that emerged in the mid-20th century were, in part, a design response to the rapid change in the way cities are used and how people move around them.

Jones (2016) suggests that there have been three distinct stages of urban transport policy since the mid-1900s (Figure 8). Stage 1 – vehicle focus – is characterised by rapid growth in car ownership, strong support for new roads and a lack of investment in public transport. Stage 2 – personal movement focus – captures a period where the consequences of car-based movement, including a poor-quality street environment, were becoming apparent with an accompanying switch to improving public transport. Stage 3 – activity/quality of life focus – emphasises efficient and sustainable modes and high-quality public realm, achieved through physical space reallocation and an accompanying decline in vehicle use and ownership.

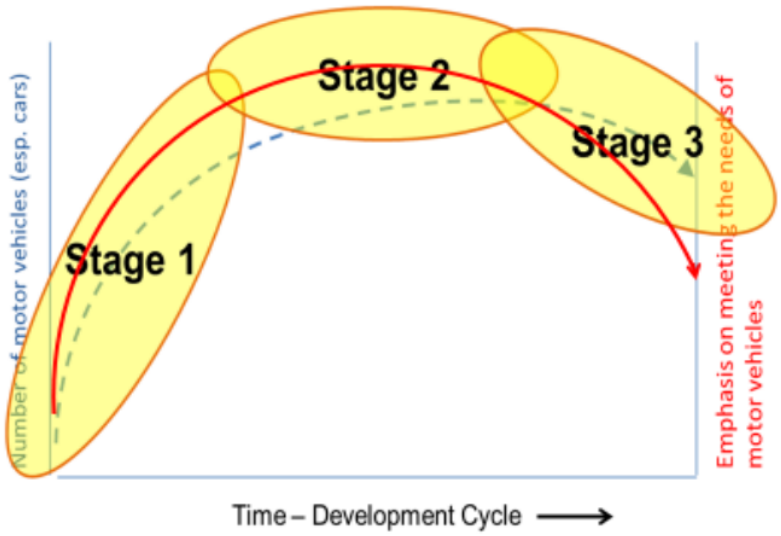


Figure 8: Characterisation of the urban transport policy development cycle (Jones, 2016, p.2). Image reproduced under Creative Commons CC-BY license.

Jones (2016) refers to bifurcation moments whereby a city makes decisions that lock it into a developmental stage, making transition to latter stages more difficult. Whereas Jones uses this term in relation to stage 1 lock in, it could equally be argued that a city such as Glasgow is currently in the liminal space between stages 2 and 3. Glasgow is still working to overcome the challenges of historical vehicle dominance, including a legacy of wide streets. These often

result, somewhat unfortunately, from historic tram routes that were decommissioned. But they are also a hangover from historic plans to build a full motorway-standard inner city ring road (Bruce, 1945), half of which now forms the M8, half of which now comprises wide, multi-lane roads that were never designated as motorway (Scottish Roads Archive, 2020). How streets are designed now, given this morphological legacy, could equally prove to be a bifurcation moment in terms of locking in the potential for safe, sustainable movement in the future.

A core tenet of the modernist period for urban planning (stage 1) was enabling free and fast vehicle movement in urban areas on the understanding that this would enable a prosperous future (Le Corbusier, 1967). This, alongside the statutory separation of highway engineering and land use planning in the post-war years, led to the enshrining of many new roads and design standards in development plans (Bianconi and Tewdwr-Jones, 2013). With the fast expansion of private car ownership in the mid-20th century, UK streets became the domain of engineer-led design, with the primary design intent of maintaining motorised vehicle flow (Böhm, 2006). Hebbert (2005) further documents the move in the late 1960s from engineers planning new urban development based on hierarchical traffic principles, i.e. those favouring the private vehicle, to large scale retrofitting of fast roads into *existing* residential areas to expediate vehicle movement.

One particular civic engineer and architect, Buchanan, had a powerful influence over the development of urban roads in the UK (Hebbert, 2005). His report *Traffic in Towns* (Buchanan, 1964) introduced ideas such as the urban motorway and the vertical separation of vehicles from people walking. This was proposed ostensibly on safety grounds, but on behalf of vehicle drivers, as modernist ideals required that drivers should be protected from injuring pedestrians (Ritter, 1964). Despite a general move more recently towards placing the onus of harm on drivers (Horton, 2016), the mentality that road safety is the responsibility of people not in vehicles to protect themselves from people driving still persists (Figure 9). Horton suggests that this conditioning of behaviour is occurring through the construction of fear, an effect also observable in the norming of safety equipment such as helmets for people

cycling and the installation of (excessive) pedestrian guardrail around crossings, which are often accepted at face value and rarely critiqued (ibid.).

Figure 9: Example of the "Think Before You Step Out" road safety campaign posters distributed throughout Glasgow's streets in the late 2010s. Road safety is being framed as the responsibility of people walking who are asked to keep themselves safe from those driving. Photographed by the author in Glasgow in January 2019.

Glasgow, now somewhat infamous for its extensive urban motorway and expressway system (Docherty, 2019), was a pioneering adopter of mass road building, as part of a 'comprehensive' redevelopment plan (Bruce, 1947) that saw the demolition of large swathes of the traditional city fabric. Poorly coordinated transport governance across three tiers of government (central, regional and local) since the 1960s has left Glasgow with a patchy public transport system, high vehicle usage and what Docherty describes as "substantial and resilient congestion and air pollution problems", despite relatively low levels of car ownership within the city boundary (Docherty, 2019, p.87). Taking Carmona's assertion that the history of a place will continue to shape its future development (Carmona, 2014), it can be hypothesised that there may be a level of institutional and systemic resistance to altering the roads regime in Glasgow, as the Avenues Programme is attempting to do.

2.3.2 The place-movement framework

With the exception of a few dissenting voices, now canonised in the urban design literature (e.g. Jacobs, 1961; Whyte, 1980; Jacobs and Appleyard, 1987), it was not until the early 2000s that vehicle-oriented design thinking really began to be challenged, with the realisation that motorised vehicles had been allowed to dominate streets at the expense of other users (Taylor and Filmer-Sankey, 2002; Hebbert, 2005). This led to attempts to reframe streets to take account of their wider function beyond movement. Perhaps the most influential of these framings was the place-movement framework developed by Jones et al. (2008)[1].

Originally referred to as 'link and place' street design, this framework characterises place and movement as two related but ultimately separate functions of streets. Jones et al. explain that:

> "[as] a Link, a street provides a conduit for through movement, and forms an integral part of the wider urban street network and other, more specialised, urban transport networks (e.g. on-street light rail network) … As a Place, a street is a destination in its own right: a location where activities occur on or adjacent to the street" (p.16).

This allows for the development of a 2D matrix (Figure 10) for the assessment of the overall place-movement (or link) status of a street, where each function is scored out of 5. The street's location within the matrix can then be used to ascertain the most appropriate design interventions, either to cater for the existing status or to enhance (or curtail) the importance of one or either function.

[1] Based on work produced through a large European-funded project called the ARTISTS (Arterial Streets for People) Project by Svensson et al. (2004).

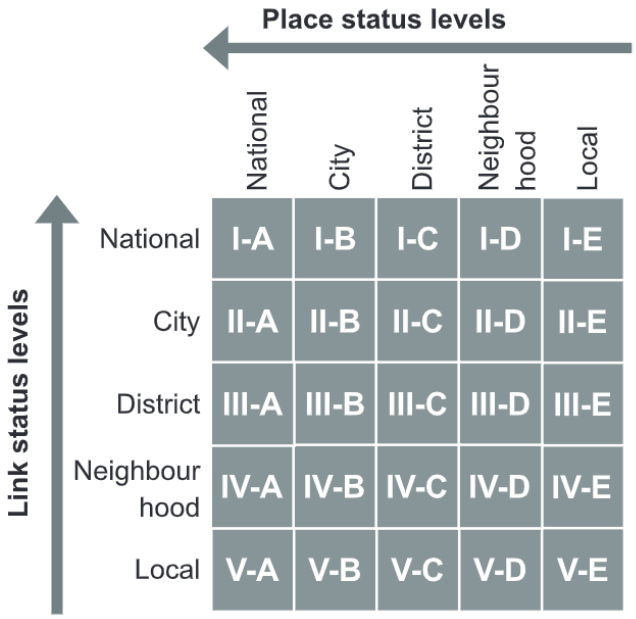


Figure 10: The five-by-five 'Link/Place' street classification matrix (Jones et al., 2008, p.17). Image reproduced under Creative Commons CC-BY-NC-ND licence.

Key within this framework is the use of the same units for measuring place and movement, which the authors argue overcomes the implicit status that has historically been given to movement over place, based on the tendency to measure the former quantitatively and the latter more qualitatively. The authors also stress that movement and place are independent of each other. Therefore, they argue, increasing the place function does not necessarily entail the need to reduce the movement function and these can be addressed separately in design terms by professionals from corresponding disciplines (Jones et al., 2008). The place-movement framework is considered in greater detail in Chapter 3.

2.3.3 Re-thinking movement: the (re-)introduction of active mobility into streets

There has been a historic tendency in UK policy to presume that movement along streets refers primarily to private vehicles (as it often does), neglecting to recognise the presence of walking, as well as cycling and other forms of micro-mobility. Whereas there is recognition within the place-movement framework that movement could entail other modes beyond vehicles, there is still an

implicit presumption that movement will primarily take place in the carriageway and place functions will occur on the footway. Aldred (2015) draws attention to this conflicted framing by criticising the place-movement matrix for perpetuating the dominance of motor traffic and failing to recognise that utility walking and cycling also require design aspects such as safety and attractiveness, which are typically considered as place functions in the typology.

This legacy of vehicle-oriented design has left active mobility modes, such as walking and cycling, occupying a somewhat contested space in contemporary streets, physically but also philosophically (Tight et al., 2011; Latham and Wood, 2015). The current situation in UK urban centres is one of attempting to retrofit walking and cycling infrastructure into road-dominated streets, creating situations whereby cycling and walking are competing, in design terms, to share inadequate amounts of 'leftover' street space. It should be noted that this is not the case everywhere. Places like Denmark and the Netherlands have consistently designed active mobility infrastructure *into* streets since political decisions were taken to do so in the 1960s (Emanuel, 2019). The UK, meanwhile, made political decisions to prioritise the car and the resulting 'typical' street designs can be seen in Figure 11.

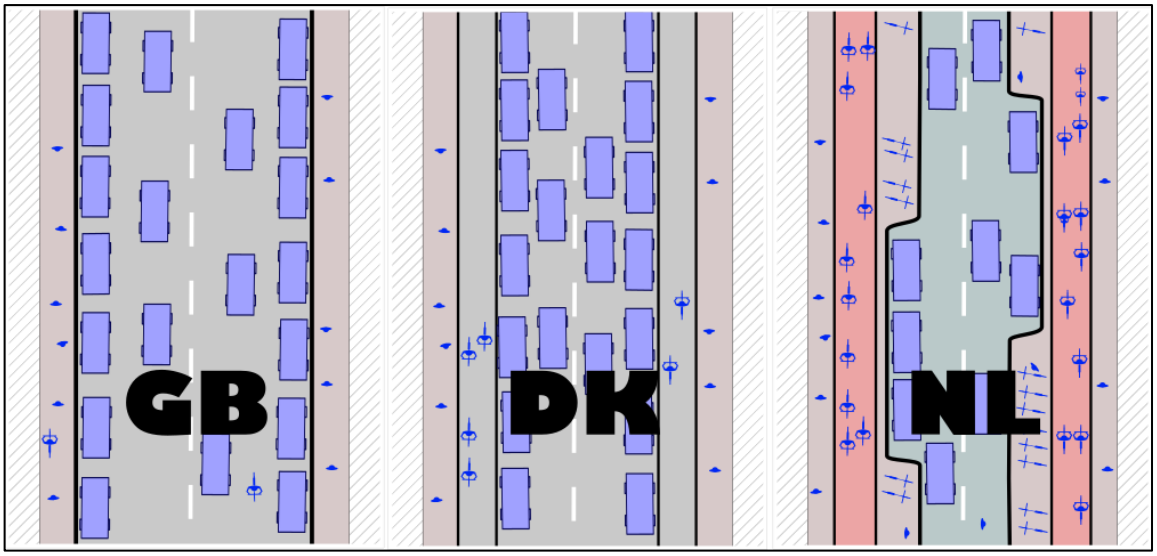


Figure 11: The difference in design approaches in the UK, Denmark and the Netherlands © Robert Weetman. Permission to reproduce this image has been granted by Robert Weetman.

2.3.4 Cycling: the forgotten middle

It is important here to note some key differences between walking and cycling. The default within the urban design literature relating to movement has been to focus on walking. Even Gehl, writing from a Danish perspective where cycling makes up a far higher proportion of total mode share than most other countries (Emanuel, 2019), bases his idea of the human scale on someone moving at a walking pace from a standing height (Gehl, 2010). However, there are clearly differences between the two modes, not least of which is speed. Black and Street (2014) therefore challenge this norm within urban design, advocating for an expansion of the human scale to include the consideration of the 'cycle scale', incorporating "an awareness of, and sensitivity towards, the diverse needs of the bicycle and its user into urban design discussions" (p.69).

Forsyth and Krizek (2011) conceptualise cycling as a mode that has concurrent similarities and differences with both walking and driving. They propose that cycling is prone to becoming the "forgotten middle", observing that "[cyclists] may not be well catered for by typical pedestrian-type urban design responses given their location in the roadway, speed and need to attend to other moving objects (pedestrians and vehicles)," (p.534). Latham and Wood (2015) offer a different perspective, exploring the experiential aspects of cycling through the lens of several different individuals as they 'inhabit' cycle infrastructure in London. Observing that streets tend to be designed around well-established settlements between motorists and people on foot, they note that "[within] this framing, cycling in London is interesting precisely because of how it involves the insertion (or more accurately the reinsertion) of a novel set of practices and materials into the existing infrastructural space of the city's roads" (Latham and Wood, 2015, p.304).

This highlights an important aspect of street regeneration programmes where cycling infrastructure is introduced: that cycling must be treated as a "wholly different mobility" (Latham and Wood, 2015, p.313) and managed accordingly. This includes the interaction with other existing modes, such as walking and motorised vehicles. In the UK, at least, designing streets to retrofit safe cycling infrastructure without inadvertently undermining the safety or useability of the street for other users, such as people with a visual impairment, is providing an ongoing design challenge.

2.3.5 Promoting road safety through 'shared space' design

Spear-headed by Hamilton-Baillie (2008) in the UK, the concept of shared space has its origins in road safety concerns. It is the antithesis of the modernist separation of modes, adopting the logic that by removing indicators of priority for all modes, such as road markings, zebra crossings and kerbs, a sense of caution will be created among all road users leading to more careful behaviour (ibid.). Indeed, the author uses the example of an ice-skating rink to illustrate how this sharing of movement space can occur naturally between humans.

Despite the onus on the re-conceptualisation of the roads environment, Hamilton-Baillie referred to himself as an architect and urban designer, not a highways engineer. He heralds shared space as a means for re-enlivening declining high streets, widening opportunities for community-led design, and reversing the decline in active travel rates, but also as a tool for improving road safety. Noting the historic divergence between the disciplines of transport engineering and urban design, he suggests that:

> "an end to separation of traffic movement from the public realm and the move towards shared space has important implications for the training and professional development of all the disparate disciplines involved. Integration of engineering with urban design implies a broadening of awareness and knowledge amongst professionals and technicians who, until recently, have shared only a sketchy understanding of each other's roles" (Hamilton-Baillie, 2008, p.179).

Despite the design approach challenging decades of orthodox roads planning, the Department for Transport published guidance to local authorities advocating for its use (DfT, 2011) and several high-profile shared space schemes came to fruition in the UK in the 2010s, including Poynton in Cheshire, Ashford in Kent and, perhaps most well-known, Exhibition Road in Kensington. However, these schemes met with almost immediate push-back from organisations advocating for people with a visual impairment (Hailstone, 2017) and the claims made by DfT about safety improvements were questioned (Moody and Melia, 2014).

Ultimately, despite Hamilton-Baillie defending the approach, the Ministry of Housing, Communities and Local Government (MHCLG) and DfT enacted a moratorium on all new shared space schemes (MHCLG and DfT, 2018) following

publication of the Inclusive Transport Strategy (DfT, 2018), which concluded that shared space was exclusionary for certain user groups, such as people with visual impairment. The issues raised continue to exert influence among policymakers with a move back towards clear segregation of modes in street design (DfT, 2020). Sauchiehall Street was designed during a somewhat liminal time, when designers were being directed alternately between fully segregating modes and not segregating at all. This may well have influenced both the process and product of the design, as it will have impacted the governance of the wider project and actions of the individuals involved.

2.3.6 International road safety approaches: systemic safety

Road safety approaches in the UK have also been influenced by international approaches, including systemic (or sustainable) safety. First developed in Sweden but also widely adopted in the Netherlands, the concept of systemic safety frames road safety as a complex systems problem (Naumann et al., 2019). It is based on the premise that there are multiple aspects affecting road safety, including that human users of space are vulnerable to error, and that the design of any infrastructural system must account for this. Infrastructure is therefore designed to be 'forgiving', with the aim of systematically reducing the likelihood of an adverse effect occurring but, accepting that error will occur, ensuring a minimal impact from such adverse events. According to SWOV, the Institute for Road Safety Research in the Netherlands, this is achieved through the systematic and consistent application of three safety principles in road design: functionality, homogeneity and predictability (Wegman et al., 2005).

These three overarching principles are further elucidated by Furth (2019) in relation to the design of infrastructure (Figure 12):

Principles of Systemic Safety

1. **Speed control and separation**: reducing the design speed for all road users at points of interaction; separating different modes according to differential speed.

2. **Functional harmony**: creating a hierarchy of roads according to function; through roads, access roads, distributor roads and not mixing these functions, in order to reduce conflicting movements.

3. **Predictability and simplicity**: ensuring that infrastructure is consistent, easily readable and understandable by all users.

4. **Forgivingness and restrictiveness**: accepting that human error will occur, designing to reduce the risk of adverse effect; preventing people making the mistakes they would like to.

5. **State awareness**: taking into account wider individual factors such as weather, the experience level of drivers, other potential impairments and distractions.

Figure 12: Principles of Systemic Safety, as applied to infrastructure design (Furth, 2017).

In essence, road infrastructure must clearly dictate to people how they are to behave in different settings, and this must be the same across entire areas to avoid the potential for confusion. Crucially, the argument is that these principles can be applied regardless of the cultural context as infrastructure should 'read' sufficiently clearly regardless of who is using it.

The Netherlands and Sweden are the only two countries that have fully adopted systemic safety principles as a basis for their entire national transport policy and infrastructure design. The concept has, however, been partially transferred to the UK, as the basis for Transport for London's Vision Zero programme (TfL, 2018). Vision Zero aims to eliminate all deaths and serious injuries from London's roads by 2041 through an action plan aiming for safe speeds, safe streets, safe vehicles, safe behaviours and post-collision response (ibid.). However, the approach has not previously been mainstreamed at a national policy or design level in the UK (Brake, 2015). Policy transfer occurs where a policy approach is 'imported' by policy actors from a different setting, often another country (Dolowitz and Marsh, 1996). Given that a crucial aspect of Vision Zero is that road and infrastructure design remain consistent between different places, which is not the approach taken in the UK, this is perhaps an example of

incomplete policy transfer, where crucial elements of what made the policy or institutional structure a success in the originating country are not transferred. This can, in some cases, lead to the policy failing (Dolowitz and Marsh, 2000).

Other countries have, likewise, used the approach to inform local area strategies, including in the U.S. (Fleisher et al., 2016). Whereas systemic safety has not been mainstreamed across all road safety legislation in the U.S., it has led to the conceptualisation of the 'Complete Street' (U.S. Department of Transportation). Complete Streets are, in effect, just mixed-use streets with degrees of active mobility infrastructure included depending on the context. However, the Complete Streets Coalition emphasise how the concept is both a product but also an approach: shaping mixed-use streets according to systemic safety principles means that streets can respond to community context but also maintain standardised safety (Smart Growth America, 2022).

It is interesting to note the essence of the 'social usage' urban design theorists (Jarvis, 1980), who were reviewed earlier in this chapter, apparent within these contemporary approaches that seek to 'reclaim' streets for people not in vehicles. Despite being badged as road safety measures, Complete Streets and shared space demonstrate founding urban design principles, such as overcoming road-induced segregation (Jacobs and Appleyard, 1987) and natural surveillance (Jacobs, 1961). There are also notable parallels with Cullen's *Townscape*, incorporating environmental perception into street design by, for example, providing visual stimulation (Cullen, 1961).

The 'completeness', or otherwise, of the Complete Streets approach has been challenged by some organisations, including the Project for Public Spaces (PPS) (Toth, 2011). PPS claim that whereas the approach is an improvement on the status quo, it is still too road engineer-led. They advocate instead for community-led design and even espouse the shared space approach. Contrast this directly, however, with a critique of this same shared space approach by Methorst et al. (2007) who suggest that it would benefit from a greater degree of systemic safety. There appears to be a trichotomy of philosophical opinion in relation to road safety, with groups advocating for a technical approach based on clear segregation of modes (systemic safety); a community-led approach, which may involve the removal of roads altogether; and the shared space

approach, which maintains that roads can be made safe and even become core components of improving public space (Methorst et al., 2007).

Given the high degree of technicality inherent within street design, it is perhaps difficult to see how the entirely community-led approach advocated for by PPS could ensure the required road safety outcomes. But their argument is perhaps as much a critique of an approach which presumes that roads will continue to form a major component of streets. Indeed, it could be argued that an absence of roads entirely would negate the need for all road safety approaches. However, there is increasing evidence of how no-, or low-vehicle environments can still fail to provide inclusive space for all users, especially those with a visual or mobility impairment (National Federation for the Blind UK, 2020; Guide Dogs, 2020). Additionally, 'micro-mobility' modes of transport, such as e-scooters, but also e-bikes, are becoming increasingly popular in the UK. For instance, there has been a notable increase in food delivery cyclists (working on behalf of companies such as Deliveroo or JustEat) post-pandemic, with higher numbers of e-bikes now visible on streets. This creates implications for how these relatively low-powered, yet still motorised, modes are accommodated in public space. A recent report from Greater Manchester found that 36% of people surveyed who walked felt unsafe around e-scooter riders, as well as 23% of respondents who cycled (Sherriff et al., 2022).

In the UK context, as discussed above, the retrofitting of cycle-specific infrastructure into mixed-use streets is a disruption of the established settlement (Latham and Wood, 2014), potentially introducing more chance for human error where two modes with differing speed profiles and a high reliance on human competence are brought into the same space. Whereas there has been research into the experiences of people cycling and walking in the context of sharing infrastructure (e.g. Delaney et al., 2017), there appears to be a dearth of research exploring how urban design principles might be understood or utilised to create a systemically safe experience on mixed-use streets.

Thus far, this chapter has reviewed theoretical urban design and engineering influences over streets, noting the threads of the former running throughout responses to the latter. However, it is the manifestation of these theoretical approaches that will ultimately shape streets on the ground. The second half of the chapter therefore reviews the governance of street design from the

perspective of urban design and engineering, before concluding with a review of the policy and guidance environment within which the Avenues Programme would have been developed, and more recent updates.

2.4 Shaped by governance: 'knowing' and 'unknowing' design

This sub-section explores the nature of urban design governance: what it is, who enacts it, and how it relates specifically to the design of streets.

2.4.1 Urban design governance

Carmona defines urban design governance as "[the] process of state-sanctioned intervention in the means and processes of designing the built environment in order to shape both processes and outcomes in a defined public interest" (Carmona, 2013, p.705). Describing governance, Carmona suggests that it is a "slippery" term (ibid., p.711) but is ultimately about recognising that power tends no longer to be centralised and controlled but rather spread between a wide range of interests.

Carmona also proposes a theory relating to the nature of design itself. Recognising that urban design (in the UK context) was tending towards a focus on high profile 'end product' projects, with little critical appraisal of the broader context, Carmona instead suggests that it is essential to treat urban design as a *process*. He coins the term "place-shaping continuum" (Carmona, 2014, p.6), referring to the recognition that the design process does not stop when the 'product' is complete but rather that the function of places will continue to change and adapt with use over time.

Figure 13 shows Carmona's conceptualisation of the place-shaping continuum. He identifies two over-arching contexts: the history of a place, which he suggests continues to exert intangible influence over design over time, as well as the contemporary polity, comprising the policy context that enables and constrains design. These, he suggests, govern four active place-shaping processes: design, development (shaping physical public realm for use), space in use, and management (shaping public realm through use). Each of these, he suggests, consist of complex aspirations and processes.

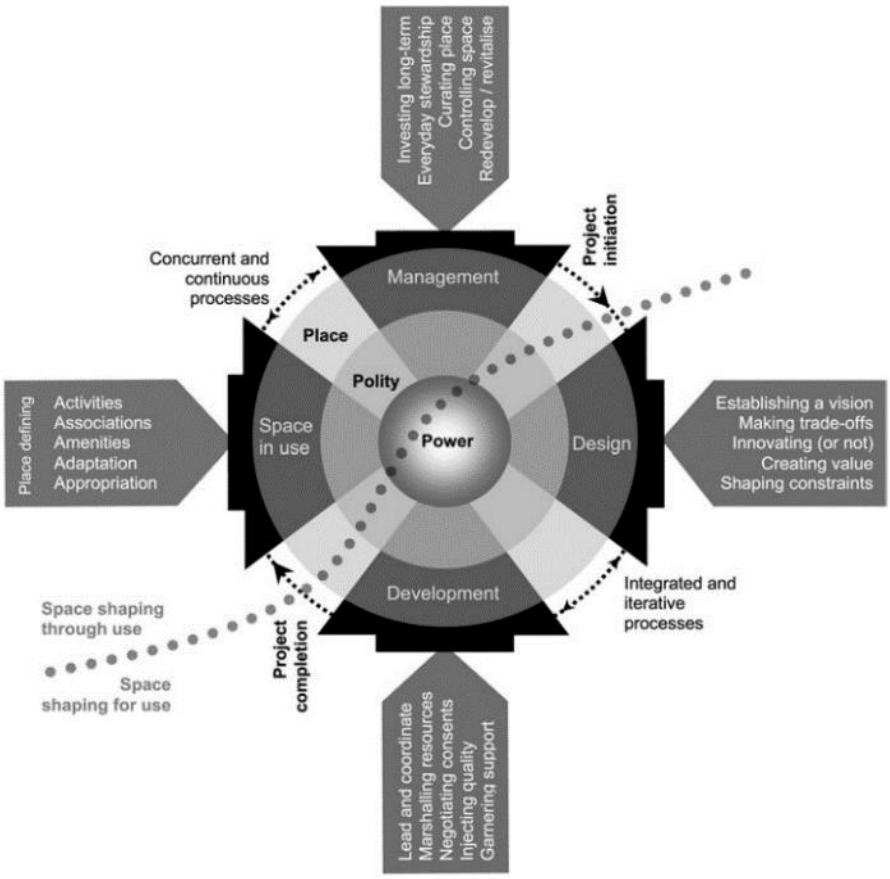


Figure 13: Urban design process: a place-shaping continuum (Carmona, 2014, p.11). Image reproduced under Creative Commons CC-BY licence.

From this, Carmona goes on to discuss the notion of self-conscious and un-self-conscious design (Carmona et al., 2003). This critically important concept has at its core the idea that built environment projects will inevitably be shaped by a myriad of individuals beyond 'trained' designers. This can lead to examples of 'unknowing' place-shaping, whereby a failure to manage the overarching shape of a design project in the longer-term can lead to piecemeal iterations of design that can ultimately undermine the design intent.

Cuthbert (2007) observes that the later post-modern period saw the expansion of urban design into other realms beyond 'pure' urbanism. He suggests that this was perhaps a combination of the discipline itself broadening its outlook (especially in response to new global issues such as sustainability) alongside the emergence of urban in other disciplines, for example sociology, geography and politics, which were increasingly looking to shape physical space according to their own lenses. However, this removed the locus of place-shaping control away

from the technocratic designers and has produced a new generation of 'unknowing' designers.

Drawing on the theoretical place-shaping continuum, Carmona (2014) concludes that it is impossible to predict how spaces, such as new public realm, will come to be used because they will always be subject to the longer-term process and management of 'shaping by use'. "As a consequence [he says] the impact of space in use on the character and quality of spaces stem [sic] from a 'natural' (rather than conscious design) process, 'unknowingly' shaping and reshaping the nature of urban places" (Carmona, 2014, p.22). This potentially has relevance for the Avenues Programme as an example of a state-implemented public realm programme with multiple actors involved. Not least because the accepted approach to street design within the disciplines of transport and engineering relies on achieving safety through strict prescriptions of how space is used. The potential conflict inherent in the un-knowing shaping of streets that possess a significant movement (or transport) function is perhaps critical in analysing the processes involved in the Avenues Programme.

2.4.2 Public sector governance

Carmona's work echoes George's concept of place-making as both a first and second order design process, whereby first order design refers to the shaping of the actual physical attributes and second order to the decision-making environment surrounding the design (George, 1997). Like Carmona, George also advocates for an understanding of the process of design, suggesting that urban design is primarily a second order design function. Whilst recognising this, Carmona (2016) suggests instead that a positive 'second order' influence over the decision environment *is*, in fact, urban design governance.

This can be contrasted, however, with the notion of individual agency within design. Following the rise of public-private partnerships as a response to the decline of public space in the late 20th century (Carmona et al., 2008), it is now accepted practice in the UK for local authorities to outsource design expertise to private sector consultancies. Indeed, Linovski (2016) observes that private sector consultants are often placed in the role of public sector actors in urban design projects, sometimes shaping the public policy arena as well as actual designs.

Despite this undoubtedly removing a degree of state control, Carmona still suggests that "[in] local authority driven public space schemes, the concurrence of regulatory, development, funding and management powers in one place creates a powerful cocktail of influence able to deliver effective and positive change (and occasionally to conspire in the delivery of major public space blunders)" (Carmona, 2014, p.31).

Richardson and White (2021), in a study of a small local planning authority in the West of Scotland, identified that design champions can have a marked influence over design quality and that utilising private sector expertise can be beneficial. However, critical examination of the motivation of private sector bodies, which may conflict with public sector objectives, is necessary to fully protect the public interest, especially with the increasing weakening of public sector power due to austerity measures (ibid.). Ultimately an 'in-house' programme, the Avenues will afford Glasgow City Council regulatory control, however, the delivery of effective change perhaps relies on interests being aligned *within* the council. This is perhaps particularly important given that the design and construction work was outsourced. Indeed, Zamanifard et al. (2018) critique Carmona's continuum model for failing to adequately account for the complexity and nuance of (potentially contested) power relationships amongst project actors.

Of additional relevance here is work by De Magalhães and Carmona (2009) who theorise a form of design governance relating specifically to public space management. They suggest four key dimensions: regulation of uses and conflicts between uses, maintenance routines, new investment and ongoing resourcing, and co-ordination of interventions. This latter category recognises the need for agents in charge of activities in the first three dimensions to "pull in the same direction" (ibid., p.113) to carry out effective governance. Ward (2011) notes the rise of the 'regeneration professional', in response to the blurring of traditional professions such as planning, engineering and architecture. This multi-disciplinary agent might perhaps be key in coordinating the interventions required of public space projects and this will be explored further in this research.

Agency is certainly a key component within any project shaping the built environment (Nielsen and Farrelly, 2018), especially where there is intent to use

technical design to bring about wider transitional change (Geels, 2005). This important theme is explored in greater detail in Chapter 4 with regards to the potential for regeneration projects to play a role in broader sustainable urban transitions.

2.4.3 The governance of mixed-use streets

The Avenues Programme will regenerate what are referred to in urban design terms as 'mixed', or 'mixed-use' streets; "the range of mixed commercial streets that bisect traditional cities and that encompass retail streets of strategic significance" (Carmona, 2015, p.3). Jones et al. (2007) note that mixed-use streets often sit in the middle of the place-movement matrix, making them the most difficult streets to design for. Their potential movement functions can include transport interchange, an 'estuary' effect funnelling local travel towards the city centre, as well as pedestrian movement along the street (ibid.). These days, other forms of active mobility, such as cycling, should undoubtedly also feature in such a typology.

In governance terms, Carmona (2015) calls for authorities to view mixed-use streets in a holistic manner, where the complex interchanges between movement and the physical fabric can be managed to support the wider commercial and social function of these streets. He notes that the complexity is increased due to the disparate management responsibilities for different functions of the street (Figure 14). This suggests an increased risk of unknowing design through use for these streets if longer term management is not holistically managed.

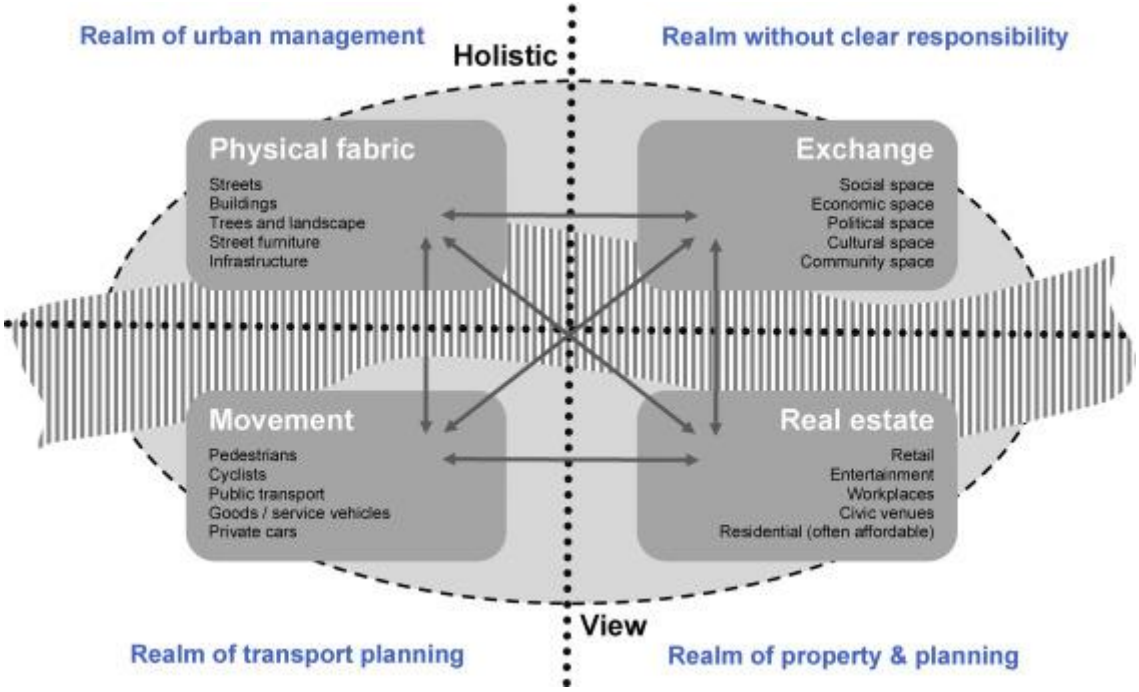


Figure 14: Management responsibilities and different functions within mixed-use streets (Carmona, 2014, p.10). Image reproduced under Creative Commons CC-BY licence.

Interestingly, Jones et al. (2007) identify both highways engineers and town planners as the major custodians of mixed-use streets but decry both professions for overlooking and undervaluing them. Carmona (2015), writing eight years later in London, concludes that innovative thinking regarding the nature of high streets is now being led by transport practitioners, including highways engineers, rather than planning or regeneration. Indeed, this is potentially reflected in the Avenues Programme, which has the reduction of carriageway space and provision of active travel infrastructure as core aims. However, this marrying together of urban design and transport, two distinct disciplines, presents a potential challenge in reconciling governance approaches and philosophies. This is explored further in the next two sub-sections.

2.5 Shaped by policy: guidance and standards within urban design and engineering

It is notable that for a significant street regeneration programme dealing with design details, the Avenues Programme does not have its own design guidance. This sub-section therefore considers the theoretical role of written guidance and standards, as well as presenting a review of the key national and local guidance

shaping the sphere in which the Avenues Programme was developed. In addition, several significant pieces of design guidance and policy have been published in the UK *since* the Sauchiehall Street pilot was completed, including an update to the Highway Code. These will be considered briefly but the core focus will be on the policy and guidance documents as they were at the time the Avenues was being developed.

2.5.1 The mechanisms of design guidance in the UK

As discussed, public space projects in mixed-use streets are required to address a complex, often conflicting set of requirements, as well as legacy issues. Carmona (2014) frames the decline in London's streets in the late 1900s as a failure of urban and social policy, leaving streets as “de facto receptors of a range of social problems on top of being clogged by traffic as a consequence of unchecked car ownership” (p.13). Given how many different policy arenas could potentially overlap in the governance of a single street, it is easy to see how the lack of a *proactive* policy approach to manage their coordination could lead to the ‘de facto receptor’ effect Carmona describes.

At a more specific level, the discretionary planning system in the UK means that decision making concerning development is rarely spelled out in advance and is instead subject to a series of material considerations, of which design is just one (Punter, 2007). In addition, whereas development control guidelines often dictate standards, design guidance in the UK tends to *suggest* or *advise*, rather than specify design. However, Punter (2007) notes that there has been a progression towards more general planning policy, alongside more prescriptive guidance, designed to give developers a clearer steer as to palatable development.

Carmona (2016) additionally criticises a tendency in street design towards substituting design with regulations, arguing that placelessness occurs due to shaping place through crude standards. He also cautions these standards becoming the norm applied everywhere, regardless of context. This poses an interesting question for a mixed-use street, such as Sauchiehall Street, where design and regulation will need to be balanced to achieve a harmonious street.

Design policy is also increasingly needing to adapt to contemporary demands. Imrie and Street (2009) report architects' concerns about needing to design to address issues outwith traditional training, such as climate change, terror threats and international migration. Whereas it could be argued that the role of a designer is to respond creatively regardless of the design brief, the reliance on designers to tackle some of the most challenging of contemporary issues appears to be placing higher demands on the design professions.

2.5.2 Philosophical considerations in design governance

There is perhaps a more philosophical angle to be considered in the discussion of design guidance and policy: that of environmental probabilism and possibilism (Bell et al, 1996). This theory, from environmental psychology, concerns the idea that the built environment can be designed to make a behaviour likely to happen (probabilism) or designed to create the opportunity for it to happen without specifying that it must (possibilism). Bearing similarities to Alexander's 'tendencies' (Alexander, 1977), these theories sit within the broader concept of architectural (or environmental) determinism, a widely debated concept concerning the extent to which the built environment shapes behavioural outcomes. Although widely refuted as an approach by some urban designers (Cuthbert, 2007), the intent to shape physical and social outcomes through design is a core tenet of many design approaches, including programmes such as the Avenues, which ultimately seek to shape behaviour through physical design.

Michelson (2011) suggests that the dividing line between probabilism and possibilism is not definitive and that instead design might be viewed as a sequence of agency from determinism through possibilism to probabilism. Indeed, this introduces the idea that a single street (or network of streets) may contain different design elements and character areas that enact different degrees of agency. A public square may function as a more possibilistic space by providing a relatively blank canvas for people to use flexibly, whereas a mixed-use street with a greater degree of design-led infrastructure may function more probabilistically in terms of shaping people's behaviour.

This poses an interesting framing for the introduction of cycle-specific infrastructure into a mixed-use street. Returning to the idea of cycling as the

‘forgotten middle’ (Forsyth and Krizek, 2011), the introduction of cycle tracks on Sauchiehall Street is arguably a possibilistic intervention with regards to cycling, in that it is offering designated space to cycle, whilst also offering people cycling a choice of whether to use the cycle track or remain in the carriageway with vehicle traffic. Likewise, widened footway increases the possibility for pedestrian movement. The introduction of the cycle track at footway level however is arguably a more probabilistic intervention from the pedestrian perspective, in that it restricts pedestrian movement (for example, by requiring pedestrians to cross the live cycle lane to access benches and bus stops). But for the street to function safely, the cycle and walking infrastructure both need to operate probabilistically, in that they need to dictate where people are walking and cycling to avoid collisions.

2.6 Shaped by the economy: the role of local economic voices

A core component of the identity of the mixed-use street is its commercial and business function. Whereas this research focuses primarily on the design and function of physical infrastructure, it is also appropriate to consider the role of the local economy in shaping mixed-use streets and the relationship between the two. Part of the ‘utility’ function of travel to and along any mixed-use street will inevitably be to access the shops and services that are located there. The physical infrastructure can contribute to this success through place-making (Living Streets, 2018), and also provide the conduit for people traveling to and along the street, but infrastructure is unlikely in itself to provide a reason for people to visit.

In order to fully consider the role of the local economy in shaping a mixed-use street, it is necessary to first step back and look at the broader, national economic picture. Economic development was one of the policy areas devolved to the Scottish Parliament when it came into existence in 1999 and, right from the outset, investment in infrastructure was considered a core remit (O’Connor and Wakefield, 2021). At the time, the remit for economic development sat primarily with Scottish Enterprise, an Executive Non-Departmental Public Body of the Scottish Government, which operated through a series of regional bodies. However, following the election of the Scottish National Party (SNP) in 2007,

Scottish Enterprise became more focussed on national priorities and the responsibility for local economic development, referred to increasingly as ‘regeneration’, became the responsibility of local authorities (ibid.).

Further devolution of power, both from the UK Government to Scotland, and internally within Scotland, saw the introduction of Regional Economic Partnerships across Scotland. This in turn led to City Region Deals, which comprise packages of funding agreed between the Scottish Government, the UK Government and local partners (Scottish Hub for Regional Economic Development, 2023). The first of these in Scotland was the Glasgow City Region, formed in 2014, which focuses on several priorities, including economic development via investment in infrastructure (Glasgow City Region, 2023). Indeed, the Avenues Programme is funded through City Deal monies: an example of a programme intending to bring about economic regeneration through physical infrastructure.

This connection between infrastructure and economic regeneration is made further explicit in more recent national funding programmes, such as the Shared Prosperity Fund (SPF), which was introduced in 2022 to replace European Union Structural Funds. The SPF includes a specific funding stream dedicated to Communities and Place, which is intended for projects relating to the built environment, social capital and public realm. The inclusion of public realm improvements as a core component of this national funding demonstrates the extent to which the UK Government is recognising the importance of the role of streets (and the streetscape) in sustainable economic regeneration. This also points to the potential strength of the economic voice in shaping streets. The public sector’s role may be to create the conditions that encourage business growth, stimulate demand for goods and services and increase the economic participation of individuals (Audit Scotland, 2016) but the nature and availability of capital for carrying out this role will shape both how and where it is manifested on the ground.

2.6.1 The relationship between the local economy and the public realm

In their research looking at the rise of the ‘experience economy’ as a diversification strategy in UK city centres, White et al. (2023) summarise the various challenges that have impacted UK high streets over recent decades. These include the longer-term shift towards out-of-town shopping centres (Dolega and Lord, 2020) and the rise of e-retailing (Jones and Livingstone, 2015), which were already problematic for high street retailers, even before the Global Financial Crash of 2007 to 2008. More recently, the restrictions placed on physical retailers during the COVID-19 pandemic provided yet further challenges for high street businesses. Despite the share of e-retailing falling slightly compared to the height of the pandemic, the figure in October 2023 was still notably higher than the pre-pandemic share in February 2020, having increased gradually between October 2022 and October 2023 (Office for National Statistics, 2023). Whereas several scholars suggest that these trends are not necessarily the ‘death of the high street’ (Hughes and Jackson, 2015; Orr et al., 2023; White et al., 2023), this does point to a potential weakening of the in-situ economic voice on the street.

Recognising the potential vulnerability of mixed-use streets to broader economic trends, White et al. (2023) draw specific attention to the relationship between the economic success of high streets and the public realm. The authors build on the work of Warnaby and Davies (1997), who suggest that an individual’s overall cognitive and emotional experience of a street will be made up of a combination of ‘visible’ and ‘invisible’ factors. These extend beyond the mere availability of retail outlets, taking in aspects including the public realm, and the associated provision of facilities, such as seating and toilets. White et al. (2023) identify the Avenues Programme as one of several similar programmes occurring in UK city centres that are taking advantage of available funding to improve the public realm in order to improve the overall visitor experience, as well as achieve wider sustainability and active travel goals Whereas the economic success (or otherwise) of high streets is more readily associated with the availability and status of retail outlets, these retail and consumption spaces on mixed-use streets should moreover be viewed as “complex economic systems” (Dolega and Lord, 2020, p.2) with the public realm playing an integral role within these systems.

2.6.2 The manifestation of local economic voices: business owners

This sub-section has thus far considered the impact of more hypothetical economic voices on the shaping of mixed-use streets, but these voices are manifested much more directly through the owners and tenants of businesses and other commercial premises located on mixed-use streets. In their comprehensive case study of three mixed-use streets in the UK, Jones et al. (2007) noted that whereas the businesses offered a wide range of retail and service activities, the decisions made by business owners regarding the opening and closing times of their retail units meant that the streets in the case studies were often 'closed' by 18:00 each day. This, the authors report, created a "slightly bleak and intimidating environment for pedestrians after dark" (Jones et al., 2007, p.31). Conversely, the authors describe the increasing expansion of the 'night-time economy' of bars, restaurants and nightclubs in UK cities. Whilst arguably broadening the appeal of streets and diversifying the economy, the authors also note the potential negative externalities of these sorts of establishments, including the violence and disorder associated with youthful drinking, at worst creating 'demographic ghettos' (Mintel, 2004). Sauchiehall Street contains a mixture of both these functions: retail units that close in the evening, as well as a substantial number of 'evening' and 'night-time economy' premises.

Returning to the concept of first and second order design (George, 1997), local authorities can to some extent shape the decision-making environment in which business owners operate – for instance by incentivising certain businesses or disincentivising others – but much of the overall make up of streets will arguably be more heavily shaped by broader factors, including the availability and nature of investment funding. Legal constraints put in place by the planning system will also shape the makeup of businesses on a street by e.g. setting limits on the proportion of certain types of use class in an area, or by restricting changes of use class.

It is also instructive to consider the role of Business Improvement Districts (BIDs) in shaping mixed-use streets. Originating in Toronto, BIDs became widespread across the United States in the 1990s and eventually transferred to the UK in the mid-2000s, following the introduction of the statutory instrument *Business Improvement Districts (England) Regulations 2004* governing their set up. In the

UK, a BID can be implemented where a pre-defined proportion of local businesses and property owners in a defined geographical area vote in favour of its inception. Once in operation, a local tax or levy is placed upon each business, based on their rateable value, and the BID can then use the revenue raised from the tax for priorities that are defined by the BID members. In many cases in the United States, the funding raised through BID levies is used for hiring additional security staff, improving street lighting, increasing the frequency of street cleaning and providing street furniture (Symes and Steel, 2003). Whereas the implementation of a BID in the UK will be overseen and handled by the respective local authority, once in existence a BID is self-governing and acts effectively as a private sector agency. It is therefore apparent how a BID, through its governing voices, could potentially play a significant role in the economic fortunes of streets, through (or as well as) exerting quite direct agency over the physical condition of streets in a BID area.

The role of BIDs in shaping streets is particularly pertinent for the Avenues Programme due to the existence of the Sauchiehall Street BID, which formed in 2014 and operated until 2019, encompassing the lifetime of the Avenues Sauchiehall Street pilot. The Sauchiehall Street BID focussed on supporting, championing and enhancing the entertainment sector (Glasgow Chamber of Commerce, 2013). It was set up in response to the publication of the City Centre Districts Strategy (GCC, 2014), which recognised Sauchiehall Street and its immediate surroundings as an important contributor to the overall city centre economy (Glasgow Chamber of Commerce, 2013). The BID Business Plan reports the findings of a survey conducted in July 2013 with proposed members, who identified “general area attractiveness, including quality of public realm” as the top priority, followed by cleansing and safety (ibid., p.7). The BID was created with an initial 5-year mandate, but members voted not to seek a re-ballot after this term and the BID was subsequently discontinued in 2019 (GCC, 2020b). This decision was taken primarily on the basis that disruption from events during the lifetime of the BID (including COVID-19 and two major fires in 2014 and 2018) had undermined the ability of the BID to demonstrate its impact. It was also recognised, however, that the Avenues Programme had transformed Sauchiehall Street (ibid.).

The BID concept has been criticised on a number of grounds, including for the encouragement of increased privatisation of public space, especially regarding the use of what is effectively private sector policing (De Magalhães, 2014). In the United States, BIDs have been accused of using their powers to deem people 'undesirable' based primarily on whether they are spending money, ultimately moving them on to neighbouring areas, creating increased segregation between BIDs and surrounding areas (Symes and Steel, 2003). But they can also provide a mechanism for improving local democracy and enabling hyperlocal agency over streets, whilst raising additional revenue, lessening the reliance on state funding (Grail et al., 2020).

As exemplified by the Sauchiehall Street BID, by providing a unified business voice for an area, BIDs can also provide a means for more efficient consultation with local economic voices ahead of regeneration projects. Standard approaches to 'community' consultation carried out by local authorities have been critiqued on various grounds, including the tendency to consult on plans that are already too established to allow for meaningful change (Virani, 2020). Indeed, the same author suggests that a further issue concerns the entire conceptualisation of community in urban policy as "a linear and homogenous construct that must be hurdled in order to get on with the business of regeneration" (ibid., p.3). A more democratic approach may be to recognise the existence of multiple micro-communities in urban places (ibid.), an approach which could be enhanced through the existence of well-governed of BIDs that act to broker the relationship between local communities and local authorities.

2.7 Shaping the Avenues Programme: the policy environment at the time

The following section reviews key policy and design guidance documentation prior to, and during, the Avenues Programme.

2.7.1 National design policy

Design in the UK is enshrined in national planning policy in each individual country and then clarified further in a series of guidance documents relating to different aspects of design. In Scotland, *Creating Places* (Scottish Government,

2013) sets out the overarching framework for architecture and the built environment. The document places a heavy emphasis on place, as it relates to planning policy, defined as “the environment in which we live; the people that inhabit these spaces; and the quality of life that comes from the interaction of people and their surroundings” (p.11). It defines the six qualities of successful places as follows:

- Distinctive:
- Safe and pleasant
- Easy to move around
- Welcoming
- Adaptable
- Resource efficient.

Creating Places has statutory status, forming a material consideration in the approval of planning applications.

In terms of the more detailed design of streets, designers are sign-posted to *Designing Streets* (Scottish Government, 2010), which is also national planning policy. This document sets out clearly at the start that a distinction should be drawn between streets and roads, with the former comprising any carriageway within an urban boundary and the latter existing outside these boundaries. The document advocates for the consideration of place before movement, but recognises that in the context of busier streets, such as mixed-use streets, this will become more complex. It states, however, that “this should be resolved through an integrated design approach and should not compromise the quality or the sense of place” (Scottish Government, 2010, p.4). Whereas some attempt is made to define how the principles of successful places might manifest in physical design terms at the level of individual streets, the guidance is still relatively conceptual. There is also an assertion that successful places must be derived from local context, rather than a rigid application of standards: “Designing Streets does not, thus, support a standards-based-methodology for street design but instead requires a design-led approach” (ibid, p.3.).

2.7.2 National engineering standards and guidance

There is a long history of engineering-focused research in the UK, which has sought to develop precise, quantitative measures for the design and construction of transport networks. Prior to the early 2000s, the UK lacked definitive national guidance for local street design. Instead, the *Design Manual for Roads and Bridges (DMRB)* (Highways Agency, 1992), which dictates design and assessment standards for the trunk and major road network in the UK, comprised the main guidance for road design. Related guidance, *Design Bulletin 32* (DB32, Department of the Environment and Department of Transport, 1977), now superseded, dealt more specifically with local street design. However, this still ultimately advised designers how to expedite the movement of cars through residential areas. Taylor and Filmer-Sankey (2002) criticised the over-reliance on *DB32* for local street design at the time, stating that "the standard pavement widths in DB32 … are defined as much by the space required for pipes and wires beneath them as by the convenience of pedestrians" (P.112).

The recognition that *DB32* was not fit for purpose led to it being superseded in 2007 by *Manual for Streets* (Department for the Environment, Transport and the Regions, 2007) and then *Manual for Streets 2: Wider Application of the Principles* (Chartered Institute of Highways and Transportation, CIHT, 2010). These documents were developed via a collaboration between urban designers, highways engineers and planners with deliberate intent to provide holistic guidance for the design of residential streets. As such, *Manual for Streets* was the first guidance in the UK to draw attention to concepts such as the place-movement framework. That said, the initial document deliberately omits complex mixed-use streets with a higher movement function and focuses instead on residential streets. It is only in the follow up guidance, published by CIHT and merely endorsed by DfT, that mixed-use streets are addressed (Carmona, 2014). Despite the inclusion of a level of design detail relating to streets, the *Manual for Streets* guides were primarily intended to advise on the development of new residential streets and as such, there is little detail relating to the retrofitting of infrastructure into existing streets.

Despite being published in England and not formally adopted in Scotland, the principles in *Manual for Streets* are widely applicable. Indeed, *Designing Streets* was derived from *Manual for Streets*, but adapted for Scotland (Scottish

Government, 2010). CIHT, however, note that use of the guidance is still not widespread, and a substantially updated version is anticipated imminently (CIHT, 2022). In addition, neither document holds legal or statutory status.

2.8 The current state of the policy field

Since the completion of the Sauchiehall Street pilot and during the lifetime of this research project, several key updates to design guidance have been published. Whereas these will not have directly affected the design of Sauchiehall Street, they will ultimately govern future stages of the Avenues project, as well as potentially impacting the 'space in use' (Carmona, 2014) if changes are made to the street. Likewise, it is plausible that because they were 'in the pipeline' during the Sauchiehall Street pilot, they could have influenced the design environment, if not the specific designs. It is therefore useful to briefly outline them here before revisiting them during the primary research in later chapters.

2.8.1 Glasgow Public Realm Design and Maintenance Guide

The *Glasgow Public Realm Design and Maintenance Guide* (GCC, 2020a) focuses specifically on public realm design, including materials, drainage, street furniture and landscaping. The guidance recognises that public realm is the common denominator in much of Glasgow's freely accessible space, suggesting that it is a core component of place-making and therefore key to achieving the vision of Glasgow as a "resilient, sustainable compact city region" (p.8). It is not specifically an infrastructure guide, however, there is brief coverage of cycle infrastructure and bus stops. It is guidance but intended for use in the assessment of development proposals and tenders for public realm contracts.

2.8.2 Local Transport Note 1/20 (LTN 1/20): Cycle Infrastructure Design

LTN 1/20: Cycle Infrastructure Design (DfT, 2020) provides detailed design advice for cycling infrastructure. Unlike *Manual for Streets*, it includes advice on

retrofitting active mobility infrastructure into existing mixed-use streets, including how to design for walking and cycling together. It introduces the concept of the 'footway level cycle track', which features in Sauchiehall Street (although note that this was designed prior to the publication of *LTN 1/20*). *LTN 1/20* was heralded as particularly noteworthy in the UK for the inclusion of several pioneering designs, such as advocating for continuous cycling priority at side roads, a long-awaited conceptual shift in the UK that had hitherto not been sanctioned in official guidance (Figure 15). Despite being non-statutory and only applying in England, *LTN 1/20* arguably set a precedent for design throughout the UK.

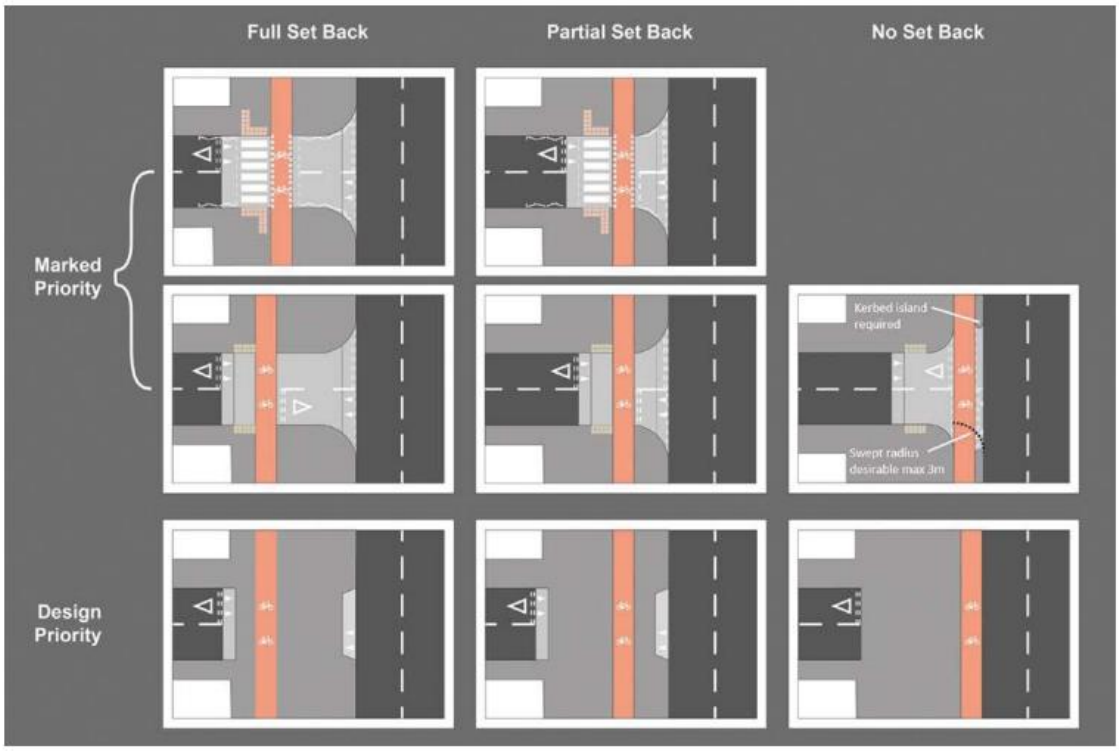


Figure 15: Design options for priority crossings of cycle tracks at side roads, as shown in Local Transport Note 1/20 (Department for Transport, 2020, p.106). Note that LTN 1/20 focuses on cycling and not all of the designs above include pedestrian priority. Permission to reproduce this image has been granted by the Department for Transport under the Open Government Licence: https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/).

2.8.3 Cycling by Design

Cycling by Design (Transport Scotland, 2011, updated 2021) is Scottish guidance intended to be used alongside *Designing Streets* (Scottish Government, 2010) to "enable experienced designers to integrate cycling into a holistic and attractive built environment" (p.8). It attempts to address the challenges of mixed-use street design, suggesting that "holistic design will enable the correct balance of

‘place’ and ‘movement’ functions” (p.8). Like *LTN 1/20* (DfT, 2020), it also provides detailed design advice for integrating cycling with walking in various different settings, but it defers to *Designing Streets* in terms of how the active travel infrastructure should fit holistically within the street. It also goes one step further than *LTN 1/20* in terms of priority at side roads by specifically referring to continuous pedestrian priority, as well as cycling (see p.162). It is non-statutory.

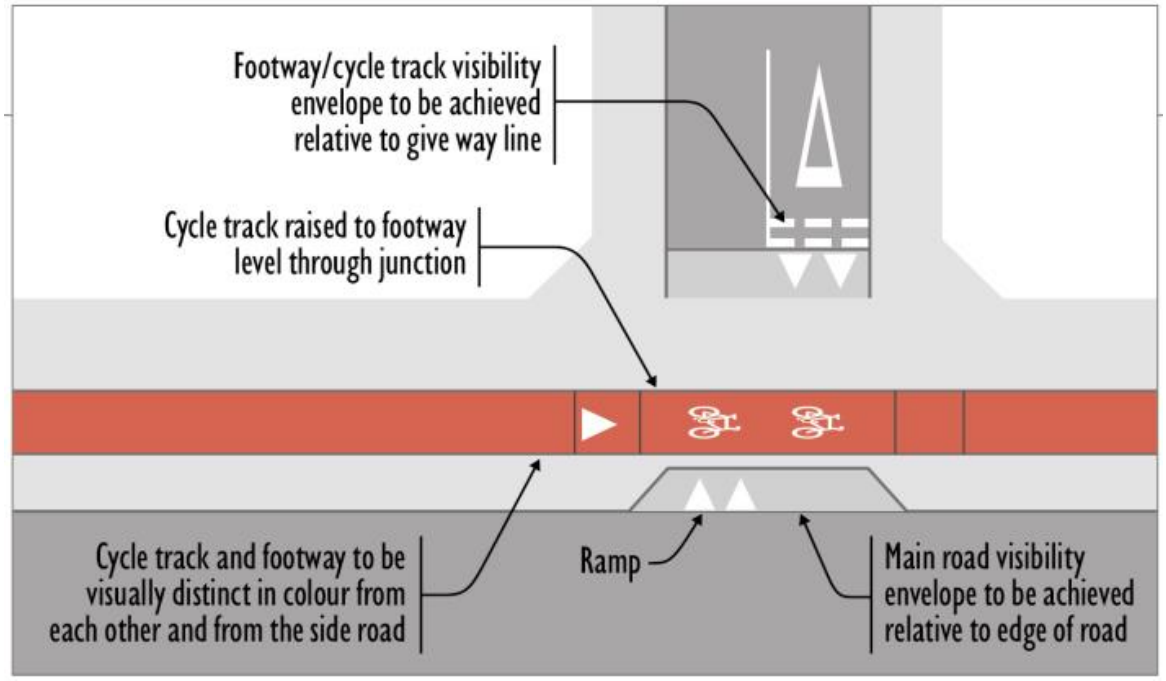


Figure 16: Side road layout included in Cycling By Design showing continuous cycle track and footway at side road (Transport Scotland, 2021, p.162). Permission to reproduce this image has been granted by Transport Scotland.

2.8.4 The Highway Code

The Highway Code (Driving Standards Agency, DSA, 2022) in the UK was updated in January 2022 to include several measures aimed at improving the safety of people walking, cycling and riding horses. These include enshrining in law that people waiting at, or crossing, a side road have priority over traffic turning in, which must give way. The continuous priority designs referred to above are intended to manifest this legal position in physical design terms and it is significant therefore that the new measures are now published in the *Highway Code*. Consultation took place prior to the publication of the updated Code and

it is possible, therefore, that the Avenues design team would have been aware of the likelihood of the Code being updated.

2.8.5 Statutory building standards

Whilst not design guidance or policy, it is also pertinent to consider the role of statutory building standards in shaping the design of streets. These detail technical requirements applicable to building work to protect the public interest, including for commercial premises. Section 4 of the Building (Scotland) Regulations 2004 (Scottish Government, 2004) details the minimum standards required to enable safe access and egress to domestic and non-domestic buildings, especially for people with restricted mobility. Document M of The Building Regulations 2010 (Department for Communities and Local Government, 2010) details equivalent standards for England and Wales. These standards, which cover aspects such as the gradient, surfacing, width and length of access routes to buildings, as well as placement of street furniture, apply for new build properties but also where existing premises are being converted (Scottish Government, 2020b). As such, individual building owners can (and indeed may be mandated to) make alterations to the street outside their property to ensure minimum access standards.

2.9 Summary

This chapter has charted the theoretical shaping of street design through the lenses of urban design and engineering, followed by the shaping of streets on the ground through urban governance mechanisms, policy, and economic voices. It contends that these mixed-use streets evolved rapidly in the mid-twentieth century to incorporate an increasing degree of movement function, in response to modernist planning ideals, before experiencing a more recent (re)turn towards their place function (Tibbalds, 1992). Contemporary mixed-use street design is still responding to the legacy of modernist ideals by physically reallocating movement space (carriageway) to place space (new public realm),

thereby lessening the dominant movement function of streets and increasing the possibility for place-based behaviours.

The potential influence of knowing and unknowing designers also formed a key theme within this chapter, as well as a recognition that the shaping of a street will continue beyond the life of a specific project. Economic actors, including business owners and traders, are important stakeholders to consider throughout the lifetime of regeneration projects, as they will have influence over the design of a street but may not necessarily be 'knowing' in terms of urban design. This is particularly key for Sauchiehall Street given the mixture of 'daytime' and 'evening economy' businesses located along the street. Economic policy, including the funding mechanisms that enable regeneration work such as the Avenues, should also be considered as key to shaping street design.

Additional areas of theoretical and practice-based contention were explored, especially relating to the debate surrounding design approaches such as shared space and the extent to which design should be led by technical professionals or laypeople. It is also argued that cities such as Glasgow are at a critical point in terms of transport policy where the design of new infrastructure is potentially pivotal in locking in mobility behaviour for the foreseeable future.

This chapter has charted the development of streets from two different disciplinary perspectives – urban design and engineering. Whereas there is some recognition that a mixed-use street environment requires the holistic *integration* of place and movement (e.g. Carmona, 2015), the review of more recent design guidance indicates that these are still being considered separately. There is a particular gap in the literature concerning the integration of active travel infrastructure, such as that for cycling, which must be technically correct to ensure its safe functioning, but must also meet the wider place-based aims of street design. Hamilton-Baillie (2008) devised the shared space approach to attempt to overcome this challenge, however, this has not proven to be universally successful (MHCLG and DfT, 2018). The identification earlier in this chapter of the trichotomy of philosophical opinion in relation to road safety (systemic safety vs. community-led vs. shared space) demonstrates the need for further research, particularly in the context of an important mixed-use street such as Sauchiehall Street. There is a corresponding gap in the urban design governance literature, which does not speak specifically to mixed-use street

projects, with their particular place and movement challenges (Jones et al., 2007).

The next chapter reviews the recent history of techniques and tools that have been developed to analyse and measure streets, especially those with mixed functions. It builds on the place-movement framework introduced in this chapter, arguing that contemporary street design requires updated methods that can also capture the public life of the street.

Chapter 3: Measuring streets

3.1 Introduction and defining the scope of the review

This chapter reviews the recent history of techniques and tools that have been developed to analyse and measure streets, especially those with mixed functions. The review is positioned from the early 1980s to the current day, reflecting the notable increase in the development of methods to analyse streets during this time. This period coincides with the (re)turn to balancing the movement and place functions of streets, as discussed in Chapter 2, which occurred in response to the legacy of modernist planning ideals. It concludes with two case-studies analysing mixed-use streets in the UK.

Sauchiehall Street is an example of space reallocation, where carriageway has been retained but reduced, and a new cycle track has been placed adjacent to the (widened) footway (Figure 17). Some of these infrastructures, such as continuous pedestrian and cycle priority at side roads and the footway-level cycle track, are novel infrastructures in the UK context. This thesis argues that in this instance, despite the segregation of walking, cycling and driving, this design approach blurs the traditional ideas of movement and place by physically combining walking and cycling in space, whilst also conceptually seeing these movement modes as contributing to the overall place function of the street. This is an important conceptual departure from the traditional dichotomy of place and movement.

Figure 17: Footway-level cycle track adjacent to widened footway in the regenerated section of Sauchiehall Street. Photo © author.

This also reflects the blurring of traditional disciplinary backgrounds where highways engineers are increasingly required to design for 'place-oriented' modes, such as walking, and urban designers increasingly need to be cognisant of the challenges of designing movement into streets. Traditionally the domain of highways engineering but increasingly included within urban design-led projects, these novel infrastructures potentially need to meet success criteria pertaining to urban design (e.g. aesthetic appeal) but also road safety. Existing tools, reviewed in this chapter, tend to focus on measuring these as discrete entities but it is argued that evaluation of the success of the contemporary mixed-use streets that include these infrastructures may be enhanced by the development of novel methods for understanding and measuring how they are functioning as a component of the holistic functioning of the whole street.

3.1.1 Defining the scope of the review

It should be noted that whereas the Avenues Programme contains broader objectives relating to longer-term behaviour change, this research is specifically considering how Sauchiehall Street is functioning in terms of *immediate*

behavioural impacts, rather than longer term behavioural change. However, this thesis contends that the ability of streets to play a role in bringing about the longer-term behavioural transitions increasingly required of them (see Chapter 4) will be at least partly dependent on their being designed to incorporate contemporary movement and place functions, as discussed in Chapter 2.

There is an additional body of public space literature that focuses on the inclusivity of streets and the right of people to be there against a backdrop of increasing privatisation of public space (Francis, 2011). Whilst this subject is hugely important to consider in terms of the wider functioning of streets, it is not the core focus of the current project and will not be explored in detail. Discussion relating to the regeneration of streets does however need to be cognisant of the potential for gentrification effects (Mandanipour, 2011) and to critically examine not just *whether* people are there, but *who* is there (and who is therefore not there).

3.2 Identifying the functions of mixed-use streets: place, movement and public life

Streets need to be designed according to their function(s) within a wider network (Jones et al., 2008). For the purposes of this research, Sauchiehall Street is defined as a mixed-use street, i.e. one fulfilling multiple functions: a primary commercial hub, a retail location, a key transport corridor for the strategic movement of through traffic, and a destination in its own right. This type of street is also variously referred to as a high street in some UK contexts and a main street in North America (Carmona, 2015). Regardless of the exact definition, there is general agreement that mixed-use streets are complex and dynamic, but also challenging due to the multiple functions which need to harmoniously coexist (Griffiths et al., 2008).

Jones et al. (2008) offer one of only a couple of papers specifically researching the measurement and assessment of mixed-use streets. In it, they introduce their place-movement framework (discussed in Section 2.3.2 of Chapter 2) contending that a street's functions can broadly be placed into two categories:

place and movement. Indicators can then be developed to assess each category separately according to the needs of different user groups. But Jones et al. propose that a suitable *combination* of place and movement functions is key for successful street design.

The place-movement framework has undoubtedly contributed significantly to the development of street design in the UK. However, it also has limitations. In focusing on the allocation of space across the full profile of a mixed-use street, the framework presumes that movement primarily takes place in the carriageway whilst place occurs in the non-carriageway space. It does not therefore speak to the detail of how various types of contemporary movement modes that tend to be designed into non-carriageway space (e.g. walking, cycling and emerging micromobility modes such as e-scooters) can physically be brought together in what is increasingly contested footway space.

The framework also contends that place and movement are separate (and separable) functions. This research, however, argues that contemporary mixed-use streets, such as Sauchiehall Street, are blurring the traditional place-movement dichotomy, both spatially and conceptually. This blurring of functions is to some extent captured within the concept of the public life of the street (Jacobs, 1961; Gehl, 2010), which comprises elements of both place and movement, as well as how they interact. This could arguably be defined as a third function of streets, alongside place and movement.

The rest of this chapter explores the various indicators and techniques that have been developed in the literature to measure aspects of place, movement and the broader concept of the public life of mixed-use streets. Ultimately, the discussions in this chapter will guide the development of indicators to assess the functioning of the infrastructures on Sauchiehall Street according to their place, movement and public life functions.

3.3 Measuring place

This section considers the various approaches and corresponding tools that are used to measure the ‘place’ component of the built environment.

3.3.1 Quantifying urban design

Building on Lynch's work on imageability, there has been recent interest in quantifying urban design principles to better inform design. A seminal study was carried out by Ewing and Handy (2009; updated by Ewing and Clemente, 2013) with the aim of investigating how subjective urban design criteria thought to be related to walkability could be operationalised and therefore measured more objectively. Whereas the study focuses on attributes of place, it investigates how these relate to movement behaviours, specifically walking. The authors' methods included the use of an 'expert panel' of urban designers and planners who were shown video clips taken by the authors to represent the experience of walking through urban environments in 22 different U.S. cities. They were asked to rate different aspects of urban design alongside the walkability of the streets in the video, allowing the authors to run a linear regression to assess how the urban design criteria related to walkability. Ewing and Clemente (2013) were able to operationalise five of eight identified urban design qualities and translate these into the physical attributes of the street.

Despite providing a significant contribution to the measurement of urban design principles at the level of the individual street, the use of an 'objective' expert panel requires critique. Any assessment of subjective concepts, such as design, will inevitably require a standardised method to provide a reliable result. The authors justify the use of the expert consultation method as they state that the urban design principles under investigation would not be familiar to the average layperson. Given that the research aims to translate these theoretical principles into more tangible attributes, this reliance on the technocratic view is perhaps less problematic. However, little attempt appears to have been made to control for the demographic and psychosocial characteristics of the panel, which comprised mainly white males.

Stamps (1999) found that design professionals often perceive design elements significantly differently to the lay public. Bonaiuto and Formara (2004) summarise this dilemma:

> The quality of an environment can be evaluated from two distinct perspectives; the technical expert's assessment, and the subject-based layperson's assessment. Good urban design that seeks to be inclusive and forward thinking should always recognise the power and usefulness of both types of quality measure (Bonaiuto and Formara, 2004, p.2)

The development of indicators attempting to assess both movement and place should therefore consider the layperson's experience of both these functions. This is perhaps particularly important when assessing the subjective experience of undertaking movement by active travel modes. Forsyth and Krizek (2011) recognised that whereas some attempt had been made to operationalise urban design metrics for walking, there was a lack of corresponding studies for cycling at the time. In their study of the distinctive urban design view from the bicycle, wherein they propose that cycling is the "forgotten middle" between walking and driving, they propose that people cycling have urban design needs that differ from pedestrians, motorists and transit users. They advocate therefore for research into the experiential aspects of cycling, such as whether facility design can heighten social interaction, or whether a sense of enclosure has negative safety implications for people cycling.

Whereas Forsyth and Krizek (2011) write from a theoretical standpoint, Black and Street (2014) propose adapting Ewing and Clemente's (2013) study to assess the 'cycle scale', i.e. the cycling equivalent of the conceptual human scale used in the measurement of urban design. In their study, which focuses on older people cycling in Reading and Cardiff, Black and Street (2014) replicate the use of expert assessors. However, these individuals undertook street audits in person (rather than using video clips) to provide a baseline rating for various urban design criteria. The study then utilised mobile observations whereby a researcher cycled along behind an older person and filmed them as they cycled. They then conducted follow up video-elicitation interviews where they played the footage back to participants and interviewed them regarding their experience. Some study participants were also fitted with sensors measuring EEG, soundscape and sonar proximity, as well as eye-tracking glasses to allow for an analysis of where they focussed their attention.

The final project report focusses mainly on the propensity of older adults to cycle, however, it does note a recommendation relating to urban design: that the design of infrastructure and the public realm should make clear to cyclists where they are meant to be. This includes ensuring routes are clearly signposted and consistent in surface texture and colour across the UK and that they provide a comfortable and positive sensorial experience (Jones et al., 2016).

The use of mobile methods, as in Black and Street's study, provides a useful mechanism for capturing people's experience of place as they move through it. Van Es and de Lange (2020) detail the 'datawalking' approach, whereby participants undertook purposive walks around the Dutch city of Utrecht and considered certain themes, such as how data are made visible in the built environment. They note that walking methodologies can be generative (produce knowledge) through capturing the embodied and situated experiences of participants. Equivalent methods have also been developed for capturing the experience of cycling (e.g. Spinney, 2015). It is interesting therefore to reflect on the potential usefulness of this method, i.e. one that uses movement but does not specifically assess movement, for generating new knowledge relating to the interplay between movement and place.

3.3.2 Technical audit tools

Like mobile methods, audit tools also draw on the usefulness of situated assessment, however they tend towards quantitative assessment of place, rather than capturing lived experience. Cain et al. (2014) provide an example of the use of the Microscale Audit of Pedestrian Streetscapes (MAPS) to assess microscale elements of the street that influence walking across several different age groups. They asked individual participants to rate attributes of the street, such as ease of crossing, using the MAPS tool and then measured their walking activity. Negative scores for each microscale attribute of the street were subtracted from positive scores to give an overall score per attribute, which were averaged along segments of the street. They found that higher walking rates (measured by accelerometer) were associated with net higher average scores for street sections, rather than scores for individual attributes. They concluded therefore that it was more efficient to target resources towards

improving several microscale street elements by a moderate amount rather than allocating resources wholly to a larger improvement of a single street element.

There is a risk that computing a net score for each street element, such as a pedestrian crossing, potentially masks the negative effect of any especially poor elements, which could undermine the functioning of the street. The Pedestrian Environment Review System tool (PERS; TRL Software), asks users to rate microscale street attributes in a similar way to the MAPS tool. However, it gives an overall score to a street according to its weakest element, taking the premise that a street is 'only as strong as its weakest link'. This perhaps gives a more accurate picture of the overall usability and safety of the street.

Level of Service (LOS) tools attempt to conceptualise the functional aspects of streets from the perspective of end users. Based on audit tools, these measures have traditionally been defined for pedestrian level of service but have more recently been expanded to include cycling (e.g. the Cycling Level of Service tool, Transport for London, 2016). LOS tools tend to take in the design of the full walking or cycling network, from wider connectivity through to the functioning of individual junctions. They also tend to be specific to a single mode, with the exception of some LOS tools that focus on highway design but also incorporate an element of mitigation for people using non-motorised modes, e.g. Highways England's Walking, Cycling and Horse Riding Assessment and Review (Highways England, 2019).

The various LOS tools attempt to offer an objective method for translating experiential qualities of the built environment into practical design recommendations. However, a review by Asadi-Shekari et al., undertaken in 2013 when active travel rates were lower than now, revealed a total of seventeen different LOS tools, each with a slightly different focus or spatial scale. These seventeen tools break down into an average of another fifteen or so categories per tool, some of which overlap, but many of which capture slightly different built environment qualities. Whereas they provide a somewhat objective method for translating street design systematically into user experience, the sheer number of possible physical and perceptual attributes that could affect the functional properties of a street makes these tools unwieldy for any holistic analysis of a street.

3.3.3 Participative tools

The move towards place-making, with its explicit focus on community participation in design, has led to the development of audit tools that seek to enable laypeople to translate their own experience of local streets into design recommendations, rather than relying on a technical expert. One example is the Healthy Streets Tool, developed by Transport for London (TfL, 2017). This tool provides a set of questions aimed at enabling laypeople to assess their local streets according to ten indicators, which touch on aspects of place, movement and public life:

- People choose to walk, cycle and use public transport
- Pedestrians from all walks of life
- Easy to cross
- People feel safe
- Things to see and do
- Places to stop and rest
- People feel relaxed
- Not too noisy
- Clean air
- Shade and shelter

Alongside this, TfL have also published the Healthy Streets Check for Designers (ibid.), which is a more technical tool aimed to support transport engineers and urban designers to assess the potential impact of a design intervention against the same ten indicators. Plowden (2019) identifies several lessons learnt through the development and implementation of the Healthy Streets Approach, including the challenges posed by the 'wicked issues' inherent in redesigning streets:

> Delivering Healthy Streets requires a major shift in thinking about what a city's streets are for and who and what should take priority in their design and use. And it depends on defining and delivering the optimal use of finite street space in different types of city streets, so they can fulfil both their 'place' and 'movement' functions. This is as much a political challenge as a technical one (Plowden, 2019, p.5).

A similar tool, developed in Scotland, is the Place Standard Tool (Place Standard, 2017, Figure 18). This also seeks to bring together public health and urban design, whilst promoting layperson expertise on the quality of local streets. The Place Standard Tool has at its core the idea that the places where people spend time can have an important effect on lives and wellbeing, as well as mediating inequality. It is designed to be used by a range of different people from professionals to community groups, both as an audit tool and a framework for conversation. However, it is more high level than the Healthy Streets Tool and there is no accompanying technical toolkit for designers, creating a greater onus on built environment professionals to translate the results into effective action.

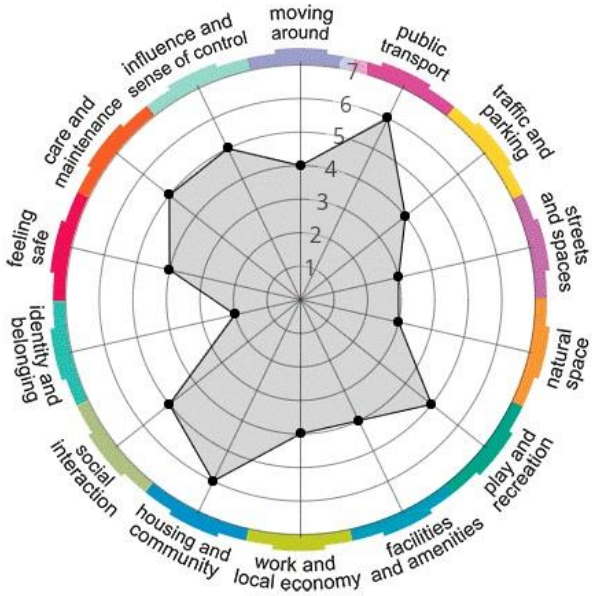


Figure 18: Example of the Place Standard Tool and the categories that it considers (Place Standard, 2017).

These participative tools are potentially useful for encouraging more equitable discussions as to who should be involved in the design of streets, and they can provide useful insight into the place and movement functions of streets from the perspective of people using them. This can be contrasted with the 'expert-led' approach (Ewing and Clemente, 2013, reviewed in Chapter 2) where a design professional makes these sorts of judgements on behalf of laypeople. However,

they are primarily designed for local, residential streets, rather than more complex mixed-use streets.

3.4. Measuring (non-motorised) movement

Since the mid-twentieth century in the UK, measurement of movement on streets has focussed primarily on optimising the flow of motorised vehicles with limited appetite to measure any other type of movement (Hebbert, 2005; Gehl and Svarre, 2013). The legacy of vehicle-dominated streets means that much of the more recent literature that includes non-motorised vehicles does so within the context of road safety, e.g. reducing the collision potential between vehicles and other modes (Laureshyn et al., 2010). It is only relatively recently that research has turned to focus on the movement of non-motorised modes in their own right, or indeed the interaction between non-motorised modes.

3.4.1 Count methods

One of the oldest methods for measuring movement is the simple 'head count', which measures the volume of people moving through a given space at a given time. Historically, these have been carried out manually, often concurrently at several fixed locations around the edge of a zone, e.g. a city centre, to allow for what is termed a cordon count. Technological methods are now more often used, including induction loops, passive infrared counters and thermal cameras (Griffin et al., 2014). These have tended to perform well in controlled environments but less accurately in more complex real-world situations, apart from infrared cameras for counting pedestrians, which retain their accuracy (Kothuri et al., 2017).

Count methods are useful for measuring longitudinal changes in movement patterns or for analysing the impact of new infrastructure, such as a bridge, on travel patterns (McCartney et al., 2012). Until recently however, these methods have only measured the total volume of people movements, rather than the nature of the movement itself. They are also 'blind' as to who is being counted (Hong et al., 2020) offering no information as to who is not there. The most

advanced sensors are now able to use Bluetooth and Wi-Fi identifiers in public space to detect more detailed behavioural patterns, such as whether an individual is lingering on the street or has returned. These highly bespoke tools, offered by commercial companies such as Springboard, also claim to be able to detect demographic data and sentiment using machine learning, which is offered to retailers to help evaluate customer experience (Springboard, 2023).

3.4.2 Observational methods

Observation, where a participant is observed by a researcher whilst carrying out natural behaviour, is an alternative method that can be used to measure both the volume and nature of movement. Van Haparen et al., (2019) reviewed the use of observation in road safety analysis and noted that the use of video analysis began to replace human observation from the mid-2000s. Both video and human observation continue to be used, however, and research has also used a hybrid approach whereby human analysts review pre-recorded footage, sometimes to calibrate automated analysis generated by machine learning (Griffin et al., 2014). Naturalistic observation can also be combined with other methods, such as body-sensing equipment (EEG, accelerometer), retrospective interviews and self-reported questionnaires (Black and Street, 2014), which can capture additional socio-demographic details about participants and provide insight into their rationale for behaving as they did.

Naturalistic observation falls into two categories:

- ‘declared’ observation, where participants know they are being observed and attempt to act naturally;
- ‘unobtrusive’ observation (Webb et al., 1966) where participants are not aware of being observed.

The latter category has a somewhat divisive history as it also includes ‘covert’ observation, which has been criticised on ethical grounds for being deliberately deceptive (Kellehear, 2020). However unobtrusive observation, whether carried out manually or using video, can simply seek to capture how people are instinctively behaving. Griffin et al. (2014) detail how the potential complexity

of undertaking this method manually can be reduced through the use of technology, such as apps that allow for straightforward recording of specific categories of participant (e.g. female, cycling, no helmet). The flexibility and capability of observational methods for capturing detail make them potentially useful for analysing the functioning of streets where new place-oriented infrastructure may be impacting movement behaviour.

3.4.3 Global navigation satellite system (GNSS) data

Lawrence and Oxley (2019) used a combination of naturalistic observation, GNSS data and self-reported surveys to assess and understand cyclists' route choice behaviour. Participants' bikes were fitted with front- and rear-facing cameras, and they were asked to cycle their normal routes without modifying their behaviour. The authors were able to cross-check route choices with real-time traffic and infrastructure conditions however they reported limitations with the GNSS tracks, which were interrupted by surrounding buildings. There is also, arguably, a potential bias inherent in observing participants when they know they're being observed because it is possible that they will change their behaviour, at least somewhat.

The GNSS limitations can be overcome by various means, such as using aggregated GNSS datasets to measure movement patterns on a much larger scale. Ferster et al. (2021) note that it has been difficult historically to measure aspects such as safety for cyclists because of needing to rely on survey data, rather than temporal or spatial data. With the increasing use of wearable activity trackers however, it is now possible to extract detailed data from 'crowdsourced' apps, such as Garmin or Strava, which can be analysed alongside a wide variety of other data. Hong et al. (2020), for example, analysed how rainy weather impacted the use of different types of cycling infrastructure in Glasgow using data from the activity tracking app Strava Metro and local weather data. They observed that activity reduced by a greater degree on fully segregated infrastructure when it rained, leading them to infer that these types of infrastructure were being used more by novice cyclists who were less likely to cycle in the rain.

Strava data have the advantage of providing aggregated sociodemographic insights. However, whereas studies have shown that they tend to represent the *cycling* population (Jestico et al., 2016), they tend therefore not to represent the general population. Strava data also tend to be biased towards certain activities, such as recreational cycling, so are not necessarily appropriate for all types of research question (Livingston et al., 2020). The nature of crowdsourced data mean that they are useful for providing insight into macro movement patterns, i.e. the relative use of one particular street compared to other streets, but not systematic enough to allow for the study of a single street at a detailed level, especially where walking is a key component.

3.4.4 Movement traces

Walking, in general, does not appear to have experienced the same level of attention as cycling in recent measurement literature, except for the use of walking traces to map movement patterns. Walking traces were made popular over fifty years ago when Appleyard and Lintell (1972) used them to assess the relationship between traffic levels and social interaction on residential streets (Figure 19). More recently, Whyte (1980) and Gehl and Svarre (2013) have used manual walking traces in their work relating to the measurement of public life.

Contemporary measurement of movement often involves the use of digitised versions of walking traces, captured using unobtrusive cameras and mapped using machine learning. UK-based consultancy Street Systems (Bailey, 2022) have developed technology that can identify and map the trajectory of different modes, including walking, to capture movement and interaction behaviour in complex situations, such as mixed-use street corridors. Artificial Intelligence can contribute greatly to the assessment of road safety, especially given the increasing need to measure interactions between non-motorised modes. However, Bailey (2022) suggests that the severity of interactions is still best analysed by human beings.

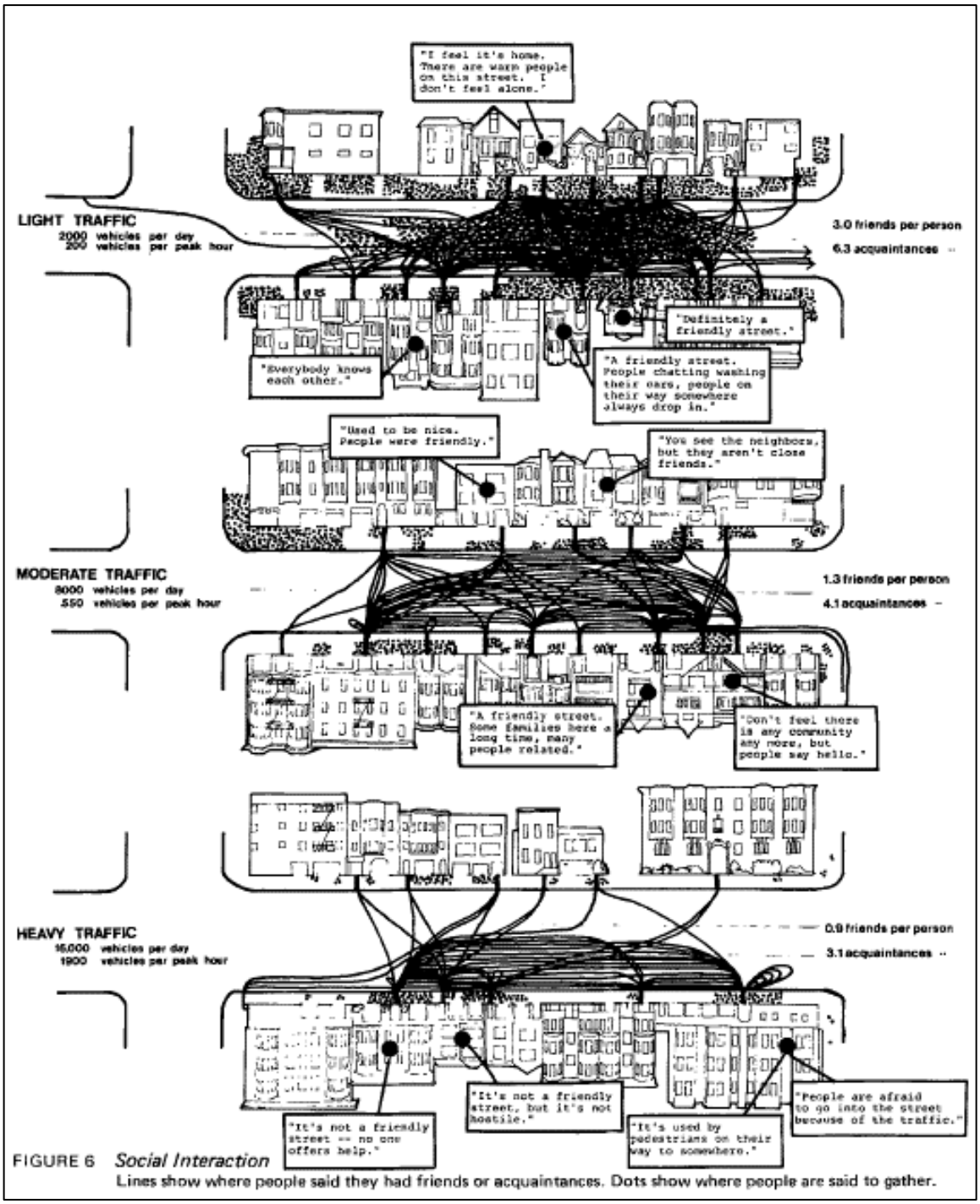


Figure 19: Pedestrian traces showing the degree of social interaction on three streets with light, moderate and heavy traffic (Appleyard and Lintell, 1972, p.92). Permission to reproduce this image has been granted by the Taylor and Francis Group.

3.5 Measuring public life

3.5.1 What is public life?

Thus far, this chapter has focussed on techniques to measure specific aspects of place (urban design) or movement in a street, but has only referred in passing to the social dimension of streets, i.e. the behaviour of people in spaces where the two functions combine. This can be understood as the 'public life' of the street and there is a rich history of research developing theories and techniques for measuring it. Gehl and Svarre (2013), two prominent researchers in the field, frame public life as a function of public space. The latter they define as "streets, alleys, buildings, squares, bollards: everything that can be considered part of the built environment" adding that "public life should be understood in the broadest sense as everything that takes place between buildings, to and from school, on balconies, seated, standing, walking, biking, etc. It is everything we can go out and observe happening" (p.2).

Gehl (2013) also refers to the social sustainability of streets, which he suggests goes beyond infrastructure, instead capturing whether streets contain aspects that attract people to 'linger'. These aspects, he suggests, are places where people are doing things – even if this is just a building site, rather than just the retail outlets thought to be the core of successful places. Social sustainability is also about providing easily accessible, inviting space in which people can encounter each other, something which Mehta (2019) suggests is key for developing social empathy and breaking down negative perceptions of otherness.

This idea of the public life of streets enabling everyday encounters is also a theme running through Whyte's seminal work on the micro-behaviours of people using public plazas (Whyte, 1980). Whyte's naturalistic observations of everyday behaviours, many of which relate to sitting and other stationary behaviours, were influential in the development of design guidance in New York in the 1980s. But they have also come to inspire decades of public life research since, including development of his time-lapse video technique for recording behaviours. Indeed, Gehl and partners have built on Whyte's work in their development of many simple public life indicators. These include the concept of

the ‘human scale’: the height and speed at which someone on foot (not in a vehicle) experiences a city street (Gehl, 2013).

As alluded to above, public life studies offer a particularly useful lens for the measurement of mixed-use streets where movement and place are both important functions. Gehl (2010) divides city activity into two types: moving and stationary. He specifically writes about walking (and occasionally cycling) when discussing public life, stating that walking is the starting point of all lively, healthy, sustainable, safe cities. Improving conditions for bikes, he argues, creates more people cycling but improving conditions for walking improves and strengthens city life, as well as enabling more walking. He characterises cycling as a faster form of foot traffic but with similarities to walking in terms of sensory experience and city life. Lastly, Gehl (2010) refers to what he terms ‘scale confusion’ whereby places have been designed at ‘car scale’, i.e. with sightlines and signage etc at the height required for a moving vehicle, rather than the human scale referred to above.

3.5.2 How is public life framed?

Whyte (1980) frames public life as something more akin to social life where it occurs in observable places such as plazas. Gehl (2010), however, focuses on ‘liveliness’ as a key indicator, defined as the length of time people spend in a place as well as the density of people there. Liveliness, Gehl suggests, can be measured as a function of three types of activity: necessary, optional and social (Figure 20). Necessary activities are those that need to take place, such as commuting or shopping, which will occur regardless of the quality of the environment. Optional activity, such as sitting to read a book, will most likely only take place when the physical environment is conducive to it. Gehl defines social activity as the ‘resultant’ behaviours that take place when optional activities occur, such as chatting to a friend. He states that walking is often a necessary activity, however, suggests that it can also form an optional activity when combined with social activity.

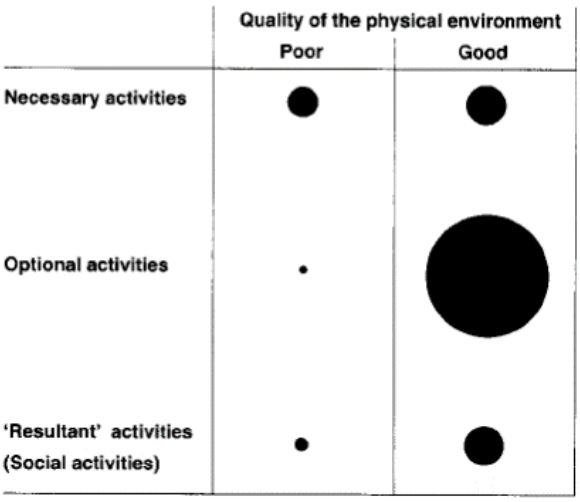


Figure 20: Graphic representation of the relationship between the quality of outdoor spaces and the rate of occurrence of outdoor activities (Gehl, 2010, p.11). Permission to reproduce this image has been granted by Island Press.

Mehta (2019) developed Gehl's original taxonomy by undertaking 'walk-by' observations in public spaces, leading to the development of three different types of 'sociability' behaviour that he observed: passive, fleeting and enduring. Mehta defines passive sociability as the social behaviour of being alone in public space, i.e. to be in the presence of others but without seeking direct verbal contact. This shared human interaction can include simply spectating; the street itself providing sufficient sensory stimulation to negate the need for social contact. Mehta suggests that it is important for streets to support passive sociability but that this needs to include spaces to stop and spend time, rather than merely encountering other bodies and activities whilst in motion. Places to sit – benches, chairs, ledges, steps etc – as well as sheltered alcoves and niches are therefore key to encouraging this function of the street.

Fleeting sociability describes the observation that people interact very temporarily in streets and that this web of public respect and trust can be the start of breaking down perceptions of otherness (Mehta, 2019). Here Mehta also refers to Whyte's concept of 'triangulation', where an occurrence on, or feature of, a street can become the focal point for two otherwise unconnected people to connect to each other (Whyte, 1980). Whyte cites examples including street performers, unusual characters, or particularly striking city views evoking this effect. Mehta (2019) concludes that mixed-use streets, when designed well, can provide a good setting for fleeting sociability. Essential to this though is the

ability of the street to support lingering behaviour and casual exchanges, i.e. sufficient space given over to comfortable movement and sitting, as well as the ability to cross the street easily where traffic has been adequately calmed. This concept therefore echoes Appleyard and Lintell's findings relating to the sociability of streets with various degrees of traffic (Appleyard and Lintell, 1972).

Enduring sociability, lastly, is the more formal type of sociability, such as that taking place in cafes or where more homogenous groups of people, such as teenagers, gather (Mehta, 2019). Here, Mehta draws attention to the difference between commercial space, where the occupier must pay to be there, contrasted with the cost-free public space of the street. Enduring sociability requires more complex and deliberate design to allow it to occur and it is often the crux of the economic function of streets. In general, Mehta (2019) advises moving away from simply considering what makes a 'good' street to asking what sort of sociability behaviour will be enabled or discouraged by different design and policy approaches.

A final framing of public life is Gehl's concept of 'life on foot' (Gehl, 2013). This framing draws attention to the difference between walking and life on foot, the former being merely a transport, or movement, function, whereas the latter is an indicator of a more holistic relationship between place and movement. Gehl posits that if conditions for life on foot are improved, walking activities will also increase. This poses an interesting question, when Mehta's enduring sociability is also considered, as to whether there is an additional, distinct sociability relating to movement. Given the rise in walking (and cycling) for health, as well as technological advancements that mean virtual social contact can now occur on the move from anywhere, it seems apt to consider whether a new type of 'roving' sociability could be added to public life research.

3.5.3 How is public life measured and what metrics have been identified?

Gehl and Svarre (2013) note that it has been necessary to develop public life tools from scratch because measurement of people's behaviour has been overlooked historically in favour of measuring traffic and hard infrastructure.

Gehl is a strong proponent of unobtrusive observational methods, suggesting that behaviour can simply be observed and mapped to understand the needs of people using the street. Whereas he notes that video surveillance and GPS may offer a more objective lens, he defends the use of human observers as long as it is clear what type of knowledge is being sought. He is also clear that a systematic approach is required, including training the eye of the observer to look for certain behaviour, or, conversely, training observers to be more general and thus avoid merely seeing what is being looked for.

Whyte (1980), on the other hand, pioneered the use of video methods. The Social Life of Small Urban Spaces (ibid.) features a whole chapter on the use of time-lapse video, including advice on how to film people closeup without their knowing. The use of methods such as undeclared filming and observation, where participants are not aware of being filmed, is these days subject to a high level of ethical regulation. In terms of the legal position, it is legal to capture images of individuals in public space, however the *Data Protection Act* (1998) means that sometimes a digital image of an individual is considered personal data (Wiles et al, 2011). This is particularly the case where an individual is identifiable in an image so if full anonymity is to be ensured, identifiable features need to be redacted. Papademas and the International Visual Sociology Association (2009) also refer to the importance of recording equipment being visible, even if the intention is to take photos without detection, to avoid inadvertently using covert methods. Despite requiring robust adaptation to ensure contemporary ethical and safeguarding standards, much of what Whyte observed about social behaviour still holds relevance and can usefully form the basis for contemporary observational approaches.

Gehl and Svarre (2013) offer a guide for observational research that can be used to produce knowledge of activity patterns:

- *How many people are there?* This requires spatial or longitudinal comparison.
- *Who is there?* Limited to high level, e.g. presenting sex and approximate age.
- *Where are people?* Are they at the edges, in the middle or evenly distributed in the space? In public, semi-public or private zones? This

should be positioned relative to elements such as street furniture, doors, bollards, etc. Microclimate and other conditions are also relevant.

- *What type of activities?* Necessary, optional or social activities.
- *What specific activities?* Gehl (2013) notes that this could be updated to contain new activities, such as smoking, talking on phones, or exercise.
- *How long?* Measuring walking speed and time spent lingering can give insight into the quality of the environment.

Gehl (2010) and Gehl and Svarre (2013) include several additional quantifiable metrics and measurement tools associated with public life indicators that they have developed. These are detailed in Table 1.

Whyte primarily observed how people sat in public plazas, noting that access to the sun was a draw for people but that the availability of sufficient seating was a stronger predictor of behaviour. He noted that people were drawn to seating that was 'socially comfortable', i.e. where there was an element of control over the location and positioning of seating. Choice, he suggests, "should be built into the basic design … the best course is to maximise the sittability of inherent features" (p.28). By this, he is referring to aspects of the environment not specifically designed as seating, such as ledges or walls, that nonetheless afford sitting behaviour. Whyte is also quite outspokenly dismissive of benches, describing them as "artifacts, the purpose of which is to punctuate architectural photographs" (p.33). He suggests that they are generally of the wrong dimensions, uncomfortable and manipulative in that they limit behaviour by being fixed to the ground, an issue which he suggests moveable chairs do not suffer from. It is perhaps difficult, however, to imagine a moveable chair remaining in situ in a busy city street these days.

Gehl (2010) and Whyte (1980) both note the importance of edges in public space. They note people's tendency to linger near the edge of open spaces, preferably where there is a wall or other frontage, so their backs are protected. Gehl draws a parallel with equivalent ancestral behaviour in caves, suggesting that people prefer to signal having a purpose in public space, rather than being alone. The location of public seating relative to edges is also key in terms of feeling protected and therefore at ease in the space. Objects which define edge space, such as bollards, are important too, even if just for leaning against. Gehl

suggests that the presence of another object allows people to feel in control of their immediate environment, a phenomenon he terms the ‘piano effect’, based on his observation of it also occurring in indoor spaces, such as drinks receptions (Gehl, 2010).

Table 1: Measurement techniques and thresholds developed to study public life indicators.

Indicator	Thresholds	Measurement tools	Study	Additional notes
Capacity	7m of pedestrian footway space can move 20,000 people per hour and 4m of cycle path can move 10,000 people per hour.	*Counting:* 10 minutes every hour. But for longer if not many people. Then extrapolate from those counts over time.	Gehl, 2010	Can include people being still vs. people moving. People smiling, people talking. How many walking in groups vs. how many alone. Active frontages vs. blank/closed/barred windows.
Distance	500m is approximately the acceptable distance over which people will naturally walk.	*Tracing:* Following one person to map their movement along or across a street segment.	Gehl, 2010	Works better in one place with the researcher stationary and able to plot visible extent of movement on a map/tracing paper.
Average walking speed	About 1mph faster in winter than it is in summer.	*Tracking:* record time taken for one person to move through a 100m section using stopwatch and following at a distance.	Gehl, 2010	Microclimate in summer makes lingering more likely; Gehl relates this to what he terms 'staircase psychology', i.e. ensuring that streets do not have overly long sightlines, allowing for people to undertake manageable stretches at a time
Number of benches and number of people sitting over time	No specific threshold however Whyte (1980) suggests more availability of seating		Gehl and Svarre, 2013	Can be cross-referenced to the orientation of the bench

	leads to higher sitting rates.			
Location and lingering behaviour of young people		*Mapping:* Can map stays and where people are lingering. Maps can be layered up over the day. Need a detailed enough basemap to plot the difference between lingering at the façade and the street edge. Mapping standing and seating with either black circles or white.	Gehl and Svarre, 2013	Useful as an indicator of inclusivity
Number of people moving	Gehl (2010) suggests this should not exceed the comfortable capacity of the footway.	*Counting.*	Gehl and Svarre, 2013	
Parents holding children's hands or not.		*Counting and Mapping.*	Gehl and Svarre, 2013	Measure of general freedom of movement but also perceived safety as a place for children.
Qualitative behaviour		*Diary writing.* Often used as a qualitative supplement to more quantitative material in order to explain and elucidate hard data.	Gehl and Svarre, 2013	Can include aspects of street activity not shown on maps, lists of activities, or day specific occurrences.

		Photographing. Useful for capturing contexts or occurrences that would require complex explanations in words.	Gehl and Svarre, 2013	
Other	Auto-ethnographic research.	*Test walks*. How long it takes to walk a route, how much time is stationary.	Gehl and Svarre, 2013	

3.5.4 Limitations of existing public life research

Whyte's research contains a wealth of useful observations and methodological advice however it pertains almost entirely to North American plazas, which are overtly place-oriented spaces, rather than streets with different types of movement. It is also somewhat a product of its time in terms of some of the language used and the sorts of behaviours accounted for (which at one stage includes "girl watchers", who Whyte suggests were present in the plaza to view the "smashing blondes" [sic], p.19). Gehl writes through a more contemporary lens and his work has direct relevance to mixed-use streets. However, like Jones et al. (2008), Gehl and colleagues sometimes presume a normative conceptual separation of place and movement. For instance, Gehl and Svarre (2013) report a 600% increase in stationary activity in Brighton New Road following a major redesign of the street, suggesting that this demonstrates a successful transition from transient street to place. This perhaps overlooks the complexities of combining several modes in contemporary mixed-use streets, including where it is necessary to measure streets that blur the traditional place and movement dichotomy.

3.6 Measuring specific infrastructure

In conceptual terms, Latham and Layton (2019) describe infrastructure as 'transparent', i.e. not noticed. This is because the terms of use of infrastructure are linked with conventions of practice: they are already negotiated and do not need to be reconsidered every time the infrastructure is used. Indeed, it is this "embodiment of standards" (p.3) within infrastructure that, according to systemic safety principles, means it should function consistently, regardless of who is using it. Latham and Layton (2019) note that infrastructure should only become visible if it has broken down. In theory, therefore, infrastructure should instinctively communicate these embedded standards clearly enough to promote the desired behavioural outcomes from users.

As discussed above, the redesign of Sauchiehall Street has introduced novel infrastructures in the UK context, particularly footway-level cycle tracks and continuous footway, both of which have emerging measurement approaches

associated with them. This sub-section reviews the relatively scant literature pertaining to these infrastructures in the UK.

3.6.1 Shared space and shared-use paths

Whereas there has been considerable research concerning road safety, there is little research on emerging forms of shared infrastructure, especially that which is located within non-roadspace (Hebbert, 2005). It is important here to distinguish between shared space (Hamilton-Baillie, 2008) and shared-use paths. The former is a holistic design approach, taking in a whole street, where vehicles have access but indicators of priority for all modes are reduced or removed entirely. This theoretically encourages all street users to slow down and communicate with each other. Shared-use, on the other hand, refers to paths shared by people walking and cycling (and occasionally horse-riding), often alongside the carriageway in urban centres but separate from vehicle space. Shared space can include a variety of different infrastructures and the approach in its purest form (with no distinction between carriageway and footway space) is still currently prohibited by the Department for Transport in the UK owing to safety concerns, especially for people with a visual impairment (MHCLG and DfT, 2018).

Research concerning shared-use paths has more relevance for the design of Sauchiehall Street. The new footway-level cycle track, defined in *Local Transport Note 1/20* (DfT, 2020), is a form of segregated shared-use path whereby non-motorised users are sharing space. However, the cycle track is delineated from the footway using different coloured tarmac and a raised delineator kerb painted between the cycle track and footway. Delaney et al. (2017) carried out research into the perceptual experience of people cycling and walking on segregated and non-segregated shared-use paths in Bristol. Intercept surveys were carried out with participants using the paths and a proportion of these were asked to take part in a follow-up experiment whereby they were fitted with chest- or handlebar-mounted cameras and asked to walk or cycle along the shared-use path for at least 15 minutes. Follow-up interviews were then undertaken within 48 hours to discuss their experiences in more detail.

The authors observe that prior to the publication of the updated *Highway Code* (DSA, 2022), there was no statutory guidance in the UK relating to the legal status of the different modes when using shared-use paths. The *Highway Code*, as was, suggested pedestrian priority, but this was not necessarily supported by the physical infrastructure, nor by the practicalities of mixing two modes with notable speed differentials. In many cases, the authors observed the emergence of local, unwritten, codes of conduct. They also found significant perceptual differences relating to perceived priority according to the mode: people cycling were more likely to want stronger regulation but fewer speed controls. People walking desired increased speed control for people cycling. Respondents generally stated that neither mode should have priority on shared-use paths, however all respondents perceived a greater level of pedestrian priority on segregated paths and correspondingly, people cycling reported increased levels of frustration with pedestrians on segregated paths. Research by Atkins (2012) likewise found greater levels of acceptance and better compliance among all users on non-segregated paths.

There appears to be no specific research examining whether a footway level cycle track (a new design in the UK) functions in the same way as a segregated shared-use path in terms of user experience and perception. These infrastructure designs share many common elements in terms of providing dedicated space for each mode separately (uni- or bi-directionally) with the ability to move easily – indeed, potentially without realising – between the two spaces. With this commonality in mind, another noteworthy finding from Delaney et al.'s study (2017) relates to the perception among people cycling that pedestrians were failing to pay attention when using shared-use infrastructure (particularly segregated paths). It could be argued that in the case of the established street settlement where footway clearly delineates a pedestrian only area relative to the carriageway, pedestrians have exercised the right to engage in a level of non-concentration whilst remaining basically safe (the classic browsing shopper on a commercial street). Given the effect demonstrated by Delaney et al. (2017), the introduction of shared-use infrastructure into a visually complex, multifunctional street such as Sauchiehall Street could potentially exacerbate the perceived problem of pedestrians not concentrating and therefore inadvertently entering the cycle track.

Instances of perceived conflict among users of shared-use infrastructures have been reported in other studies. Lei Kang et al. (2013) concluded in their study on the impact of the presence of bicycles on pedestrian level of service that "the bicycle flow rate, maximum speed and bicyclists riding against the pedestrian flow all have a strong negative impact on pedestrian perceptions of [level of service]" (p.19). They also raise an important point concerning the effect of cultural context, noting that their research, which is based in Shanghai, Beijing, Hangzhou, and Hefei, where it is the cultural norm for people to cycle on the footway, will have been biased by this convention.

Likewise, research undertaken in places such as Denmark or the Netherlands with established shared infrastructure, and where a historically higher mode share for cycling and means that it is a much more established mode (Emanuel, 2019), will perhaps inevitably have led to a greater acceptance of sharing space. Thomas and DeRobertis (2013) advise against direct comparison of user experience between different cultural norms, even between the US and UK which have comparable levels of infrastructure and mode share. This points to the importance of UK-specific research into the experiential aspects of infrastructure.

3.6.2 Continuous footway

As with shared-use, there has been very little research into continuous footway in the UK. A review by Living Streets Scotland (forthcoming) notes firstly that the term is ill-defined and inconsistently used in the UK. Guidance refers interchangeably to continuous footway, blended crossings, Copenhagen crossings and footway crossovers, each of which may or may not cater for people cycling, as well as people walking. In the Netherlands, 'exit constructions' (which form continuous footway at most urban side roads) are used consistently across entire areas as part of the Dutch 'systemic safety' approach, whereas in the UK, continuous priority for people walking or cycling tends to occur on a piecemeal basis at singular locations. Perhaps unsurprisingly, there are also notable differences concerning key design details within UK design guidance, such as whether the footway material should continue across the junction, the height of

the entry ramp and the extent to which ‘give-way’ markings should be provided for vehicle drivers (ibid.).

Table 2 provides a summary of the aims, measurement techniques and key findings from the four main studies carried out in the UK. Figure 21, directly below, demonstrates the approach taken by Steer Davies Gleave (2018) to classify interactions between pedestrians and drivers at side roads. Despite not assessing pedestrian behaviour independently of driver behaviour, this approach could be adapted for instances where a pedestrian approaches the side road with no vehicle present.

Table 2: A summary of the aims, measurement techniques and key findings from four key continuous footway studies in the UK.

Authors (date)	Locations	Aims and Method	Metrics	Findings
Wood et al., (2006)	London: TfL network roads and local borough roads.	Assessment of road safety at sites with "side road entry treatments" (SRETs). Observation of interactions using video analysis.	STATS19 collision data for 1000 SRETs. Pedestrian looking and crossing behaviour at 8 study sites and 3 control sites.	Differing effect of SRET design according to road type: no effect on collision frequency on main roads but decreased frequency on local roads. Pedestrians less likely to look for turning vehicles at SRETs compared to control sites. Unsure if pedestrians expecting drivers to give way.
Steer Davies Gleave (2018)	7 continuous footway sites in London.	Assessment of how continuous footway influences driver behaviour using video analysis. Consequent safety implications for pedestrians.	Volumes of users (motorised and non-motorised), junction geometry, direction of travel (in/out of junction). Interaction behaviour and assessment of level of priority for pedestrians and cyclists (Figure 21).	78% drivers on average gave way to pedestrians when they were on the crossing but only 17% drivers yielded to pedestrians if they had not already entered the crossing. Drivers more likely to give way when turning out compared to in and when turning left compared to right. Wider footway led to less driver give way behaviour. Vertical deflections (such as street furniture) and tighter junction geometry increased driver give way behaviour.

AECOM (2018)	1 continuous footway site in Edinburgh.	Longitudinal analysis at time of construction of side road, 6 months and 12 months later. Analysis of all interactions between users.	Volume of non-motorised users crossing. No. interactions and % non-motorised users involved in an interaction. % drivers giving way. Design and operational observations.	Volumes of users increased across 6 and 12 months. No. interactions increased but % of non-motorised user interactions remained steady at 2-3%. % drivers giving way to pedestrians reduced from 41% at time of construction to 27% 12 months later. Road markings appeared to suggest driver priority and could be confusing.
Flower, Ricci and Parkin (2020)	10 continuous footway sites across the UK.	Assessment of road safety at all sites. Assessment of driver and pedestrian behaviour at side roads, independently and when interacting. 6 hours of video analysis at each site.	STATS19 data at sites and within 100m Categorised behaviour into carriageway user proceeding or not and footway user proceeding or not. Further categorised as 'forced', 'voluntary' and 'no yield' behaviour.	Continuous footway no more and no less safe than traditional crossings in terms of collisions. Percentage footway users forced to yield ranged from 0% – 37% (higher forced yield rate when pedestrian volumes were lower. 89.7% footway users on average showed no yield across all sites. Both stakeholders and key informants noted importance of clear and consistent kerbs, lining and paving to contrast the carriageway and footway (and cycle track where present).

		Focus groups with stakeholders to assess opinion of continuous footway. Follow up interviews with key informants to identify.	(Some interviewees were not familiar with continuous footway). Eight individuals from transport planning, engineering and public health, at local authorities and private sector consultancies.	Sufficient height required for ramp (not specified) and tight turning radii. Challenges included requirement to use tactile paving even though they felt it was counterproductive to pedestrian priority by design.

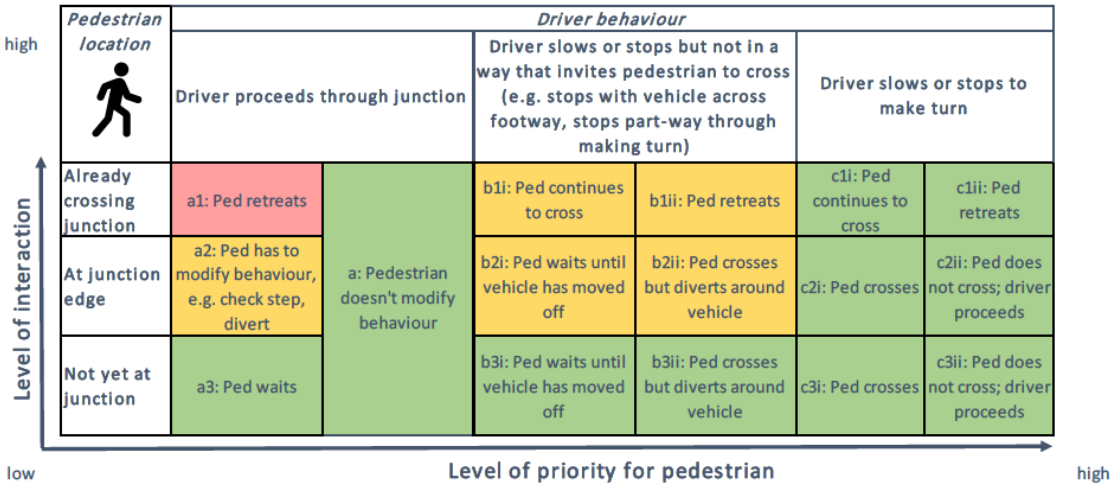


Figure 21: Metrics for classifying pedestrian / driver interactions at continuous footway sites (Steer Davies Gleave, 2018, p.7). Permission to reproduce this image has been granted by Steer Davies Gleave (Steer).

Overall, the relative paucity of research into continuous footway in the UK makes it difficult to draw any reliable conclusions about their effectiveness. Flower, Ricci and Parkin (2020) appear to provide the only study so far that specifically probes people's opinions of continuous footway, and their methodology is the only one to assess pedestrian behaviour as distinct from driver behaviour. It is notable too that each of the studies above utilise time-consuming video capture and analysis to provide in-depth conclusions. Whereas this is useful, no research appears thus far to have focussed on continuous footway as just one of several components in a mixed-use street. It is argued that the complex video analysis undertaken in the studies above may be outwith the budget and capability of local authorities undertaking regular monitoring of streets. The development of a simple 'snapshot' analysis technique that could be undertaken manually (or automated where fixed cameras, such as CCTV, already exist) may be a useful addition to aid understanding of how continuous footways are performing in terms of the overall movement and place functions of mixed-use streets.

3.7 Measuring mixed-use streets: two case studies

The final section of this chapter presents two case studies concerned specifically with the measurement of mixed-use streets. There are very few studies pertaining to the evaluation of mixed-use streets, especially those that focus on

more than one function of the street. As such, methodological discussions are relatively underdeveloped in this domain. Given the mixed nature of Sauchiehall Street, two relevant studies by Jones and colleagues – one comparing several mixed-use streets in England (Jones et al., 2007) and a more recent international project called MORE (Multimodal Optimisation of Roadspace in Europe, 2022) – are reviewed here. Carmona has also proposed theory relating to mixed-use streets and undertaken some empirical work to test these theories (Carmona, 2015). These studies address the assessment of mixed-use streets in their entirety, and each is therefore significant in size and scope. Some material is therefore less relevant for the current research, however, the next sub-section outlines the relevant measurement techniques undertaken in each case.

3.7.1 Jones et al. (2007): Rediscovering mixed-use streets. The contribution of local high streets to sustainable communities

This mixed methods study aimed to build a picture of how mixed-use streets function and are managed, including different stakeholder views. It also investigated how tensions and conflicts in the street manifest and are articulated, as well as identifying improvements that could be made to the design process. The four case study streets were in Coventry, Sheffield and two in Tooting, London.

The authors utilised several different approaches to data collection:

- Desktop review of exiting data
- Urban design analysis
- Community Street Audits
- CCTV footage to look at:
    - vehicle counts, by vehicle type and direction;
    - turning movements at key junctions;
    - pedestrian counts, along the footway, by direction and numbers of wheelchairs and pushchairs;
    - pedestrian crossing movements, formal and informal, by direction and numbers of wheelchairs and pushchairs;

    - pinch points affecting movement along the footway;
    - observation of activities carried out on the footway;
    - use of footway as a public space.
- Stakeholder surveys with business, residents and other people
- Focus and design groups
- Professional interviews to probe planning and management functions

Jones et al. incorporated several novel approaches into their study, including using CCTV to capture 'the day in the life of a bench' where they filmed one bench for a full day, capturing key moments throughout the day. They also used intercept interviews, firstly to gather high level sociodemographic data from participants, including whether they lived locally or were just visiting, but also to gain brief opinions on aspects such as footway congestion.

From these data, the authors were able to assess who was using the streets, why they were there, how they had travelled there, and how these varied across different locations on the streets. In addition, they were able to offer insights into how the streets were used according to their movement and place functions. They report movement metrics relating to pedestrian flows, the proportion of foot traffic passing through the area relative to the proportion lingering there, transport interchanges, as well as patterns of street crossing. All of these were calculated from the CCTV footage.

In terms of the place function, they used focus group data to draw conclusions relating to the social interactions on the street. Additionally, they used the CCTV footage to identify ten types of activities being carried out by people using the street (Table 3). They observed that the majority of these occurred informally and were not properly recognised, nor catered for in existing design guidance.

Table 3: The ten types of pedestrian activities identified on the street using CCTV footage (Jones et al., 2007, p.50).

Browsers: have an interest in what that particular mixed-use street has to offer, commercially and culturally: they are the 'window shoppers', and the tourists or visitors admiring the street scene as they walk along.

Socialisers: there to meet others, to be seen and to converse with others. They tend to stand in groups or walk slowly along the footway, taking up considerable width and may often be oblivious to the needs of other footway users.

Observers: usually more solitary people, who in the main observe other people on the street and their activities. They may be seated on a bench, enjoying outdoor facilities offered by a café or public house, or leaning against a wall.

Waiters: people who arrange to meet others at an agreed landmark location along the street; others wait around on the street for friends to complete other tasks, such as shopping or visiting public toilets.

Resters: people who sit down in order to rest and recuperate. They include disproportionate numbers of older people, and those with young children or with heavy shopping bags.

Queuers: the many people queueing on the street, to use a cash machine or a telephone, to wait for a shop to open, to gain entry to a club, or to buy something from a street vendor. They may also be queuing for a bus or taxi, or waiting to cross the road.

Workers: from fruit and vegetables to seafood, street stalls are part of a vibrant mixed-use environment. Some stalls operate seasonally (for example, ice-cream sellers) or at night (hot-dog vendors). In addition, there are other people giving out leaflets, wearing sandwich boards, soliciting contributions for charities, or just begging. There are also various illegal street activities, such as soliciting for prostitution, or selling black market DVDs/CDs and cigarettes.

Entertainers: the larger streets and associated public spaces attract street entertainers, ranging from musicians to jugglers and mime artists.

Customers: street workers and entertainers depend on customers. Transport also has its street customers, such as those buying bus tickets or feeding parking meters.

Inhabiters: finally, there are some people who are forced to reside on the street for lack of anywhere else to go during the day or live at night. They may be living in bed-and-breakfast accommodation or have nowhere to live at all. Shop doorways are appropriated as makeshift beds at night, while street drinkers inhabit particular spaces during the day. Many of these groups and their activities are generally labelled as being 'antisocial'.

In terms of the economic voices, the authors carried out interviews with business owners on each of the three streets, ranging from 44% of the possible businesses in Tooting and 80% in Ball Hill. Questions to business owners focussed on the following: characteristics of the respondent or their business, satisfaction with local business services, satisfaction with provision of public facilities and street condition, concerns about traffic and personal safety and security and suggestions for improvements. The authors report that business satisfaction with local trading conditions was relatively high across each of the three streets, ranging from 90% in Ball Hill to just over 70% in the other two areas. Of particular note is the finding that whereas only 37% - 40% of residents and visitors reported dissatisfaction with transport access, nearly double the proportion of business respondents considered that their customers were dissatisfied with access by private vehicle. Business owners also reported relatively high levels of dissatisfaction with the amount of litter and graffiti, although this was proportionate to the levels reported by residents and visitors in all but one case study street.

This case study aimed to provide a snapshot, rather than a longitudinal study. As such, the authors focussed primarily on surveys and focus groups for measuring the economic status of the mixed-use streets that were included, as well as carrying out land use mapping to demonstrate the relative make-up of the streets. Alternative metrics that are often used for measuring economic patterns include vacancy rates (vacant properties as a proportion of all properties) and change in vacancy rate over time. Dolega and Lord (2020) also used this approach to classify local centres in Liverpool within four categories of trajectory: high vacancy (increasing), high vacancy (decreasing), low vacancy (increasing) and low vacancy (decreasing). The authors note, however, that it is also important to consider the magnitude and persistency of vacancy because this may not be portrayed in a straightforward way. For instance, a short-term vacancy might perhaps be viewed as positive because it enables new retailers to move into an area, however, longer-term vacancy rates are more indicative of structural problems (Wrigley and Dolega, 2011).

Overall, Jones et al. (2007) conclude that mixed-use streets have been undervalued and overlooked by both transport and planning professionals. They note that these streets have significant potential to enable sustainable travel

both to them, in terms of their proximity to residential areas, and along them as key public transport corridors. This in turn would contribute to making the economic centres served by mixed-use streets more sustainable. In terms of place, the authors conclude that mixed-use streets can help foster social inclusion owing to their relatively high accessibility, including for people with mobility impairments. In addition, they have an important role as a community focus where people can encounter otherness but also 'bump into' acquaintances, thereby potentially reducing isolation and loneliness.

Despite this potential, however, the authors noted significant issues within each street. Despite being perceived to be generally safe, the mixed-use streets were not considered pleasant places to spend time by visitors or residents. In part, this was due to the physical fabric. The authors also noted the dominance of vehicular traffic, with associated perceived fear of injury amongst interview participants, poor cleanliness, a lack of public amenities, especially public toilets, and under-representation of some groups, including people using wheelchairs or prams.

Jones et al. draw specific attention to various conflicts occurring in the street: competition for space and compatibility issues where even if space is sufficient, modes cannot mix safely. Of these, many involve vehicles and occur in the carriageway, but they draw attention to the footway as a specifically contested space. They note conflicts between people walking and street furniture, such as café tables. Here they also draw attention to the potential conflict inherent in the normative ideas of lively streets (e.g. Gehl, 2010), which often rely on aspects such as street café furniture to provide some of the liveliness function. They suggest that these sorts of micro-conflicts, including those between bus passengers and people walking past bus stops, have been under-researched previously.

Despite the thoroughness of the case study, Jones et al. (2007) do not particularly consider cycling (nor other active travel modes) in their research, other than noting a potential conflict with buses in bus lanes. As such, there is no discussion of potential conflicts between people walking and cycling, nor consideration of how street infrastructure might increase or mediate these conflicts.

3.7.2 Multimodal Optimisation of Roadspace in Europe (MORE, 2022): Better Streets for Better Cities

MORE is an EU Horizon project aiming to develop an objective approach to the planning, design, management and operation of road-space on major urban routes based on practical research in five European cities, including London (Jones, 2019). MORE is a large, multi-dimensional project but the section focussing on mixed-use streets offers interesting theoretical insight into the management of contemporary issues.

Jones (2019) suggests framing road space reallocation not just in terms of motorised vehicle space vs. kerbside space but developing the place-movement typology to include consideration of where emerging non-road space (such as footway) interacts with traditional road space. He also critiques the traditional approach towards the regulation of emerging forms of mobility (such as e-bikes) where management authorities tend to wait until a new mode emerges and then regulate it in retrospect on a mode-by-mode basis. Instead, he argues, street space could be managed by proactively designating certain movements in certain areas of the street, thereby allowing for the emergence of new modes into an existing framework without the need to regulate on a mode-by-mode basis.

Sauchiehall Street presents an interesting case study in this respect because infrastructure such as cycle track running alongside the footway deliberately introduces movement functions into what was traditionally ‘place’ space. Continuous footway also arguably uses movement-based infrastructure to bring about place-based aims, i.e. using street design at side roads to lessen vehicle domination and create a safer, more pleasant environment for people either moving along, or lingering on, the street. This is not only a spatial blurring of the traditional place-movement dichotomy but also a conceptual one, in that continuous footway disrupts established movement infrastructure (both for drivers and people walking or cycling) in the pursuit of place aims.

Concerning the governance of mixed-use street design projects, Jones (2019) suggests that one of the key learnings from MORE is that “[listening] to other professionals, leaving preconceived ideas behind and being open to other perspectives is the most successful approach to take” (p.51). He also draws attention to the importance of city authorities committing upfront to engaging

in the *whole* street redesign process, i.e. recognising that street design can play a valuable role in achieving other policy objectives beyond those relating directly to the street. This finding supports the idea of framing streets as conduits of wider sustainable transitions.

3.8 Summary

Building on the urban design and engineering literature reviewed in Chapter 2, this chapter has detailed various measurement techniques and indicators that can be applied to mixed-use streets. It has also unpacked the traditional dichotomy contained within the place-movement framework, which has been instrumental in the development of contemporary street design. It has argued that the sorts of novel infrastructures emerging in contemporary UK streets blur this traditional dichotomy and, as such, require updated measurement techniques that also capture their public life function. This is especially important in enabling assessment of the role of streets (and their infrastructures) in meeting broader objectives relating to e.g. sustainability.

This gap in the literature identified in this chapter, concerning the measurement of contemporary mixed-use streets, reflects the corresponding conceptual gap identified in Chapter 2. This reiterates the need to update existing conceptual analyses of mixed-use streets (Jones et al., 2007; Carmona, 2015; MORE, 2022) so that they incorporate the full breadth of functions that a contemporary street is required to fulfil. Specifically, this should include cycling and other active mobility infrastructure as a core component of the street, with corresponding techniques to measure the novel infrastructural components according to their potential for enabling, not just movement and place, but also public life. In this vein, the other key gap identified in this chapter concerns the lack of research into continuous footways in the UK, as well as newer active mobility infrastructure such as footway-level cycle track. Whereas there is some research in this area (Wood et al., 2006; Steer Davies Gleave, 2018; AECOM, 2018; Flower et al., 2020), these studies look at the movement function of the infrastructure in isolation, rather than how it fits holistically within the wider street environment. An overarching framework could incorporate techniques to measure both the movement and place functions of contemporary

infrastructure, as well as considering how it contributes to the public life of the street.

Development of a holistic framework, such as that described above, will enable measurement of a street in terms of its current functioning. Whilst useful, this will not necessarily address the wider context in which a contemporary mixed-use street must operate, and the requirements made of it. As discussed in Chapter 1, there is also a need to understand more clearly how streets play a role in enabling a wider (just) transition towards a sustainable way of living in urban areas (Scottish Government, 2019). Chapter 4 therefore introduces Socio-technical Transition Theory (STT, Geels, 2002), a transitions framework that analyses long-term trends. Following introduction of the main STT theory and other related theories, Chapter 4 concludes with an adapted version of the STT framework, which incorporates key theory from chapters 2 and 3. This will form the analytical framework for this research, providing the means to analyse not just how Sauchiehall Street is currently functioning, but the potential for it, and other mixed-use streets elsewhere, to bring about wider sustainable transitions in the future. As such, the methods and approaches reviewed in this chapter will inform the development of the methods used in this research, detailed further in Chapter 5.

Chapter 4: A Socio-technical Transition Theory framework

4.1 Introduction

Chapters 2 and 3 outlined the mixed-use street as a complex urban entity at the nexus of place and movement functions. Streets are a city's economic heartbeat, its commercial and touristic draw. This is perhaps especially true for more primary streets, which are generally found in urban centres. These also tend to form transport arteries, enabling the mass movement of people through, to and between destinations. Each of the visible aspects in an average street scene represents an entire domain of theory and praxis governing its individual contribution to the street but also linking it in with other aspects of the street. In short, streets are a complex phenomenon to frame and understand. This chapter ultimately presents a theoretical framework that places the street, as the research object, within the wider context of the sustainable transitions increasingly required of all urban places in light of global pressures, such as the climate emergency.

4.1.1 The role of streets in urban transitions

There is growing recognition that cities are intrinsically enmeshed within the wider transition towards increasingly pressing sustainability targets. Some of these relate to public health outcomes, including what is described as the "obesity epidemic" (World Health organisation, 2000), but many targets pertain to ecological issues. The notion of a 'climate emergency' has become a household term and many authorities in the UK and elsewhere have declared responses (McHugh et al., 2021). Climate change and the transition towards ecological sustainability have also been described as a 'wicked problem' (Incropera, 2016): an issue that is difficult or impossible to solve because of changing or contradictory requirements; a problem which has no single solution and is resistant to resolution (Rittel and Webber, 1973). Transport policy has also been described as such (Marsden and Docherty, 2013).

As the physical canvas of cities, streets have long been recognised for their potential as transitional agents (Jacobs, 1961; Jacobs and Appleyard, 1987), whether enabling sustainable transitions or hindering them. The example given in Chapter 3, of Sweden and the Netherlands mainstreaming a systemic safety approach to street design to improve road safety, exemplifies the use of streets as a transitional agent. Clearly, transitional action can take place across many conceptual realms within a city, but a street is perhaps the epitome of an overtly physical canvas that can literally be altered. There is also great potential for the use of a street to engineer transitions due to the range of functions and systems that can be acted upon within a single, physical space. Indeed, streets might be described as a sort of concentrated melting pot of sustainability, comprising many of the most problematic 'illnesses' (Vale and Campanella, 2005) of non-sustainability, such as motorised transport, embedded carbon within fixed materials and a hostile environment for natural features. But streets are also a hotbed of opportunity in terms of shaping human behaviour towards more sustainable outcomes, for instance through enabling increased rates of sustainable mobility (Brand et al., 2014; Brand, 2021) and reducing urban heat effects (Fallast et al., 2021).

Nielsen and Farrelly (2019) note the different schools of thought concerning the city as a *context for* transitional change but also an *object of* transitional change. They describe a sort of paradox within the built environment whereby when it's viewed as *context*, it's seen to be fixed, whereas when it's viewed as an *object* of change, it's seen to be malleable, through the action of urban practitioners. To rephrase Nielsen and Farrelly, it could be argued that a street can function both as a canvas (context), which can be altered to make it more (or less) sustainable itself, but also as a transitional conduit (object), acting to enable or constrain behaviours that in turn contribute to wider sustainable outcomes.

Pickett et al. (2004), discussing the resilience of cities, note the 'fixed' nature of features such as heavy infrastructure networks (roads, sewers, utilities), where other functions of the city grow and develop around these networks. Scheer (2011) observes that infrastructure networks such as these tend to be

fairly resistant to large-scale or rapid change and also tend to outlast both physical buildings and institutional governance, such as political administrations. The legacy of predominating road infrastructure in the UK following the modernist period (described in Chapter 2) has created environments where motorised vehicles often 'crowd out' other street users (Latham and Nattrass, 2019). The fixed nature of this physical street infrastructure potentially creates a physical, as well as conceptual, barrier to the transition (back) towards a more equitable sharing of street space (ibid).

However, contemporary regeneration approaches are recognising the need to overcome the limitations of these fixed infrastructures, in part by recognising the potential of streets not just as canvas, but also as conduit. Fallast et al., (2021) note the importance of "raising awareness that road space should not only be understood as a traffic connection, but that the street should be perceived and used as a public space and as a fundamental asset for urban ecosystems" (p.120). As discussed in chapters 2 and 3, approaches including Healthy Streets (Transport for London, 2017) and Complete Streets (National Complete Streets Coalition, 2010) are combining theory from public health, urban design and sustainable mobility to not only alter the canvas, but also improve the potential of the conduit. The overall intent of this research is to investigate what occurred during the Sauchiehall Street pilot project, but also how the completed street is shaping behaviour, ultimately with a view to informing future street regeneration projects. Given the importance of a street as both canvas and conduit in terms of the sustainable transitions required of contemporary cities, it is argued that to assess the lessons emerging from this single street regeneration project, it is important to contextualise the role of the project within a broader transition framework.

4.1.2 Alternative transitions frameworks

There are a broad range of conceptual frameworks that have been used to understand and promote the transition towards sustainability (El Bilali, 2018). The selection of a framework within a research project has implications for the nature of the research and the conclusions reached. In utilising a theoretical

framing to make sense of qualitative data, a researcher is also applying an interpretive lens, which will act to shape and potentially constrain the direction of analysis (Gregory, 2020). In this research, socio-technical transition theory forms the main conceptual framework, with the addition of elements of strategic niche management to enable the examination of the processes surrounding the development of the 'niche' - Sauchiehall Street. It is important to note, however, that in choosing to view the project's research questions through the lens of STT and SNM, analysis will naturally follow the pattern of these established theories. Conclusions, similarly, will therefore sit within the constraints of these ways of framing transitions. Whereas this is not necessarily detrimental – new knowledge will still be created – it is useful to acknowledge that were the same qualitative data to be analysed using a different framing, different knowledge may well be created. A selection of relevant alternative frameworks is outlined briefly here, including an explanatory rationale for why they were not selected for use in the current research.

STT and SNM sit within a group of four frameworks focusing on technical transitions that have risen to prominence. The other two are transition management (Rotmans et al., 2001; Loorbach, 2010) and technical innovation systems (Hekkert et al., 2007; Bergek et al., 2008). Whilst there is a significant degree of overlap within these technical frameworks (Figure 22), each has developed a slightly different approach to framing transitions.

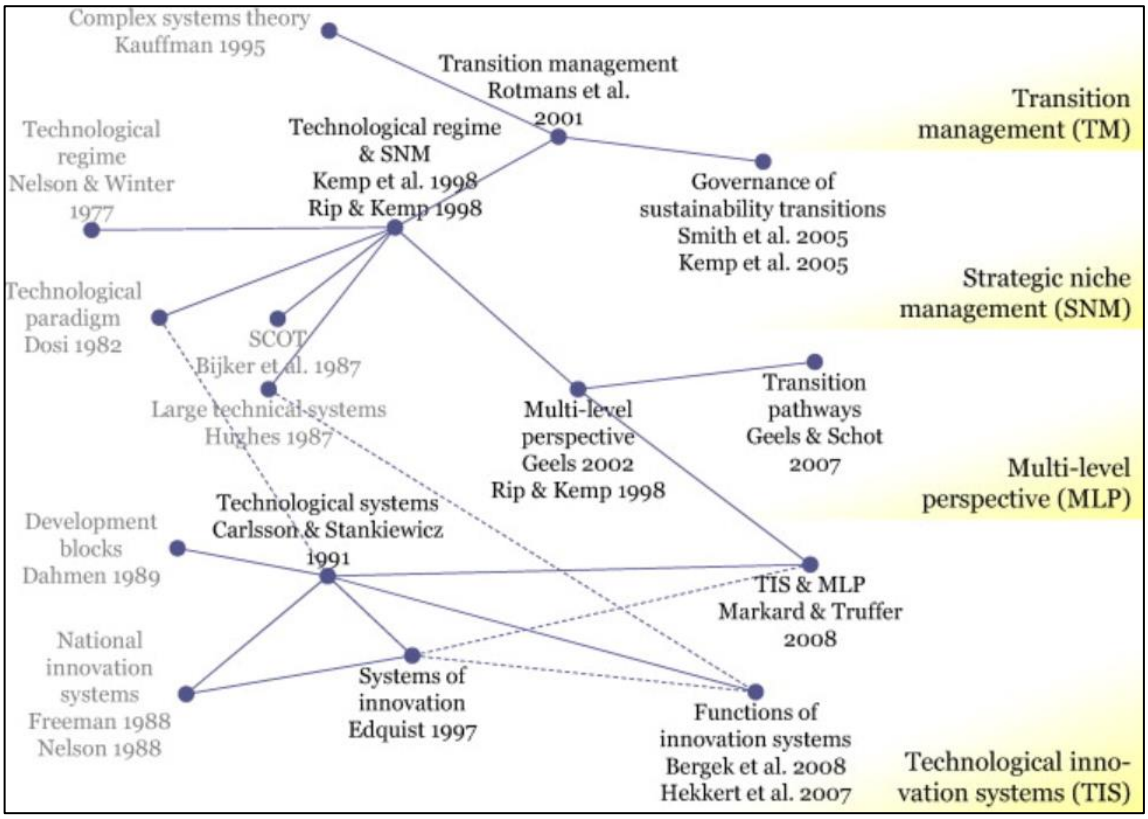


Figure 22: Map of key contributions and core research strands in the field of sustainability transition studies (Markard et al., 2012, p.957). Permission to reproduce this image has been granted by Elsevier.

Transition management (Rotmans et al., 2001; Loorbach, 2010) is a governance process methodology that incorporates insights from complex systems theory (Kauffman, 1995). It has been used in a variety of settings, including the large international Resilient Europe Project (Frantzeskaki, 2022). Instigated by the European Commission's URBACT programme, this knowledge exchange project worked with city leaders, planners and other decision makers in 11 cities across Europe to examine what urban resilience would look like in each city and which transformative actions would be required to strengthen this (ibid.). Loorbach (2010) notes that transition management is an explicitly normative model, in that it presumes sustainable development to be a long-term goal. Technical innovation systems theory (Hekkert et al., 2007; Bergek et al., 2008), on the other hand, focuses more on identifying the barriers to, and drivers of, innovation, especially in the sphere of policy making (Bergek and Jacobsson, 2003; Markard et al., 2012). Whereas both of these frameworks could potentially generate useful insight for the current research around the more specific technical innovations (such as continuous footway), it is considered that they

would be more suitable for research focussing on a project with a more explicitly declared intent to bring about a sustainable transition. Indeed, technical innovations systems theory may yield significant insight if used to study a project from the outset and as it develops, but it is considered less useful for the retrospective nature of this research.

In addition, there are adjacent frameworks that focus more on the social processes (or agency) of actors, such as the social practice approach (Hargreaves, 2011) and policy entrepreneurship (Kingdon, 1995; Capano and Galanti, 2021). The theory of social practices investigates the social relations between producers and consumers, as these are embedded in infrastructures (Hargreaves et al., 2013). A change of social practices occurs when their continuous replication is disrupted (Warde, 2005). Pre-dating the social practice approach, the concept of the policy entrepreneur recognises the role of the 'public entrepreneur' who acts from a position outwith government to help implement new ideas into public practice (Roberts and King, 1991; Kingdon, 1995). Many roles have been identified for the policy entrepreneur, such as advocacy, interpretation, and brokering ideas (Kingdon, 1995), leading Capano and Galanti (2021) to suggest that the term had become over-stretched and over-simplified. They coin the more general term policy entrepreneurship to attempt to de-personalise the concept, instead focussing on patterns of action, carried out by a range of actors, ultimately to promote innovation (ibid.).

Both the social practice approach and policy entrepreneurship could undoubtedly uncover new knowledge and may be particularly useful if applied to the process (qualitative) phase of this research (see Chapter 6), however, their framing is more specific than socio-technical transition theory, and less able therefore to provide an over-arching framework that can usefully bridge the two phases of this research – qualitative *and* quantitative. Either framework could be applied to future research focussing more specifically on the role of agency, and policy entrepreneurship may be a particularly useful framework for assessing the role of policy as a regime in its own right.

The rest of this chapter will outline socio-technical transition theory (STT), and the related theory of strategic niche management (SNM), in more detail. These will be used to frame the analysis and discussion presented in chapters 6 and 7.

4.2 Socio-technical Transition Theory

STT is a theoretical framework for identifying and analysing long term, systemic changes (although there is scope to apply it to a shorter period). Although multiple authors have developed and explored the idea since the mid-1980s (Freeman and Perez, 1988; Kemp, 1994; Schot et al., 1994; Rip and Kemp, 1998), it was Geels (2002) who first combined the various strands of this theory into a coherent framework. In seeking to develop the framework, Geels and other authors have applied it widely to various concepts, including everything from the hygiene transition between cesspools and sewer systems in the Netherlands (Geels, 2006), animal welfare in pig farming (Elzen et al., 2011) and the breakthrough of rock 'n' roll in mid-nineties America (Geels, 2007a).

The theory was originally conceptualised as 'Technical Transitions Theory' and, as Geels (2002) outlines was defined as "major technological transformations in the way societal functions such as transportation, communication, housing, feeding, are fulfilled" (p.1257). The original framework borrows from related theories, including Geels' own research interests relating to evolutionary economics and the sociology of technology (ibid.). The latter led Geels to conclude that "technology, of itself, has no power, does nothing. Only in association with human agency, social structures and organisations does technology fulfil functions" (2002, p.1257). From this came the addition of the 'socio' aspect and the coining of 'Socio-technical Transition Theory', referenced only in passing by Geels in his 2002 paper but adopted as the primary nomenclature in subsequent research on the topic. STT, therefore, is concerned with describing and understanding the long-term movements between socio-technical systems.

Transport, energy and agriculture form three core domains considered in transitions literature. Within the transport and mobilities literature, case studies predominately refer to 'technical' innovations as those entailing [digital] technology, such as integrated ticketing, electric vehicles or biofuels (Geels, 2018) or 'societal' innovations, such as the introduction of shared mobility services (e.g. Ruhrort, 2020). There does not yet appear to be any existing literature presenting the physical regeneration of a street as a 'technical'

innovation in its own right. It is argued, however, that street regeneration projects (certainly in the UK) are increasingly introducing what are seen to be cutting edge technical designs in terms of infrastructure. Sauchiehall Street is an example of this where the intention was to design in elements such as continuous footways at side roads and a continuous bi-directional cycle track level with the footway. Treating these interventions as socio-technical innovations, it is argued, may help to uncover wider lessons on the potential for transition-focused street regeneration.

4.2.1 The Multi-Level Perspective (MLP)

The central component of STT is the adoption of what is termed the multilevel perspective (MLP). The MLP describes three theoretical levels within which socio-technical systems are embedded: the landscape, regimes, and niches. The 'higher' landscape level is more stable than the 'lower' niche level and it is through the shift from one regime to another regime that transitions occur (Geels, 2011). Aspects of this approach were developed prior to Geels' STT framework with research within technology studies already referring to the notion of niches and regimes (Kemp, 1994) and a socio-technical landscape (Rip and Kemp, 1998).

Figure 23 contains a visual representation of the MLP and the three levels are explained in more detail below.

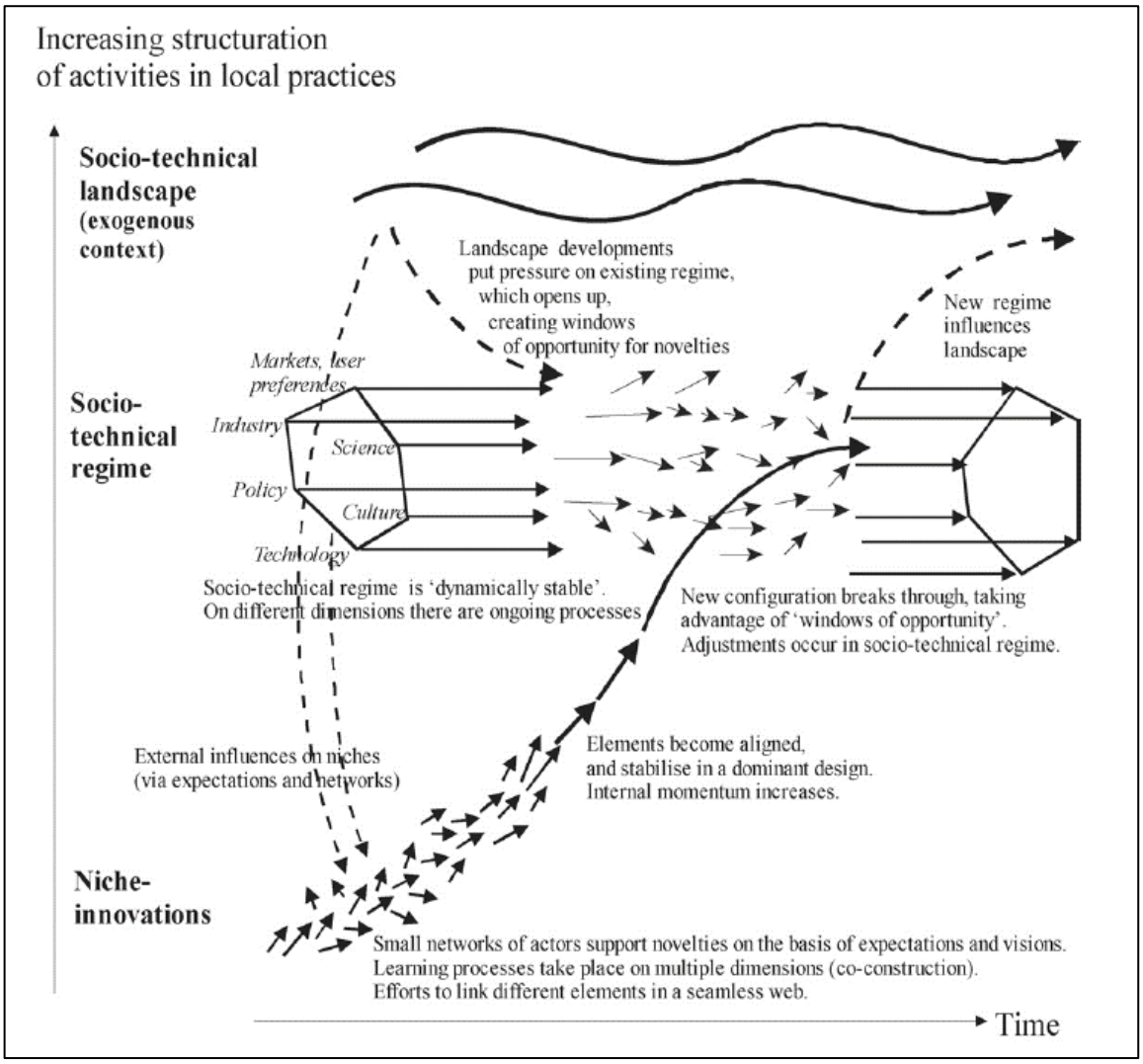


Figure 23: The multilevel perspective on transitions (Geels and Schot, 2007, p.401, adapted from Geels, 2002, p.1263). Permission to reproduce this image has been granted by Elsevier.

Landscape level

At the top is the socio-technical landscape consisting of what Geels refers to as "a set of deep structural trends … such as oil prices, economic growth, wars, emigration, broad political coalitions, cultural and normative values, [and] environmental problems" (2002, p.1260). These are long-term trends, external to the transitions themselves, which are relatively stable. They will eventually change over time, in response to pressure from changing regimes or, occasionally, due to 'shock' events, as exemplified by the COVID-19 pandemic (Wells et al, 2020). But generally, they are long-term trends and therefore resistant to sudden change.

Regime level

Beneath the landscape level are the socio-technical regimes, described by Geels as “the semi-coherent set of rules carried by different social groups” (2002, p.1260). These might be understood as belief systems or prevailing practices that govern the behaviour of individuals, groups or systems at any given point. Geels also describes them as “institutional structures that link technical artifacts and actors” (2007b, p.127). Key here is the emphasis on agency and the fact that systems are largely brought about and maintained by human action but that these agents will be working within the context of social networks. Sorrell (2018) describes the process of how regimes can come to “lock in” technologies and behaviours (p.1269). This occurs when increasingly extensive support systems and frameworks develop around an innovation, thereby entrenching it as the dominant system. Sorrel refers to design standards, along with entrenched social norms, as examples of ‘lock-in’ effects that once developed, make innovation in existing systems, such as engineering, largely incremental.

The regime level in the MLP is an extension of Nelson and Winter’s ‘technical regime’, in which they reference the field of engineering, suggesting that within a community of engineers, certain cognitive routines and search heuristics will govern how engineers look for information and how they interpret it, such that they won’t necessarily see developments outwith their focus (Nelson and Winter, 1982). This is evidenced more recently by Jones (2003) with reference to how highways engineers in the UK are often constrained by entrenched rule-based processes and principles that limit their ability to design streets appropriate for more sensitive locations, such as mixed-use streets in urban centres.

Geels elaborated on Nelson and Winter’s concept, identifying three specific types of rules, based on Institutional Theory (Scott, 1995), that might form regimes:

- formal rules, such as standards and government regulations
- normative rules, including sense of identity, behavioural norms and role expectations

- cognitive rules, namely the search heuristics, problem agendas and rules of thumb from Nelson and Winter's original concept (Geels, 2004).

From this, Geels developed the concept of the socio-technical regime from Nelson and Winter's original model. The processes and actor networks within the regime level act to stabilise the landscape level. Geels (2002) notes that this is a dynamic stability, i.e. change does occur at the landscape level but the reciprocal pressures between regime and landscape level will act to effectively 'maintain the status quo'.

Whereas the socio-technical regime concept could presumably be applied to any professional discipline, this particular example from the engineering discipline forms a relevant connection to this research on Glasgow's Avenues.

Niche level

The final level of the MLP is the niche level. "Niches" within the MLP refer to radical technological innovations (Schot, 1998). Socio-technical change is therefore described as a process whereby a niche is able to 'break through' and exert pressure on an existing regime (Rip and Kemp, 1998). Because of their novelty, niches are inherently vulnerable when exposed to regime pressures, so often they are not able to find a foothold and they simply fail. Indeed, Mokyr (1990) invokes the geneticist Goldschmidt's term "hopeful monsters" to describe how new technologies can often have relatively low technical performance or cost a lot of money (p.351), and this visceral description has come to be used widely in transitions literature since.

4.2.2 The process of socio-technical change

According to the MLP, socio-technical change occurs when radical innovations are able to break through from the niche level to eventually exert enough pressure on an existing regime to disrupt it and eventually replace it with (or transform it into) a new regime. There are several theoretical propositions as to how this mechanism occurs, but it is generally accepted across the literature

that niches can break through successfully when processes at the landscape and regime level have created "windows of opportunity" (Geels, 2002, p.1262). In addition, a niche often needs to be offered adequate protection from market pressures to allow it to develop.

The critical point here is that the landscape can (and does) exert pressure on the regime and that regimes will go through processes of destabilisation. The current research uses this idea to frame the Avenues as occurring within a newly emerging, if not yet stable, regime which has emerged as a response to changing landscape pressures such as the more recently framed climate 'emergency' (McHugh et al., 2021).

4.2.2.1 Developments to the framework

The MLP is a deliberately open framework (Geels, 2020) and as such has been critiqued and further developed by various authors, leading to some useful clarifications and extensions of certain aspects of the framework (Geels, 2011). Earlier theoretical work on the development of MLP by scholars such as Kemp and Rip had conceptualised a relatively linear process whereby a niche innovation was thought to entirely substitute an existing regime, thereby becoming the newly dominant regime. Geels critiqued this model as being too linear and process driven, and instead placed a particular emphasis on the movement between the levels of the MLP. An updated model developed by Geels and Schot (2007) identified three dynamic mechanisms for how socio-technical change occurs: "(a) niche-innovations build up internal momentum, through learning processes, price/performance improvements, and support from powerful groups, (b) changes at the landscape level create pressure on the regime and (c) destabilisation of the regime creates windows of opportunity for niche innovations" (p.300).

Of particular note for the use of the framework in the current research is the criticism by Berkhout et al. (2004) that it is difficult to operationalise empirically as it's not clear how the different levels map onto real-life events. In response, Geels (2011) suggests that the scope of the analytical topic will have implications for how the framework applies, so it is important first to

"demarcate the object of analysis" (p.31) and then apply the framework. Geels goes on to clarify the difference between a regime and a system, following a criticism from Markard and Truffer (2008) that they are unhelpfully interchangeable in the literature. He clarifies that "system then refers to tangible and measurable elements … whereas regimes refer to intangible and underlying deep structures … [so] 'regime' is an interpretive analytical concept" (p.31).

A further relevant critique is that the framework underplays the role of agency (Smith et al., 2005). Geels suggests this is not the case and that, rather, agency is inherent within all the levels of the MLP because they all refer to elements enacted by social groups (Geels, 2011). He further explains that the vertical axis of the model (Figure 23) relates to increasing levels of 'structuration of activities', i.e. that at 'higher' levels, greater numbers of actors are working to reproduce the activities there. Given the importance of agency within the current research, the lack of a more detailed mechanism in the MLP means it is useful to identify further theoretical lenses through which to view this particular element and incorporate theories of agency from the design governance literature reviewed in Chapter 2. Strategic Niche Management theory (Kemp et al., 1998), for example, sits alongside the MLP and offers more insight into the potential actions of agents involved in enacting sustainable transitions. This theory is outlined in more detail below.

Lastly, Geels responds to a criticism that the MLP is overly heuristic (Genus and Coles, 2008) by suggesting that its heuristic nature is also its strength in that it just provides a method for framing transitions in a certain way, allowing for questions about patterns and mechanisms to be asked (Geels, 2011). He adds that the MLP is not a "truth machine" (p.34) but a method for guiding analytical attention to relevant questions and problems (ibid). It is in this vein that the MLP will be applied to the current research, by framing the Avenues Programme in terms of its role within the broader sustainable transition taking place. Existing case-studies of socio-technical change will be utilised to guide attention towards the sorts of questions that will help to shed light on the key features of the Avenues Programme, and key events during the Sauchiehall Street pilot project, which together shape this project as a niche.

4.2.3 Case studies of the MLP

Of most relevance to the current research is the application of the MLP framework to various transitions concerning transportation and the built environment. The MLP is inherently flexible and has been used both for framing concepts and for describing processes of longer-term change. At the more conceptual end of these, Nielsen and Farrelly (2019) use the MLP to conceptualise the built environment as a potential context for, and object of, sustainable transitions. They attempt to capture the multiple processes operating in a notional built environment context, characterising these as landscape factors (Figure 24). This provides a useful guiding principle for identifying landscape factors in the current research.

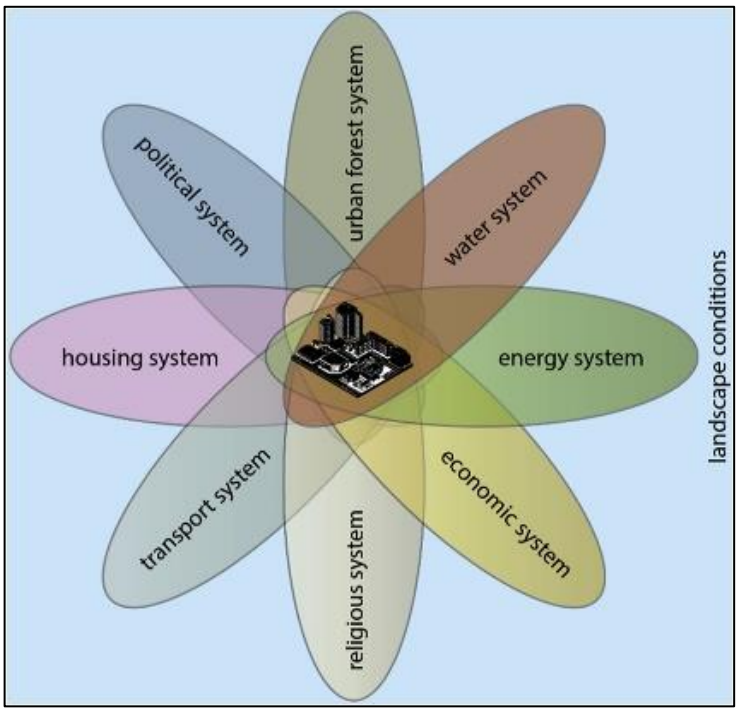


Figure 24: The multiple processes operating within a built environment context, characterised as landscape factors within the MLP. (Nielsen and Farrelly, 2019, p.242). Permission to reproduce this image has been granted by Elsevier.

Nielsen and Farrelly (2019) argue that despite the presence of a physical or strategic plan for the future, cities are typically changed in a piecemeal fashion, project by project, or street by street. They characterise these individual

projects as spatial nodes, suggesting that each project will have certain characteristics in common:

- they are a manifestation of multiple systems,
- they can influence user behaviour for their whole lifetime,
- they are the product of multiple agents across different sectors, both at their conception and throughout the managed life cycle.

The authors suggest that the overarching transitioning of a whole city occurs where a critical mass of these spatial node projects act to exert outward pressure on a dominant regime (or system) within a given location. They conclude that, framed in the context of transitions, "one can interpret individual projects as a nested set of systems that are aimed at directly delivering a specific need to their immediate users (whilst also contributing to and influencing broader systems of society)" (p.244). They also place a specific emphasis on the role of agents within these nodes, characterising these as individuals who play a role in systems and have the ability to act with intention. They argue that there is a critical need to better understand the role of urban practitioners who have the agency to shape the development of the built environment towards a more sustainable outcome.

In a different study, Stolper et al. (2022) provide a detailed methodological example of the application of the MLP and STT to the energy transition within Dutch shipping (
Figure 25). Their study is particularly insightful because it focuses on the significance of a pilot project, as is the case in the current research. Geels and Raven (2006) suggest that pilot projects with new technologies are particularly noteworthy within transitions research as they form a bridge between research, development and diffusion of a product. Stolper et al. (2022) follow a methodology which starts with laying out the theoretical framework, where they report that "a socio-technical framework was selected as a starting point, shipping literature was then collected to fill this framework" (p.1418). They then performed semi-structured interviews with relevant actors based on their framework, which they describe as explorative in nature, "to ensure that all elements that might play a role were discussed without being suggestive" (p.1418). They concluded the research with three case studies of existing and

planned pilot projects, analysing the trajectory from start to finish to better understand how successful pilots are managed. This included exploring costs and funding sources as these were identified as potential barriers to transition.

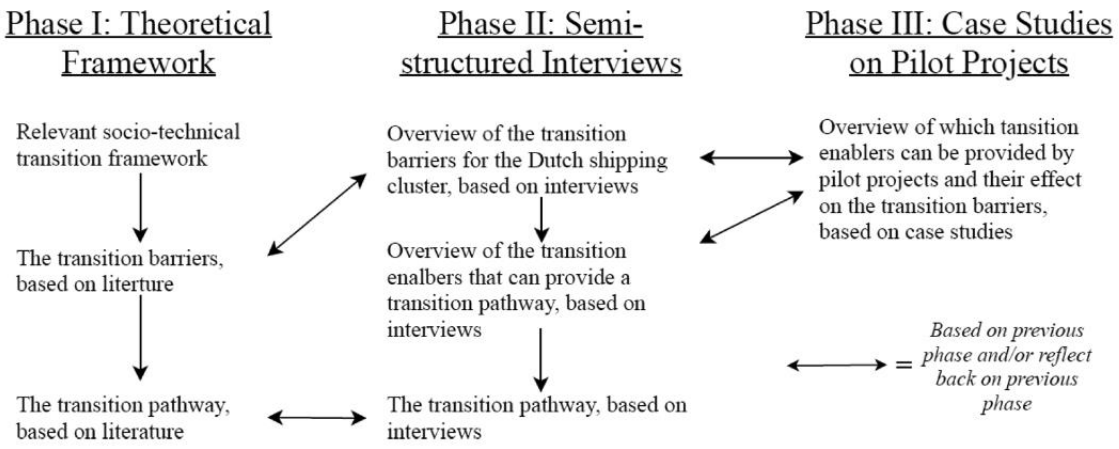


Figure 25: Methodology applied by Stolper et al. (2022) to research the significance of pilot projects for energy transitions within Dutch shipping (p.1418). Image reproduced under Creative Commons CC-BY licence.

In this instance, Stolper et al. were interested in analysing the barriers to transitions and they used the approach above to identify barriers at the landscape, regime and niche level. This was done firstly according to the literature and then based on the first-hand experience of interviewees who were industry experts. Through the case studies, they were then able to assess where pilot projects had provided solutions or workarounds for the barriers they had identified.

In discussing the application of the MLP to a practical case study, the authors observed that the shipping industry did not have a single socio-technical regime, as STT may suggest. They instead conceptualised the sector as a series of sub-regimes (but noted that this could also have been conceptualised as a cluster of niches). They also found that the governing structure within the shipping industry was much weaker than the MLP would suggest in terms of bringing about transitional change, so they were required to reconceptualise the transitional mechanism to account for what they were seeing.

The case studies above have primarily described the application of the MLP to broader contexts or longer-term projects. The current research, with its focus on a specific project, will make use of the MLP to frame the wider context in which the project is taking place. But the core focus will be much more specifically on the actions and processes occurring at the niche level, i.e. by framing the Avenues Programme as a niche 'incubator' in its own right. Although not a core focus in their study, Stolper et al. (2022) introduced elements of Strategic Niche Management to look in more detail at the case study aspects. Given the relevance of this theory as a tool for interrogating the Avenues, it will form the next section of this chapter.

4.3 Strategic Niche Management theory

Strategic Niche Management (SNM) theory is an analytical framework for analysing the nature of niche innovations in key transition sectors, including transport and energy. SNM theory was originally conceptualised by Kemp et al. (1998) and updated by Kemp et al., (2001). Like the MLP, it is intended to look at longer-term change to understand the impact of niches within systems. More recently, however, Caniëls and Romijn (2006) produced a 'guidelines for practice' paper taking the original premise of the framework and outlining how it can be applied to understand how niches are created. In their paper, they describe using SNM theory to identify the best possible conditions for creating a sustainable niche, including the ideal processes of agency. It is this element that will primarily be used in the current research, although the broader theory will also be described for context. Their presentation of the prospective nature of SNM theory makes it suitable for analysing the anatomy of an emerging niche, or 'niche in progress'. As a live, ongoing project, it would appear apt to conceptualise the Avenues as one such example of a niche in progress.

Having reviewed a wide range of SNM literature, Caniëls and Romijn (2006) summarise what they consider to be the three main characteristics of the niche creation process. Firstly, that it should match together the promise and stakeholder expectations of the innovation with the needs of society that are being addressed (Kemp et al., 1998). Secondly, that there is space for

experimental learning in terms of how the niche is received and how expectations about it change over time as its benefits and disbenefits become clearer (Hoogma, 2000). Thirdly, that any niche formation process is dependent on a network of agents (Kemp et al, 1998) – a point which is covered in more detail in Section 4.3.1.

Caniëls and Romijn (2006) also summarise the interactions in the literature between niche creation, and landscape and regime factors, advocating for a slightly different contextual typology. In this, they suggest that contextual factors (be they to do with the landscape or regimes) can be split into factors that are absolutely necessary for a niche to occur and then things that will stimulate or enhance a niche but are not strictly necessary for it to occur. They further subdivide the latter category into factors that cannot be altered in the short term but might change over the longer term, as opposed to factors that are more easily changed in the short-term, for instance through policy measures. Table 4 below summarises their conclusions, based on Kemp et al. (1998) unless specified.

Table 4: The interaction between contextual factors (landscape or regime) and niche creation (adapted from Caniëls and Romijn, 2006).

Factors which are absolutely necessary for niche creation		Availability of sheltered space for niche incubation where niche is not required to 'perform' immediately
		Availability of sheltered space for niche incubation where advantages of niche are highly desired, i.e. where regime is under pressure (such as climate emergency)
		Niche not too advanced when first created, opening up opportunity for incremental improvement and evaluation by agents
Factors which are not absolutely necessary	Not amenable in the short-term (but open to long-term change)	Regime instability, opening up opportunities for actors to develop visions for change and creating expectation of niche as problem solver
		Actor networks with sufficient institutional support, skills, knowledge and techniques (not solely "activists") and a broad public support base (Kemp et al., 2001; Brown et al., 2004)
	Amenable in the short-term	Policy instruments, such as financial incentivisation or support
		A balance between top-down (Government or senior management-led) process and bottom-up (agent-led) process
		Identification of "promising next steps" – visioning – to enable measurement of change once regime transition is underway

Lastly, Caniëls and Romijn (2006) summarise what they view to be five key steps in niche creation. These are summarised below in Table 5, based on Weber et al. (1999) unless specified otherwise.

Table 5: The five key steps in niche creation according to SNM theory (from Caniëls and Romijn, 2006).

1. Choice of a promising technology	Needs to be 'smart', defined as something simple at the outset with the potential to grow more complex later
	Needs an agent of change to champion the innovation
	Needs to be broad enough to be open to change initially but specific enough to look similar to existing technology
2. Selection of experiment	Needs to balance being radical with being achievable otherwise it will peter out
	Benefits from stakeholder communication at this stage but mainly from "lead users" who can give specific feedback (Kemp et al., 2001)
3. Set up and implementation of experiment	Needs a "champion" agent of change to set up goals and actor network
	Should use what is already there in terms of actors' skills and knowledges but nudge the learning process in the desired direction
	Should set up reflexive experimentation (Truffer et al., 2002) where small steps in innovation allow process, strategies and actor expectations to adjust to each other
	Policy makers should assume the role of enabling actor, rather than technology sponsor
4. Scaling up	Identify opportunities to replicate the experiment later and keep the learning stored in a network
	Look to customise the innovation when the pioneer market turns into a mass market
5. Breakdown of protection around niche by means of policy	Be ready to withdraw protection from niche if it is either failing to thrive or thriving to the extent that it is ready for market competition

SNM analysis has tended to focus on contexts where there has been a deliberate intent to create a niche with a view to shifting a regime. As a result, it has most

often been applied to case studies where an obvious ‘product’ has been launched, such as a new technology (Kemp et al., 2001). This opens up an interesting theoretical question about what might constitute deliberateness in terms of niche creation in ‘real-world’ projects, such as the Avenues Programme. For instance, does a lack of knowledge of the specifics of SNM theory mean that an agent cannot be thought to be acting with deliberateness? Or can it be assumed that the extent to which there is deliberate intent to bring about transition can be probed by analysing how individual agents describe the stated objectives of a project? Given the broad applicability of the MLP and SNM theory across different disciplines and topics, it appears pragmatic to presume the latter.

Section 4.3.1 below describes how SNM theory views the concept of agency. Of relevance here is Carmona’s concept of knowing and unknowing designers within the field of urban design (Carmona et al., 2003). Given the assertion that all sorts of agents can be shaping design outcomes, regardless of whether they are aware of their actions, it seems pragmatic to presume that the SNM framework could be applied to a project which, despite not *knowingly* comprising a niche, is nevertheless demonstrating many relevant characteristics of a niche. A further theoretical question pertains to the appropriateness of classifying an urban design-led street regeneration project as a technical niche. The application of this framework to a novel case, it is hoped, will provide new insight into how to analyse the case study. Discussion in the conclusion chapter will also relate, however, to whether (and how) a project such as the Sauchiehall Street pilot might be viewed in wider transitional terms.

4.3.1 Agency within SNM theory

Clearly, a largescale project such as the Avenues will have a complex network of agents involved throughout its lifetime. Carmona (2021) suggests that there are generally two types of urban designer involved in projects: those employed by a private developer to deal with design and those in the public sector dealing with design governance. The Avenues differ here in so much as there is no private developer involved. Instead, the local authority (Glasgow City Council) is acting

in the role of landowner and quasi-developer but also shaping the governance of the project. But there are multiple divisions within the City Council assuming various roles within the Avenues Team. The financial beneficiaries are also non-specific, in that there is no developer seeking to make a profit, but also because financial gains are expected to manifest via the turnover of businesses on the street (ultimately bolstering 'the economy') and plausibly, in the longer term, through less tangible ways such as state savings due to improved public health of the city.

There are many frameworks in existence which seek to model and analyse agency within projects. This includes the notion of agency within urban design, either on the part of designers, who may be knowing or unknowing (Carmona et al., 2003), or alternatively on the part of the end users of a street, where inclusive design can enable individual agency for street users (Francis, 2011). But given the focus of the current research, to uncover factors within the Avenues project which influenced the particular design of Sauchiehall Street, the discussion of agency within the SNM framework provides a more detailed conceptual extension to the broader governance theory within urban design literature. Geels (2011) contends that the MLP has the notion of agency enshrined at each level and SNM theory provides further detail on the nature of agency within a niche.

As previously discussed, Caniëls and Romijn (2006) suggest that whilst a strong actor network may not be absolutely essential at the regime or landscape level for niche creation to *occur*, it forms an important component of the process of developing the niche once it has been created. Applying this to the field of urban design governance, O'Connor and McDermott (2004) note that successful innovations in the cases they studied were brought about by a core team that had a combination of specific, in-depth knowledges but also a considerable level of all-round, general knowledge. They also note that it is useful for individuals to have worked in several different teams within an organisation in order to be able to build a wider informal network, both inside and outside the organisation (ibid.).

The same authors refer to 'communities of practice' where individuals are able to cross organisational boundaries (McDermott and O'Connor, 2002), a concept

also referred to as 'boundary-spanning individuals' by Probst et al. (1998). Caniëls and Romijn (2006) also refer to the *practice* of community as an important factor, for instance through sharing expertise, sociability, argument, disagreement and negotiation. This echoes Adams and Tiesdell's assertion that "successful places come about through effective coordination between the many different actors involved in their production and consumption" (2013, p.106).

Another key focus in SNM theory, which is also echoed in urban design governance literature, is the concept of the "champion" (Kemp et al., 1998). The authors are quick to suggest that this individual should not be too 'activist', lest their values are too unrepresentative of society more broadly. But it's clear this actor needs to be hands-on and to promote learning within the actor network. Kemp et al., (2001) state that in terms of successful longer-term transitions, the development of learning networks, as well as high quality learning experiences, is actually more important than the success of the specific niche. Caniëls and Romijn (2006) therefore conclude that an attitude of "openness and flexibility on the part of all actors" is key (p.11), including a willingness to change course if required and not be overly attached to a specific 'baby' in a project.

The discussions concerning agency are particularly interesting when considered through the lens of Carmona's knowing and unknowing designer (Carmona et al., 2003). How important is it that the project champion is also a 'knowing' designer, not only in terms of achieving the intended outcomes of a project, but also in terms of the ability of a street such as Sauchiehall Street to bring about transitional change? Likewise, to what extent does this matter for other agents involved in the wider actor network? What, if anything, is the relationship between Kemp's 'champion' (Kemp et al., 1998) and Bentley's 'heroic form-giver' (Bentley, 1999), especially given the assertion by Bentley that the latter, as an urban designer, may be instrumental in dictating the initial design but will rarely control its full lifecycle through the project? Lastly, how do the expectations of actors relating to the *outcomes* of a project influence broader learning *about* the project? Ieromonachou et al. (2004) suggest that expectations stated by actors often reflect the cultural values underlying the project and can

therefore reveal assumptions on the part of actors which may advance or undermine the project.

Given the importance of both technical (engineering) design and more general (urban) design for a street aiming to achieve both movement and place outcomes, understanding the nature and location of agency within the Sauchiehall Street pilot would appear key in analysing the journey to the final iteration of the street. The following section outlines a case study by Ieromonachou et al. (2004) concerning application of SNM theory to a transport innovation in Durham, England.

4.3.2 SNM theory in practice

This sub-section reviews two case studies of SNM theory being used in practice. The first, by Ieromonachou et al. (2004), concerns the implementation of road user charging in Durham, England. Its relevance relates to it providing an example of SNM theory being applied both to a transport scheme within the UK, as well as exploring the adaptation of SNM theory to look at an example of strategic niche *policy* rather than a physical technological innovation.

The second, by Berry et al. (2013), seeks to provide a more detailed interrogation of the actual processes and interactions involved in a project that is specifically seeking to bring about transformation. Their research, which focusses on the development of 'Lochiel Park Green Village', a nearly zero carbon housing development in Adelaide, Australia, asks what role niche sustainable developments might play in transforming the local housing market. Crucially, they were able to research the project whilst it was underway, thereby providing the ability to observe the processes taking place and probe the opinions (and intentions) of key project actors. Using this insight, they sought to provide a clearer understanding of the mechanisms involved in niches acting to shift regimes, asking questions such as whether "the transformational impact of the niche [is] related to interactions that occur during its conceptual birth, or from the experiences of actors involved in its physical creation, or from the learnings that occur once it exists or from any specific combination of stages" (Berry et al., 2013, p.647).

4.3.2.1 Ieromonachou et al. (2004): Adapting Strategic Niche Management for evaluating radical transport policies--the case of the Durham Road Access Charging Scheme

Durham was the first place in the UK to use newly available traffic reduction strategies after they were made possible by the Transport Act 2000 (Her Majesty's Government, 2000). The Local Authority utilised this power to introduce road user charging in a very small but crucial area of Durham city centre near the cathedral where the combination of several historical attractions and narrow streets was creating significant problems for managing vehicle access. Ieromonachou et al. applied SNM theory retrospectively to analyse what had occurred during the project and then to understand how to get from the new technology (road user charging) to implementing transport policy more generally.

As a result of using SNM in this manner, Ieromonachou et al. suggest a conceptual update, which they term Strategic Niche Policy Management (SNPM). The authors suggest adapting SNM theory to conceptualise innovative policy measures as a niche because many of the processes suggested for technological niches are the same as those used for policy formation. The paper lays out a mechanism for how niche policy innovations may eventually lead to regime change (Figure 26).

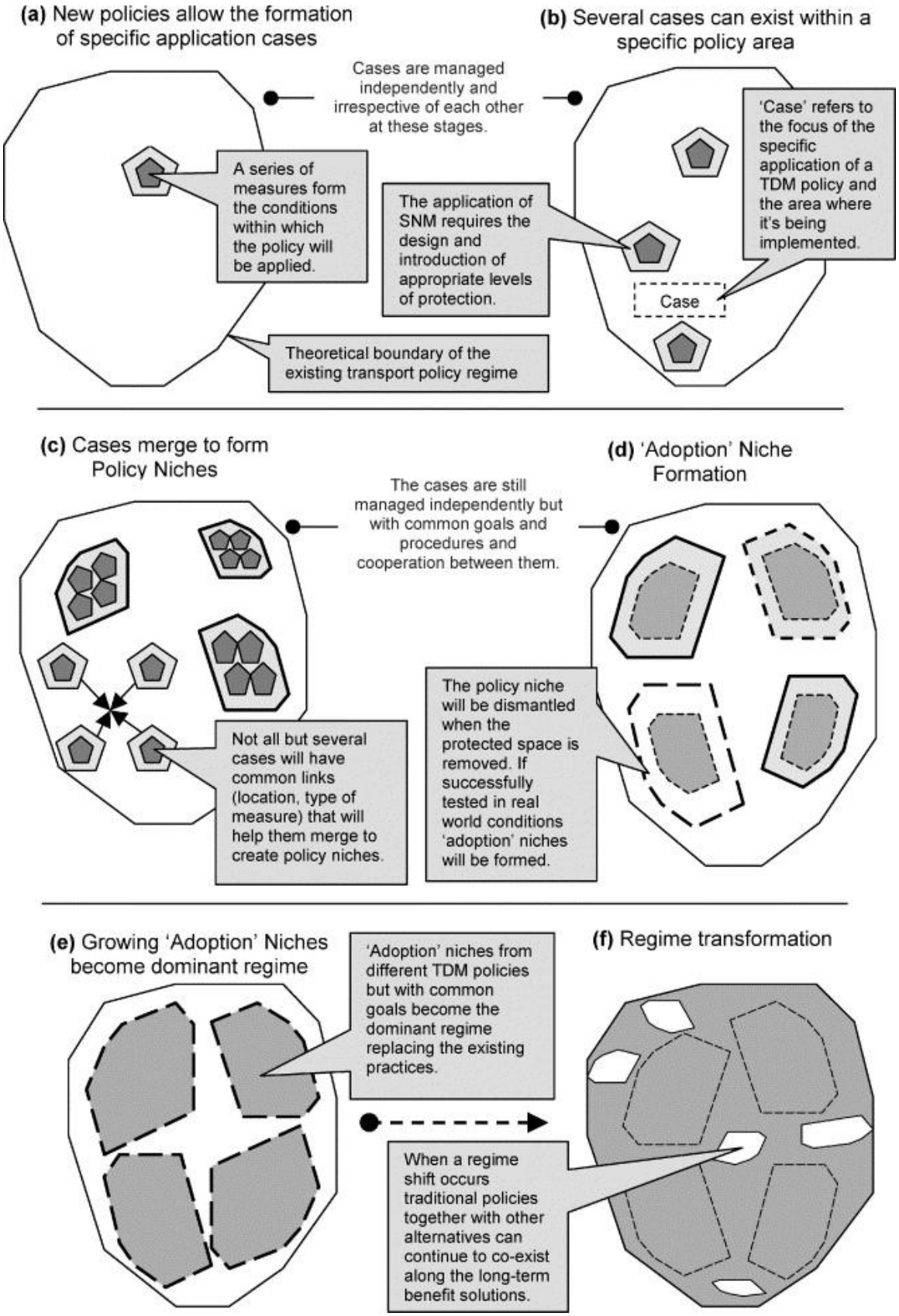


Figure 26: The process of niche formation according to SNPM (Ieromonachou et al., 2004, p.80). Permission to reproduce this image has been granted by Elsevier.

Figure 26 describes how a series of possible measures (such as road user charging) within a theoretical boundary of the existing regime can be applied to cases (projects) within the regime. These cases then merge by building up links between neighbouring cases to form a niche with protection around it. The authors apply a spatial element here suggesting this will happen more effectively if the cases are close by, or different local authorities using the same sort of measures share knowledge or standardise cases. These then become the regime over time if adopted. The authors move away from using the word 'market' because they state that the equivalent doesn't exist within policy. A new regime will mean new policies, but these may co-exist with the old regime for a time. Protection can be removed when the regime has become normed, e.g. companies carrying out travel plans as standard or where road-user charging becomes national policy.

There are potential parallels with the current research, whereby specific elements of infrastructure design (such as continuous footway) form measures, and individual streets (such as Sauchiehall Street) form cases. The Avenues Programme involves redeveloping several separate streets in a similar style at the same time, making this spatial lens potentially relevant for understanding how these individual niches might interact to create a new regime.

To carry out their research, Ieromonachou et al. (2004) undertook an initial appraisal of background Cabinet reports, local and national newspapers, and other grey literature to understand the context. This helped structure an initial questionnaire for key partners and actors on the scheme and interview questions for three focussed interviews, including the Project Manager. Through taking this approach, they were able to identify key elements that, in their words, made the project a success. They were also able to identify the difference between partners, described as agents actively involved in making the project happen, and actors, who are agents more peripherally involved or on the receiving end of the measures. They then applied SNM theory to deduce some thematic analysis, including themes relating to partner-actor networks, expectations-motivations, regional context-societal embedding, and general learning.

4.3.2.2 Berry et al. (2013): The impact of niche green developments in transforming the building sector: The case study of Lochiel Park

Berry et al. (2013) describe the development of the Lochiel Park project, a very low carbon housing project near Adelaide, Australia. Their description includes the political background and the stated intent to bring about transformation within the housing market. In providing the background, they characterise climate change as an immediate and highly pressurising landscape factor, exerting pressure on the incumbent housing regime to change. This, they suggest, enabled interaction effects between the niche processes and this landscape factor, which ultimately helped bring about the transformational outcomes of the project. For example, there was senior government buy in to the project from the outset because of the perceived need to address climate change concerns, which meant that permission was granted by senior management for project officers to experiment with new construction techniques. This landscape pressure also enabled the project team to push for more ambitious objectives within the project.

The authors describe incidences where new technologies or approaches were used, which were uncommon within the incumbent housing regime. These included examples of 'standard' construction companies being required to source low carbon concrete for the first time, ultimately leading to one company adopting the more sustainable concrete as their main product. They argue that the protection of the niche offered greater freedom for the development of processes and guidelines, leading to the willingness of agents to invest creativity and new thinking within the niche.

Berry et al. (2013) conclude their analysis of the actions occurring within the niche with a section focussing on major barriers encountered during the project, arguing that these will have shaped the niche but also started the regime transition. They encountered multiple incidences where actors, systems or processes from existing regimes acted either to undermine the aims of the project, or just failed to support them. A relatively innocuous example was the default provision of a 50kph speed limit in the development, despite specified objectives to create a low-speed environment to support walking and cycling.

Berry et al. observed that at the time, there simply wasn't a legal mechanism available within the incumbent regime for providing a slower speed limit in a residential area. They make an interesting point that "although the niche is created largely free of the constraints of the dominant regime, it is still subject to influences associated with processes, tools, artefacts, regulations, and policies of that regime" (p.652). This sort of 'default provision' behaviour is highly likely to have occurred during the Sauchiehall Street pilot.

Of additional relevance to the current research, Berry et al. return to their original research question by drawing out examples of what they call the 'impact' of the Lochiel Park project, i.e. where pressure has been observably placed upon regimes within the housing system. Much of their observation here focuses on education and behaviour, in keeping with existing socio-technical literature, especially changes in processes, skill sets, practices, knowledge and policies. However, they also note the increased confidence of the South Australian government to move the goalposts in a positive direction (vis a vis low carbon development) as a result of delivering the project, and the impact on the wider public through communication and dissemination of learning.

Despite these observable indications of transitions, the authors also note the limitations of the project, concluding that a critical examination suggested wholesale changes to urban development policies, building standards, industry practices and consumer expectations had not occurred. However, it is recognised that transitions will rarely happen immediately, and several other authors support the idea that an accumulation of niches (temporally and spatially) are required to bring about iterative change (Ieromonachou et al., 2004; Borghei and Magnusson, 2018). This is also pertinent for the current research, given that Sauchiehall Street forms the pilot street of a much longer-term project, which will eventually encompass several similar streets. It is likely that similar incidences of new technologies and processes challenging incumbent regimes will also have been important events during the Sauchiehall Street pilot and this approach therefore provides a useful focus for analysing the current project.

4.4 The application of STT and SNM theory to the current research

This chapter has provided an overview of the multi-level perspective within socio-technical transition theory, as well as the related theory of strategic niche management, with its focus on agency. These concepts are, by nature, heavily theoretical. Heeding the advice of Geels (2011) to clearly demarcate the object of the research, this last section will attempt to demarcate the Avenues Programme and Sauchiehall Street pilot as the objects of analysis, with a view to outlining how STT and SNM will be adapted to weave in learning from chapters 2 and 3, and ultimately used to create a new analytical framework.

Taking a regime as an analytical concept (Geels, 2011) the Avenues and Sauchiehall Street pilot can both be characterised as events occurring during specific regimes, shaped by them, but ultimately a product of a gap having arisen in these regimes that has allowed the creation of the Programme. The MLP, in this case, provides a useful overarching framework for conceptualising the context within which the Avenues Programme sits. It is particularly useful for identifying landscape factors, in keeping with the approach taken by Nielsen and Farrelly (2019) in their conceptualisation of the built environment as a context for transitions. But it can also be used to direct attention towards the regimes operating to shape the project.

Berkhout et al. (2014) observe that the MLP framework is potentially empirically ambiguous and indeed, it seems plausible to characterise the existence of niches at several different analytical levels. For instance, the Avenues Programme itself could be conceptualised as a niche, as could the pilot project, or even the innovative infrastructures of the street. The case studies of SNM theory in practice are instructive here and the conceptual approach that will be taken echoes that of Ieromonachou et al. (2004). As such, the Sauchiehall Street pilot will be treated as a niche, but the approach will be left deliberately open with a view to using the interviews to identify specific aspects of the street that could also be conceptualised as niches, following Ieromonachou et al. (2004).

Overall, interrogation of the processes and events of the Sauchiehall Street project will be used to shed light on the nature of the regimes surrounding it and the potential impact of the Sauchiehall Street pilot on these regimes, in keeping

with the approach of Berry et al., (2013). Elements of SNM theory will be applied, firstly to inform discussions relating to agency within the project, but also to inform RQ3, which relates to wider learning from the project, including whether the use of STT and SNM theory in this case has proved useful.

4.4.1 Adapting the conceptual framework for the current research

Figure 27 presents an adapted version of the multi-level perspective within STT theory (Geels, 2002; Geels and Schot, 2007), which will provide a conceptual framework for analysis in the current research. It takes the premise of the MLP but applies it specifically to the context of the regeneration of an urban street, drawing in theory identified in Chapters 2, 3 and 4. The framework incorporates Carmona's place shaping continuum (Carmona, 2014), proposing that different regimes may act to constrain the *design and conceptualisation* of the street compared to those acting to constrain the *space in use*. The actions of knowing and unknowing design agents (Carmona et al., 2003) are also posited as key in influencing the protection around a niche, shown in conceptual 'enabler' or 'blocker' form in the framework. This knowing designer could perhaps be Kemp et al.'s champion (Kemp et al., 1998) or Bentley's heroic form-giver (Bentley, 1999). The Avenues Programme is conceptualised as a 'niche incubator', i.e. itself a niche, but also creating a space where technological infrastructure niches are developed, in this case via the pilot project on Sauchiehall Street.

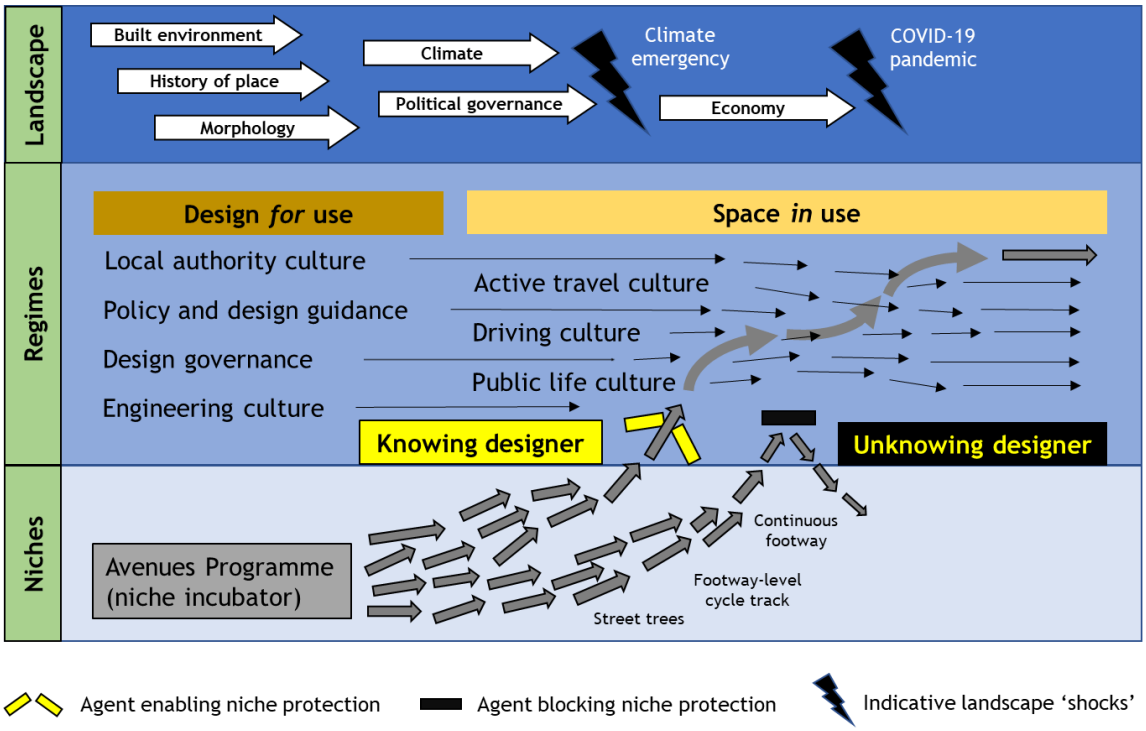


Figure 27: An adapted conceptual framework to frame analysis in the current research. Based on the MLP in STT theory (Geels, 2002; Geels and Schot, 2007), incorporating the place-shaping continuum (Carmona, 2014) and knowing and unknowing design agents (Carmona et al. 2003).

Table 6 reiterates the research questions and outlines examples of prompt questions derived from the analytical framework in Figure 27 that will be used to structure the analysis of each question. These examples are not exhaustive and, as outlined above, application of the framework will be deliberately flexible with a view to understanding how it can most usefully be applied to projects such as the Sauchiehall Street pilot.

Table 6: Overview of research questions and prompts from the conceptual framework that will be used to approach analysis of the qualitative and quantitative data.

Research questions	Overview of prompt questions from STT and SNM theory
1. **How was the design of the Sauchiehall Street Avenues pilot project shaped by the conceptualisation, delivery and construction process?** a. What were the forces shaping the design of the street? b. What was the original design intent? - Were there philosophical underpinnings evident in the design? c. What were the pivotal events and agents along the way?	• What were the landscape factors surrounding the inception and development of the Avenues Programme (Nielsen and Farrelly, 2018)? • Do interviewee responses indicate the presence of regimes shaping the project (Geels, 2002)? o Are interviewees demonstrating regime thinking? o What was the nature of the expectations of actors (Ieromonachou et al., 2004)? • Are the new street infrastructures conceptualised as innovative niches (Geels, 2002)? o Were actors demonstrably knowing or unknowing (Carmona et al., 2003)? • What sort of network of agency is apparent within the project (Caniëls and Romijn, 2006)? o Was there a champion – or champions (Kemp et al., 1998)? What was the nature of this individual? Were they more "heroic form-givers" (Bentley, 1999)? o What was the nature of the knowledge demonstrated by actors (specific, general)?

	○ Was there evidence of communities of practice having developed (McDermott and O'Connor, 2002)? And boundary-spanning individuals (Probst et al., 1998)? ○ Did actors demonstrate openness and flexibility (Caniëls and Romijn, 2006)?
2. Is the design of Sauchiehall Street enabling and encouraging the intended behaviours? a. Are people using the street as intended in terms of its place function, movement and public life functions?	• Is regime thinking observable in terms of individual and collective behaviour on the street (Geels, 2002)?
3. What learning does Glasgow's Sauchiehall Street Avenues pilot offer for designing the streets of the future?	• What barriers occurred and how did these interact with the MLP observable within the project (Berry et al., 2013)? • Can useful insight be gained as to the potential of a programme such as the Avenues to bring about wider sustainable transitions by analysing it using STT (and SNM theory)?

4.5 Summary

This chapter has outlined STT and SNM theory, ultimately leading to the presentation of an adapted conceptual framework, which will be used to frame the analysis undertaken in this research. The potential usefulness of STT theory for analysing a street regeneration project in the context of a wider requirement for cities to transition towards more sustainable entities has been noted – streets form a particular component of these transitions as both canvas for transition and conduit through which transition can occur. But the chapter has also noted several potential limitations of the framework as applied to the current research. Furthermore, it detailed the potential alternative frameworks that were considered, including transition management, technical innovation systems, the social practice approach and policy entrepreneurship, explaining why these were not ultimately selected for the research. This provides the opportunity to assess the usefulness of the framework in this novel setting, a point which will be included in the conclusion chapter. The next chapter outlines the methodology adopted in this research.

Chapter 5: Methodology

5.1 Introduction

This chapter outlines the research strategy and methods adopted in this research. It starts by recapping the research aims, objectives and questions. It then outlines the mixed methods research strategy and case study research design, before detailing the research methods and associated data sources selected to address the overarching research questions. The second part of the chapter details the use of these qualitative and quantitative methods, including their limitations. There is a particular focus on the virtual walking interviews, necessitated by COVID-19 restrictions, as these were a novel method at the time. Likewise, the approach taken in the quantitative phase requires additional focus as this is also a novel update to existing methods. It concludes with a discussion of ethical issues arising during the research.

My interest in this topic stems from several years working as a practitioner, first in local authority planning and latterly as a technical consultant specialising in the design of streets to enable active travel. As such, this chapter also includes two sections reflecting on the use of the methods within the broader experience of returning to academic research after having worked in practice. This is not only intended to aid discussion of their validity, given the nature of the researcher as a methodological 'instrument' in both phases, but also to shed light more generally on the nature of conducting (online) research and the contemporary use of observational methods.

Appendix 1 considers the impact of the COVID-19 pandemic on both the research and the researcher. The pandemic was declared in the early stages of the research and therefore had various impacts. As such, the discussion in Appendix 1 also informs this chapter.

5.1.1 Research aims, objectives and questions

The overarching aim of this research is to investigate the processes taking place during the conceptualisation and design of a contemporary street, and to

investigate what the implications of these processes are for longer-term transitional change. The objectives are three-fold:

1. To interrogate how new street infrastructures intended to enable active travel and enhance public life are designed, planned and constructed.

2. To evaluate the extent to which such interventions result in the intended use of the street.

3. To theorise how the design of future city streets within the context of urban governance and engineering can best enable sustainable transitions.

The research questions pertaining to these objectives are as follows:

1. **How was the design of the Sauchiehall Street Avenues pilot project shaped by the conceptualisation, delivery and construction process?**
    a. What were the forces shaping the design of the street?
    b. What was the original design intent?
        i. Were there philosophical underpinnings evident in the design?
    c. What were the pivotal events and agents along the way?

2. **Is the design of Sauchiehall Street enabling and encouraging the intended behaviours?**

Are people using the street as intended in terms of its place function, movement and public life functions?

3. **What learning does Glasgow's Sauchiehall Street Avenues pilot offer for designing the streets of the future?**

5.2 Research strategy

This section details the decision to adopt a mixed methods research strategy based on the nature of the research object: a project involving the regeneration

of a complex, mixed-use street, which is expected to meet multiple wider regeneration objectives. As such, the research consists of two phases:

- A *'process' phase*, which is qualitative, comprising document analysis and semi-structured interviews.
- An *'observational' phase,* which is primarily quantitative but also incorporates qualitative analysis.

The phases were undertaken sequentially, the results from each method informing the next, to ultimately build a comprehensive strategy to address the overarching research question. Together, this approach allows for triangulation of the three different data sources (Creswell, 2013; Natow, 2020), intended to improve validity during the subsequent analysis.

5.2.1 Exploring the philosophy behind street design

Sitting behind this research is the idea that a street can be both the *context for* but also the *object of* wider transitional change (Nielsen and Farrelly, 2019). Street regeneration programmes physically modify the street – it becomes the object of transition. But the intent behind modifying the street is one of wider transition through behaviour change, be that on mobility, economic or sustainability grounds. As such, streets are also the context of change and increasingly required to act as agents of change, for instance through promoting sustainable mobility and increased footfall to aid economic regeneration. One element of the Avenues Programme that makes it particularly interesting to research is that it manifests broader social and environmental objectives through the design of one physical street.

This research takes the view that the physical street speaks a language to those that use it and that this is key to enacting this transitional behavioural change. In essence, if infrastructures such as cycle tracks and benches are not perceived to be safe, inviting and easy to use, people are unlikely to use them (DfT, 2020). Here, theories of environmental possibilism and probabilism provide insight (Bell et al., 1996). Physical design can be possibilistic, *suggesting* behaviour, at one end of the spectrum (perhaps by providing an alternative, non-direct route

through a park), right through to probabilistic, *dictating* it, at the other end (e.g. clearly defined lanes of traffic moving in one direction on motorways).

The roots of this idea can be found in the ecological approach to environmental perception, which suggests that individuals experience the environment as a series of functionally significant structures or "affordances" (Gibson, 1977). Whyte (1980) gives the example of a bench on a street affording sitting due to its physical dimensions relative to human requirements. Likewise, Alexander, in his exploration of his Pattern Language, identifies observable behavioural "tendencies", which he suggests can be encouraged or suppressed by the design of the environment (Alexander, 1977). This 'language' spoken by a given street is therefore shaped and dictated by those designing it, however sub-consciously. This research seeks firstly to explore the conceptual thinking governing how that language is 'written' by designers and project managers, even if the 'words' look objective. The second phase of the research goes on to observe how the language of the street is being translated by people using it, as manifested through physical behaviours.

The Avenues Programme is melding together a variety of different professional disciplines and areas of expertise, each of which have their own ontological and epistemological stances. Sauchiehall Street is the product of both urban designers and highways engineers as individual professionals. They in turn are governed by their respective discipline-specific design manuals and standards. Historically, urban design has moved between attempts to *quantify* the creation and experience of place (e.g. Lynch, 1960; Cullen, 1961; Hillier, 1976), and a recognition that placemaking requires a degree of *subjectivity*, which is difficult to measure and dictate through design (e.g. Jacobs, 1961; Carmona et al., 2003). The place aspects of street design have therefore largely been studied using qualitative methods (with recent exceptions, e.g. Ewing and Clemente, 2013).

Highway engineering, on the other hand, tends towards positivist thinking, using empirically based calculations to achieve objective outcomes relating to e.g. safety or vehicle flow rate (Hebbert, 2005). There has been a recent proliferation of engineering guidance for active travel advising exacting dimensions and materials to ensure safety in highways environments (e.g. *Local Transport Note 1/20*, DfT, 2020). Alongside this, there are urban design guides

and manuals, such as *Designing Places* (Scottish Government, 2010), promoting the creation of place, often referring to the desirability of including walking and cycling as a function of this sense of place. Already, therefore, this provides an interesting, potentially conflicted context for the pursuit of a public realm design project on a mixed-use street like Sauchiehall Street with an established vehicle movement pattern, high footfall and a high place function within the city centre. There is potentially an inherent mismatch between the positivist stance of engineering-led design and the qualitative-led approach of urban design.

The physical street is a real, tangible entity. Likewise, people using the street – whether they are driving, walking, cycling etc – are exhibiting observable, tangible behaviours. The physical design of the street is the product of quantitative engineering diagrams and design theory, produced by professional engineers and designers who will have intended a specific outcome through the medium of their designs (be that safety, beauty etc). However, it is also important to recognise that, behind these observable realities, there will be a myriad of parallel perceptual realities that are not easily observable in a direct manner. This argument forms the essence of Bhaskar's theory of critical realism, which states that ontology must be understood to be separate from epistemology: what is experienced is separate from what is known about that experience (Bhaskar, 1975 *in Bhaskar and Callinicos, 2003*).

This logic also forms a core tenet of environmental psychology, which has relevance for the discussion of the relationship between street design and behaviour. People using the street may exhibit certain similar-looking behaviours, but the rationale for that behaviour might differ hugely between individuals (Nasar, 2011). In addition, behavioural economic theory would suggest that these individuals will be operating within their own bounded rationality (Simon, 1990) and their behaviour will therefore occur along a spectrum from entirely conscious through to entirely sub-conscious at any given moment, depending on how they react to the design of the street (Bell et al, 1996).

These differences in individual perception, highlighted here to illustrate the potential for multiple realities, are becoming increasingly well-researched in terms of the ramifications for behaviour change programmes and designing inclusive infrastructure (Sloan Devlin, 2018). However, the qualitative nature of

much of this research, often relying on interviews and surveys, potentially means that there has been on over-reliance on self-reported data, inevitably pertaining to an individual's constructed reality, which they may or may not be conscious of (Lawrence and Oxley, 2019; Panter et al., 2019). What is lacking therefore is analysis of broader behavioural patterns focussing on the inherent response to the street environment, regardless of the level of conscious decision making involved.

Likewise, a feature here that is perhaps less well recognised and researched in terms of public realm projects is the ramifications of the existence of multiple realities within the approach of the designers. Mixed methods research focussing on mixed-use streets has tended to focus on analysing functions of the redesigned street (Jones et al., 2007; Carmona, 2015), but not alongside consideration of the processes that occurred to produce the street. Logically, if it is accepted that individuals operate within the constraints of bounded rationality (Simon, 1990), on a spectrum of sub-consciousness, even within disciplines associated with more positivist thinking (such as engineering), decisions will potentially be affected by subjective factors.

Unlike highway design, the design of active travel infrastructure has tended to be indicated by engineering *guidance*, rather than dictated by standards, which arguably leaves room for human decision making and influence. This research seeks to probe the potential for multiple constructed realities amongst the individuals involved in that design process, inspired by Flyvbjerg's pivotal work in *Rationality and Power* (Flyvbjerg, 1998). It also seeks to move beyond a purely qualitative measurement of the user experience to understand how the language of the street is shaping instinctive behaviour.

5.2.2 A mixed methods strategy

The strategic mixing of methods in research has its roots in the idea that all methods have biases and weaknesses. Therefore, collecting both quantitative and qualitative data can serve to neutralise the weaknesses of each data type (Jick, 1979). The approach has developed towards a more systematic integration of data types but still with the overarching rationale that the combination will result in greater insight than can be achieved by either data type alone

(Creswell and Creswell, 2017). Mixed methods research also allows for the integration of different theoretical perspectives (Creswell et al., 2011).

Plano Clark (2010) describes using mixed methods to examine processes and experiences, along with outcomes. In this case, the adoption of a mixed methods strategy is intended to address two interrelated aims. Firstly, the approach allows for investigation of the two discrete elements within this research project: the first looking at the conception and design of the street, the second focussing on the resulting user behaviour. These elements require different methodological tools, some of which fall more within a qualitative domain and others into a quantitative domain.

Secondly, there is the potential for the existence of different philosophical perspectives amongst the various individuals involved in designing and implementing the project (Nelson and Winter, 1982; Jones, 2003). A critique of mixed methods is that by opting for qualitative or quantitative methods, the researcher is committing to the underlying ontological and epistemological perspectives of those methods, which will differ (Bryman, 2016). However, in this case, it is precisely the co-existence of these differing perspectives amongst the individuals involved in the programme that the research is trying to uncover, by using a mix of complementary methods with different philosophical underpinnings.

This research adopts what Creswell and Creswell (2017) term an exploratory sequential approach. This approach tends to place a greater emphasis on the qualitative phase, where a broad range of data are collected. The quantitative phase then explores specific elements from the qualitative phase in more depth. An initial process (qualitative) phase explored the experiences of the individuals involved in designing and implementing the Sauchiehall Street pilot. The observational (quantitative and qualitative) phase then examined how the design is manifesting in behavioural terms.

Creswell and Creswell (2017) note that there can be challenges involved in identifying the appropriate qualitative findings to use, which in this case was managed by adopting a theoretical framework for analysing the data. This framework is based on socio-technical transitions theory (Geels, 2002, detailed further in Chapter 4), which provides a mechanism for capturing the ability of a technical intervention to bring about transitional change over time.

5.3 Research design

This research adopts a case study design. Case studies can be applied in multiple ways depending on the nature of the research, including the consideration of multiple cases or a singular focus on one in depth case (Yin, 2009). Historically, they have tended to be used for research focussing on evaluation, however, they are increasingly being utilised to provide an in-depth study of entities, such as programmes and events, and processes within programmes (Yin, 2014).

Creswell (2013) describes the use of the 'instrumental' case study, where a researcher seeks to investigate a case with a view to gaining insight into a larger issue. In this research, the Avenues Programme is investigated as an instrumental case study. Indeed, Yin (2004) advises choosing the most significant case possible to maximise the likelihood of contributing to research and practice outcomes. The Avenues Programme is also understood as having a role in providing context for the pilot project on Sauchiehall Street, which is treated as a separate, nested case study within the Avenues Programme. In effect, this is taking a phenomenological line of enquiry (Spinney, 2015), viewing the Avenues Programme as a time-bound, yet ongoing, phenomenon. The Sauchiehall Street pilot is a differently time-bound phenomenon, consisting of a discreet design and construction phase (now complete) alongside an ongoing 'live' phase of operation, the study of which will be temporally bound by the constraints of the research project.

Queirós et al. (2017) describe qualitative research as being concerned with probing aspects of reality that cannot be quantified to deepen the understanding of a given problem. Conversely, quantitative data can be numerically quantified and there is a tacit understanding that these data can be generalised to the level of a population (Martin and Bridgmon, 2012). Within both approaches, there is a need to adopt different measures to ensure validity. Mixed methods research can be beneficial in this regard because the use of quantitative and qualitative approaches allows for a high degree of triangulation, not just within one approach but across both (Denzin, 2009).

An additional step that was taken in the pursuit of validity is an ongoing account of researcher reflexivity, using data from a reflexive journal kept by the researcher. This was embedded throughout the research project, both in the

qualitative phase (as is traditionally expected) but also the quantitative phase, with a view to ensuring a valid selection of methodological tools and an openness to interpretation of the emerging data.

5.3.1 Research questions and associated methods

The overarching aim of this research is to investigate the processes taking place during the design and conceptualisation of a contemporary street, and to ask what the implications of these processes are for longer-term transitional change. Having outlined the theoretical and methodological strategies adopted in this research, Table 7 articulates how the methods are used to address each research question. Figure 28, below, describes the steps taken within the case study design to address the research questions.

Table 7: The relationship between the research questions and the selected methods.

Research questions	Phase 1	Phase 2
	Document analysis and interviews	Observation
1. How was the design of the Sauchiehall Street Avenues pilot project shaped by the conceptualisation, delivery and construction process?	✓	
a. What were the forces shaping the design of the street?	✓	
b. What was the original design intent? - Were there philosophical underpinnings evident in the design?	✓	
c. What were the pivotal events and agents along the way?	✓	

2. Is the design of Sauchiehall Street enabling and encouraging the intended behaviours?	✓	✓
a. Are people using the street as intended in terms of its place function, movement and public life functions?	✓	✓
3. What learning does Glasgow's Sauchiehall Street Avenues pilot offer for designing the streets of the future?	✓	✓

Figure 28 outlines the steps in the case study design adopted in this research.

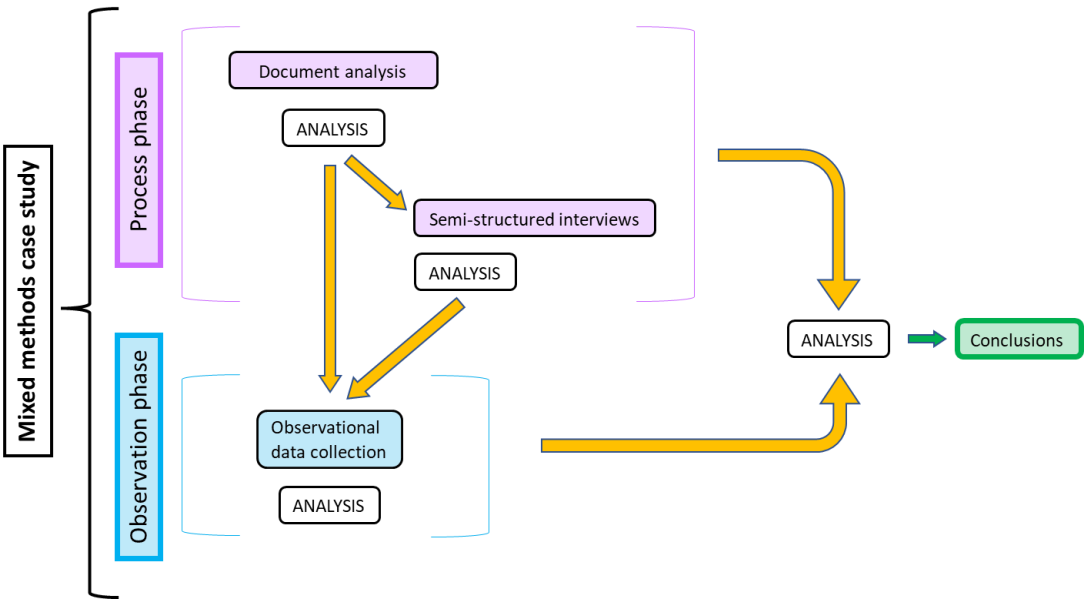


Figure 28: Steps to be followed in this case study research.

5.4 Data collection

As detailed in Figure 28, the process (qualitative) phase of this research was carried out first, starting with an initial period of document analysis, followed by qualitative interviews. Whereas the interviews relate mainly to RQ1, the document analysis both informed the development of the interview questions

and directly contributed to addressing RQ2. Both phases inform RQ3, relating to wider lessons to be learned from the project.

In essence, RQ1 asks “how did Sauchiehall Street come to look like that?” This question seeks to probe the various forces shaping the design of the street, including the wider policy context and individual agents (and teams) involved in designing, planning and implementing the project. As such, the two data collection methods were chosen to address the different aspects of the question but with the intent of combining the data sources to increase their validity.

The observational (mixed) phase of this research followed the process phase. The main aim was to address RQ2, which effectively asks “how is the street being used?”. Having reviewed literature relating to the measurement of public life, it was ascertained that observational methods are frequently used (e.g. Whyte, 1980; Gehl, 2010; Gehl and Svarre, 2013). However, the research rarely concerns itself with the detail of how specific types of street infrastructure impact public life, whether positively or negatively.

Research relating to emerging infrastructures, such as continuous footway, also tends to use a form of observational analysis, often based on AI and video analysis (Wood et al., 2006; Steer Davies Gleave, 2018; AECOM, 2018; Flower et al., 2020). These projects tend to be discreet, analysing pieces of infrastructure in isolation. Several research papers pertaining specifically to the measurement of mixed-use streets also exist (Jones et al., 2007; Carmona, 2015; MORE, 2022). These present mixed methodological approaches with an array of data collection methods designed to capture the full breadth of factors affecting streets, including the economic and residential context. But their breadth means that they likewise do not consider the impact of discreet aspects of street design, nor the influence of the processes informing the design of the street.

5.4.1 Document collection

In a substantial review of the use of triangulation, Natow (2020) found that document analysis alongside interviews was the most used triangulation strategy. In the current research, analysis of the relevant policy, strategy and guidance documents was carried out before commencing the interviews. This was undertaken firstly to identify specific individuals to interview but also to

directly probe the influence of policy over the design, taking into account George's framing of urban design as a 'second order design endeavour', where designers primarily shape the design environment rather than the design object directly (George, 1997). Analysis of this aspect of the design environment allowed for identification of themes to probe further in the interviews, as well as setting the context for understanding the wider position of street design within local and national policy.

The search for documentation was carried out entirely online using Google Scholar, in part due to COVID-19 restrictions preventing access to physical libraries during this phase of the research. To conduct the search as methodically as possible, different search terms were utilised: urban design, street design, highways engineering, planning policy, transport planning policy, the Avenues Programme, Sauchiehall Street and the Glasgow City Region City Deal. These were searched for strategically by adding the geographic area to each search term at the UK and Scottish level, followed by regional (Glasgow City Region), followed by local (Glasgow City) and even hyper-local, in some cases (e.g. strategies pertaining specifically to Glasgow city centre). In addition, the detailed planning application for the Sauchiehall Street pilot was located using Glasgow City Council's online planning portal. Where a document was not readily available online, Glasgow City Council were approached directly to request a digital copy.

Searches were also carried out using the University of Glasgow's online newspaper repository, Nexis, which includes over 1000 national and local papers, to identify newspaper articles relating to the Sauchiehall Street pilot. The search was conducted for the period between January 2017, prior to the commencement of the construction, and June 2022 (the conclusion of the final data collection phase). Following a filtering process to remove articles that did not contain content relevant to the Avenues Programme, this produced 12 articles that could be fully accessed, ranging from June 2017 to January 2022.

Where relevant, interview participants who referred to specific documentation or designs not available in the public domain were asked to provide these to the researcher, within the limits of confidentiality.

Appendix 2 details the documentation and articles that were included in the eventual analysis, including two documents not in the public domain. Images from one of these were reproduced with permission in this thesis.

5.4.2 Semi-structured interviews

Interviews are widely used within qualitative social research. These can range in type from fully structured through to fully unstructured, with semi-structured interviews falling in the middle of the two extremes (Bryman, 2016). Qualitative research tends towards use of unstructured and semi-structured interviews, with Bryman further noting that whereas these also constitute extremes, most interviews employ aspects of both to allow for a sufficient balance between structure and freedom to respond to the interview participant.

Due to interviews requiring the collection of primary data from human participants, it was necessary to apply for ethical approval prior to conducting the interviews. This approval was granted by the College of Social Sciences Research Ethics Committee on 26 November 2020.

Seventeen interviews were carried out with individuals representing different aspects of the Avenues Programme and Sauchiehall Street pilot. Thirteen interviews were performed by the researcher using Microsoft Teams between February and July 2021. One additional interview took place on Teams in March 2022. Two interviews were held by telephone and email in March and April 2021, followed by an additional telephone interview in August 2021. Details are included in Appendix 3.

This phase of the research focussed broadly on all three of the research questions, but with particular intent to probe the first question concerning the shaping of the design and the challenges encountered during the process. Semi-structured interviews were deemed to be the most appropriate tool for this due to their flexibility and the emphasis on encouraging respondents to communicate underlying attitudes, beliefs and values (Fielding and Thomas, 2008). As described above, document analysis was utilised to ascertain the policy context within which the individuals involved in the Avenues Programme were operating

but the interviews were used to probe participants' interpretation of these documents.

Semi-structured interviews were also used in this case to allow for the development of a narrative of what occurred during the Sauchiehall Street pilot, with a view to developing this aspect of the case study, akin to the style used by Flyvbjerg (1998). In his portrayal of a major transport planning project in Denmark, Flyvbjerg was able to draw attention to the differences in 'reality', as reported by the official documentation, and the more subjective experiences of the different groups involved. The current research is designed such that the interview data collected in the study can be analysed in tandem with document analysis to enable a style of analysis akin to Flyvbjerg's.

5.4.2.1 Sampling and recruitment strategies

Interview participants were generally considered to be "elite" actors, broadly defined as an individual who holds or has held some powerful position that has afforded them unique knowledge or information from a privileged perspective (Natow, 2020). Elites are often hard to reach but a source of data that are not easily, if at all, obtainable from other sources (Davies, 2001). Given the nature of the Avenues Programme, there were a finite number of people who were involved in the conception and design. It was therefore decided to recognise every interviewee as 'elite' in as much as they were each representing a discrete, unique aspect of the programme or street experience. Participants were nominally viewed as belonging to one of three elite groups:

- Group 1: designers, planners and 'conceivers' of the Avenues Programme and/or Sauchiehall Street pilot
- Group 2: project managers, construction managers and others shaping the implementation and delivery of the Sauchiehall Street pilot
- Group 3: consultees, including specific business owners and people representing other stakeholder groups who shaped the design of the street.

The first interviewees were identified during the document analysis and others were already known to the researcher. These initial interviewees were then asked to provide details of additional participants who could be approached for

interview, many of whom put the researcher in touch directly with the intended participants via an email introduction. This strategy therefore utilised an element of snowball sampling (Bryman, 2016) but also allowed access to potentially hard to get participants because the personal introductions were being performed by known individuals. It is possible that this may have occurred more easily due to carrying out the interviews online because participants were able to send an email immediately after the interview had finished. The Urban Big Data Centre at the University of Glasgow (with which the researcher is associated), works closely with Glasgow City Council on the Avenues and this also helped to ensure that all key contacts were identified.

The sample size in this research was small, reflecting the equally small study population. Given the discrete nature of the Avenues Programme and the exploratory nature of the research, it was felt that a full grounded theory approach (Creswell, 1998) would be inappropriate. Instead, all the specific individuals and groups involved in the conception, planning and delivery of the Avenues Programme were mapped, with a view to interviewing at least one individual from each group. The sample size was considered adequately representative of the research when no new individuals or groups were being referred to the researcher for interviewing.

5.4.2.2 Adapting the 'walking' interview for use online

The original intention for this research project was to carry out face-to-face 'mobile' interviews: semi-structured interviews performed with participants whilst walking along Sauchiehall Street (Evans and Jones, 2011). It became apparent relatively early in the COVID-19 pandemic that performing interviews in person was going to be impossible due to restrictions on meeting other people, so the decision was taken to perform the interviews virtually, using video conferencing software.

Hill et al. (2021), in a study of performing employment interviews, reported that they were able to entirely replicate their usual interview process online. Despite this assurance, however, it became apparent that it would be possible to use the pandemic-induced requirement to interview online to explore novel methods, rather than just seek to recreate a non-online process. This led to the

development of a virtual walking interview. Clearly, the physical act of walking was not possible, but the approach attempted to capture the essence of a walking interview as far as possible. This method could contribute to the suite of virtual consultation methods for cases where capturing the wider street context is important, but where participants, such as those with mobility impairments, are not able to physically walk.

Mobile methods, within which walking interviews sit, generally describe "any attempt to physically or metaphorically follow people/objects/ideas in order to support analysis of the experience/content/doing of, and inter-connections between, immobility/mobility/flows/networks" (Spinney, 2015, p.232). In other words, to recognise "the role of more-than-human entities in co-constituting the research encounter" (Foley at al., 2020, p.517) and to provide an insight into the "experiential, affective and material aspects of practice which are often marginalised in less participative modes such as surveys" (Spinney, 2011, p.165).

Research focussing on a physical street is by its very nature situated and the physical environment around the street will form part of participants' constructed meanings of the street (ibid.). The original intent behind using walking interviews was to use the physical context of the street as a prompt to enable participants to speak in greater depth about wider aspects of the project than they might when interviewed statically. In this case, given that the second research question focuses on the experience of using the redesigned Sauchiehall Street, it was felt that use of a walking interview would be a useful tool for eliciting additional situated information from participants. Another advantage of this method is that it allows a greater degree of agency with the interviewee able to dictate the route taken, ultimately leading to a greater degree of co-construction of the interview (Gubrium and Holstein, 2003).

5.4.2.3 Interview design

An interview protocol (Appendix 4) was developed containing several themes and questions, based on the prompts generated from the updated theoretical framework, detailed in Table 6 in Chapter 4. But the interviewer was free to vary the sequence and probe for additional information as the interview went on (Fielding and Thomas, 2008). Where interviews were carried out with

participants using Microsoft Teams, a link was provided by the researcher. Each interview was scheduled for an hour and all, bar two of the online interviews which were slightly longer than an hour, were completed within the scheduled time. Appendix 3 lists the interview participants.

At the start of the interview, the researcher briefly recapped the consent form with each participant, the majority of which had been received prior to commencing the interview, to reiterate their consent. Three participants had not consented to being identified in the research and care was taken to ensure that these individuals were referred to with a job title that was sufficiently generic to avoid identification, even within a small project. After explaining the context and outlining the course of the interview, the researcher proceeded to start recording, having again reiterated with the participant that they consented to this, even though it was detailed in the consent form. Participants were reminded that the data are stored securely and anonymously within the University of Glasgow OneDrive and will be deleted within 10 years of the end of the research project, in keeping with the Data Management Plan.

Once recording, the researcher shared her screen and showed participants a sequence of 25 photos of Sauchiehall Street, presented in order as if walking along the street (Figure 29). The images were taken by the researcher and pertained to discrete sections of the street, with particular focus on novel infrastructures, such as the side roads. They were taken from the perspective of walking along the footway and each image was shown for approximately 8 seconds, unless the participant offered comment.

Participants were invited to take note of any points on the street they wished to return to later in the interview and were free to comment on the content of the photos as they were shown. Microsoft Teams has a function that enabled the participant to take control of the researcher's screen and therefore the second part of the interview included giving participants the option to do this and 'walk' the researcher to specific parts of the street for further discussion. This was intended to mimic the sort of natural conversation that might occur whilst walking. During latter parts of the interview, which focussed on broader themes, it was possible to 'un-share' the screen and enable the researcher and participant to see each other directly.

Figure 29: Example of sequential photographs used in walking interviews to mimic walking along the street. Photos © author.

More detailed reflections on the experience of carrying out the interviews are included in Section 5.6.1. Appendix 8 contains the reflexive journal kept by the researcher throughout the data collection phases, including the interviews. This noted some of the challenges of undertaking the virtual walking interviews, including where the technology sometimes failed, disrupting the process, and the impact of not feeling able to build as much rapport as would normally be the case face to face. However, there were also examples of where rapport was built and interviewing virtually actually offered advantages in terms of being able to draw on other online resources during the interviews. Whereas the approach could be finessed in future research, it certainly offers promise as a means for carrying out interviews that pertain to a situated context, such as a street, but where physical access to the street is not possible.

5.4.3 Observational data collection

Observational methods involve participants being observed by a researcher whilst carrying out natural behaviours. Non-intrusive observation is an approach

where those observed are not specifically made aware of the researcher and generally do not know they are taking part in a research study (Webb et al., 1996). Whyte (1980) set a precedent for using video to capture data, however other public life researchers have tended towards manual observation (Jacobs, 1961; Gehl and Svarre, 2013).

The rationale for adopting this approach stems from the systemic safety principle that street infrastructure should be 'predictable and simple' irrespective of people's 'state', i.e. their ability to understand how it functions (SWOV, 2018; Furth, 2017; Furth 2019; see Chapter 2). Non-intrusive observation allows a researcher to capture *instinctive* behaviour, rather than to probe participants' understanding, or opinion, of the street. Whereas these latter elements are important in other ways, it is argued that they should not matter for the effective functioning of street infrastructure.

Following the precedent set by Whyte (1980) and continued by Gehl and colleagues (2010, 2013), an observational journal was kept alongside the quantitative observation to capture qualitative narration to enrich the data. Indeed, this was also the core rationale for undertaking manual observation, rather than video analysis. Drawing on the mobile methods literature, which identifies the "the role of more-than-human entities in co-constituting the research encounter" (Foley at al., 2020, p.517), it was felt that the researcher would gain a far richer experience of the street by being physically embodied within it. In future, it would be possible and potentially more efficient to automate the approach using apps (Griffin et al., 2014) or video analysis.

Analysis of the documentary evidence and interviews identified themes relating to specific aspects of the street design, including the side roads, footway-level cycle track, and the installation of benches and trees with intent to create 'place' within a movement-dominated corridor. Within this were sub-themes relating to the influence of particular agents within the project team over the design of these infrastructures. The quantitative phase of this research was therefore used to develop an approach that combined methods from public life studies and engineering studies, ultimately with a view to contributing to methods for use in evaluating contemporary mixed-use streets. The methods are primarily quantitative in terms of the data and analysis however they are

enriched by analysis of additional qualitative narratives developed in parallel to the main data collection.

5.4.3.1 Developing observational methods

In this research, non-intrusive observational methods from public life studies were developed to measure three discrete elements of Sauchiehall Street. This research posits that people should instinctively use the street as intended, regardless of whether they have anything other than basic knowledge of the legal context of where they are permitted to be.

Each method was developed based on adapted forms of existing methods, as follows:

1. Lingering behaviour: measured by public bench occupancy rates, commercial outdoor seating occupancy rates and other stationary, or mobile, behaviour away from benches along the street.

This is based on methods used by Whyte (1980), Gehl and Svarre (2013) and Jones et al., (2017) to measure sitting and other stationary behaviour. It pertains generally to the public life of the street, but specifically focuses on what is traditionally considered a 'place' function (sitting or lingering) in the context of a movement-dominated street. These were selected for the research because they combine to provide a readily quantifiable measure of public life that provides a snapshot of behaviour across a whole street, rather than a fixed point. This research also intended to hold relevance for practitioner audiences, thereby methods have been selected and developed such that they should be easily replicable by a layperson in future.

Bench occupancy data were collected by walking the length of Sauchiehall Street (between Buchanan Galleries and Charing Cross) and Argyle Street (between James Watt Street and the start of Trongate) recording the occupancy status of every public bench at the point where the researcher passed it. A similar process was carried out for people occupying private seating outside commercial premises on the street. Concurrently, individuals exhibiting 'other' stationary behaviours were recorded. These included people busking, people

working on the street as e.g. charity collectors, and people inhabiting the street as their residence during the day[2].

The main data collection was carried out by the researcher, who walked up the street carrying a clipboard with the proformas attached. Occupancy and other lingering data were recorded as subtly as possible using a pen, and the researcher endeavoured to keep moving and not make eye contact, to avoid drawing attention to herself. Where photographs were deemed useful, these were taken from behind, or at least without the subject being aware.

The researcher carried copies of the Participant Information Sheet, which could be shared with anyone who wished to know more about the research. This helped ensure that the approach did not entail covert observation, an approach that has been criticised on ethical grounds (Kellehear, 2020). These were ultimately not required and only two individuals in total approached the researcher to question her activity, both of whom were satisfied with a basic explanation.

2. Footway-level cycle track behaviour: measured by observation of where people are instinctively walking and cycling, relative to the desired locations intended by the street design.

This is based on Gehl and Svarre's (2013) measurement of movement using traces, combined with research into shared-use paths by Delaney et al., (2017). The intent behind this method was to measure whether people were walking and cycling in the correct parts of the footway-level cycle track, as intended by the design. In addition, behaviour when there was an obstruction in either the footway or cycle track (referred to as a 'pinch point') was also observed to assess how people were instinctively navigating these obstructions.

The mode and location of people walking and cycling at the point where they passed the researcher was recorded using a simple tally, i.e. person walking in

[2] The term 'inhabiter' (Jones et al., 2007) is used specifically to refer to individuals who were observed sitting or standing on the street, often asking for money and sometimes with belongings. Sometimes these individuals were observed sleeping in makeshift bedding. However, the term 'homeless' is avoided because it is not possible to form a judgement pertaining to homelessness based purely on observation.

the footway, person cycling on the footway etc. Each of these individuals was categorised by presenting sex and as either adult or child. Individuals were further categorised by mode as '2+' where they were in pairs or groups. Where relevant, individuals were lastly categorised by mode according to their status as a delivery cyclist, using a mobile phone to speak into or using a mobile phone in their hand. The same approach was used for the unobstructed and pinch point observations.

3. Side road behaviour: measured by deviation from a constant trajectory on the part of people walking and driving at side roads.

Side roads were observed to assess 'deviation' behaviour on the part of people walking and driving at the sites. The side roads on Sauchiehall Street are designed to promote pedestrian priority across the side road, with drivers expected to give way to people waiting to cross, as well as those already crossing. They emulate 'Dutch-style' continuous footway, however it is debatable as to whether they fully replicate this approach (Living Streets Scotland, forthcoming).

The deviation measure is an adapted version of Steer Davies Gleave (2018), taking in elements of Flower, Ricci and Parkin (2020) and Gehl and Svarre (2013). It seeks to measure instinctive reading of the newly designed side roads – the extent to which people behave as if they have priority – on the part of people walking and driving. It assesses the extent to which people were changing their behaviour on approach to the side road, i.e. were people driving slowing or stopping for people walking, were people walking asserting their priority to cross without hesitation, regardless of the presence of vehicles. Deviation was defined separately for people driving and walking with corresponding criteria used to categorise the behaviour of each group (Table 8).

Table 8: Assessment criteria used to categorise deviation categories for pedestrian and driver behaviour at side roads.

	No deviation	Minimal deviation	Significant deviation	Full deviation
Pedestrians	No glance up / no change in speed / "oblivious"	Glance up on approach / no change in speed	Slow down on approach / look around / break off conversation	Stop at side road / full look around / actively give driver priority
Drivers	No change to speed / force pedestrians to hurry or retreat / dangerous behaviour	Minimal slowing / force change to pedestrian behaviour / overrun yellow lines	Enter slowly / give way to people crossing	Stop regardless of whether pedestrians are waiting or crossing

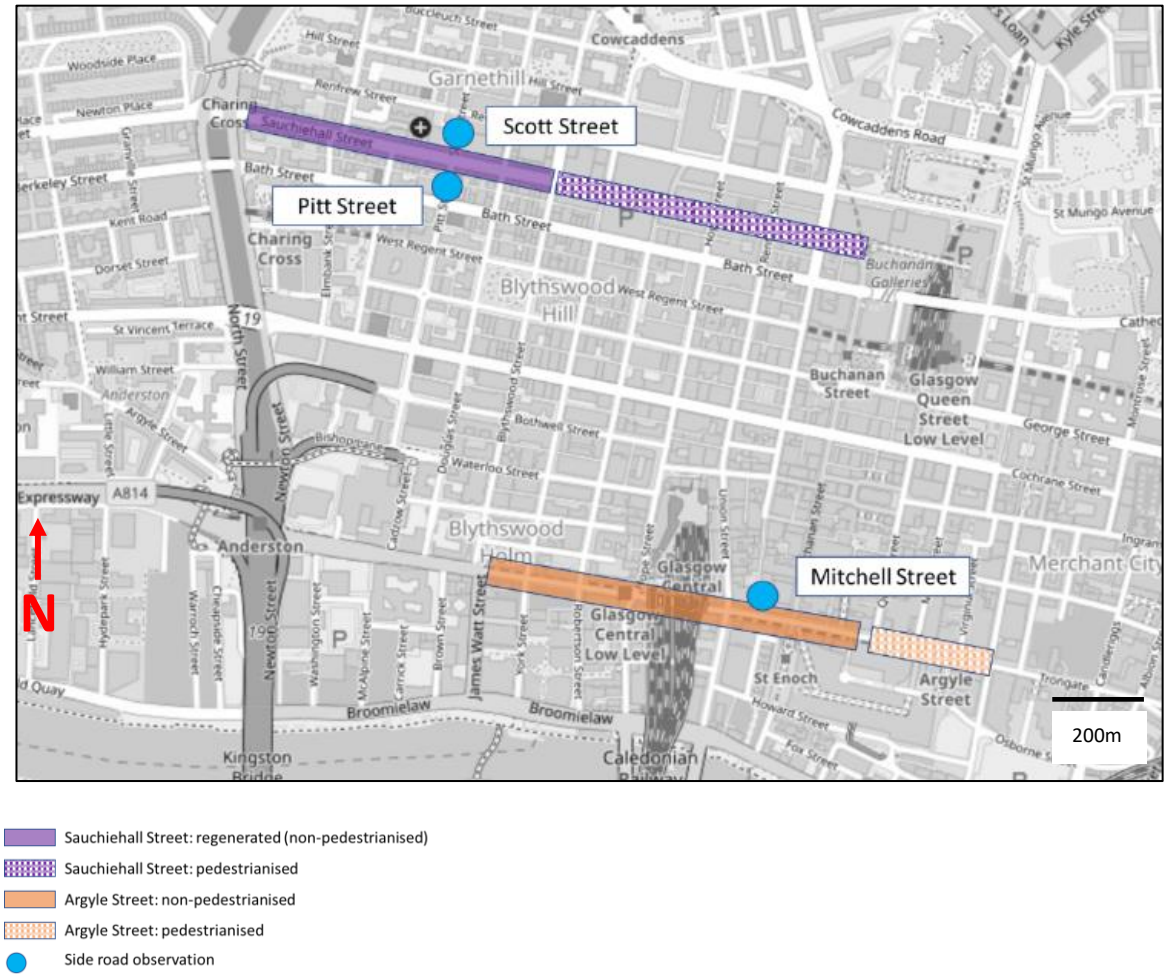
Two different types of behavioural interactions are important for the functioning of side roads. Perhaps the more obvious of the two is the interaction events between people walking and people driving, i.e. those that occur when these two agents coincide with each other at a side road. Prevailing behavioural norms in the UK (regardless of the legal position) imply that if someone walking and someone driving coincide at a side road, the person walking will stop and give way so the driver can enter or exit. In seeking to revert this priority, continuous footway should encourage people driving to wait and give way to someone crossing a side road.

Indeed, analysing whether this is occurring is important for understanding the overall successful functioning of continuous footway. But in this research, it is argued that a second type of behavioural interaction is also important; that of the individual who is walking - or the individual who is driving - with the continuous footway *in the absence of* the other agent. This, it is argued, better demonstrates how people are instinctively interpreting the design of the continuous footway. In order for it to function successfully, people walking should be doing so continuously regardless of whether there is a vehicle present. More importantly, perhaps, people driving should instinctively be changing their behaviour at the continuous footway regardless of whether someone is crossing. A change to instinctive behaviour in this way would demonstrate the shifting of the regime currently constraining driver behaviour in this context.

The behaviour of people walking was therefore observed regardless of whether a vehicle was present. Likewise, driver behaviour was recorded even if there was no pedestrian present. This approach allowed for assessment of the overall functioning of the side road relative to the design intent of promoting pedestrian priority. Interaction events were captured by way of the qualitative narration that was recorded alongside the more quantitative capturing of data. Whilst not recorded systematically - this narration focused primarily on 'negative' interactions, i.e. where it was felt that a driver behaved dangerously, but it also captured some 'positive' interactions – this nonetheless provided a useful addition to support the wider interpretation of the quantitative data. Solely analysing interaction events, i.e. where a person walking and a person driving interacted, would provide a clearer assessment of the safety of the side road, however it would not have allowed for assessment of how people walking and driving were instinctively interpreting the infrastructure, as is the aim of this phase of the research.

5.4.3.2 Data collection sites

Figure 30 and Figure 31 illustrate the location of the study sites within Glasgow city centre. The analysis of lingering behaviour is focussed foremost on the regenerated (non-pedestrianised) section of Sauchiehall Street with the older (pedestrianised) section and equivalent sections of another comparable street in Glasgow (Argyle Street) used as controls. The focus of the analysis of the footway-level cycle track, as well as the side roads, is the regenerated section of Sauchiehall Street, with Argyle Street providing a control.



Sauchiehall Street: regenerated (non-pedestrianised)
Sauchiehall Street: pedestrianised
Argyle Street: non-pedestrianised
Argyle Street: pedestrianised
Side road observation

Figure 30: Location of study sites within Glasgow city centre. Map © OpenStreetMap contributors.

Sauchiehall Street: regenerated section (non-pedestrianised)
Argyle Street: non-pedestrianised section
Non-obstructed observation site
'Pinch point' observation sites

Figure 31: Location of 'obstructed' and 'pinch point' footway-level cycle track observations on Sauchiehall Street and control sites on Argyle Street. Map © OpenStreetMap Contributors.

These methods allowed for analysis of novel infrastructures but from the perspective of how they are functioning in the broader public life of the street. This approach was based on the thesis that for a street to be considered socially and environmentally sustainable, sustainable mobility behaviour needs to be occurring safely and instinctively within the street, as part of the public life.

Having designed each method, proformas were developed for each (Appendix 5) allowing the researcher to categorise people's behaviour quickly without needing to stop for too long and become noticeable. The mechanics of carrying out each method are described in detail in Appendix 6.

5.4.4 Sampling

Sampling was approached by defining specific time periods for data collection. Three periods of data collection were carried out (in October 2021, January 2022 and June 2022) to incorporate three different seasons. Side road data were only collected in October 2021 and January 2022. This was deemed to be sufficient on the presumption that seasonal effects were not key to this metric, as it involves observing behaviours (walking) that are likely to occur regardless of the climate. Observations were dispersed evenly across four time periods: 08:30 – 09:30, 10:00 – 11:00, 17:00 – 18:00 and 19:30 – 20:30 and each method was repeated twice. This was originally intended to capture peak and off-peak, but it became apparent that Sauchiehall Street did not exhibit these as expected. As such, these periods were just taken to represent four discrete times during the day, rather than to provide more generalisable insight into peak and off-peak patterns. For each method, therefore, the sample was 100% of the relevant people present at each site during the pre-specified time periods. The lingering method was updated following a pilot study to more clearly define what constituted stationary behaviour away from benches, thus omitting a few people from the eventual sample.

The majority of data collection took place on weekdays outwith school holidays, with the exception of one session in October 2021, which was carried out on a Saturday in half-term. Weather data were also recorded during each data collection session, including temperature and 'feels like' temperature (using the MetOffice app), daylight status, sun, rain and wind.

Metadata for all observations is included in Appendix 7.

5.5 Data Analysis

This research utilised Thematic Analysis (TA) as the main data analysis method for the data. TA involves 5 stages: compiling, disassembling, reassembling, interpreting, and concluding (Yin, 2016), described in more detail below. It was adopted for this research due to it offering flexibility and being independent of any particular theory or epistemology (Braun and Clarke, 2006). Whilst primarily applied to the interview data, a version of TA was also applied to the document analysis, albeit whilst recognising that these comprised a different type of data source. The quantitative data were analysed using descriptive statistics.

5.5.1 Document analysis

Bowen (2009) notes the immense value of documents in case study research, as well as the usefulness of the method for triangulation within mixed methods research. The analysis is carried out in three stages: skimming (superficial examination), reading (more thorough examination) and interpretation (ibid.). This approach therefore represents a modified version of full TA. It was noted in the current research that the documentation primarily comprised guidance and strategies, as well as reports and minutes from meetings, many of which were published by government organisations. Atkinson and Coffey (1997) note that even documents such as these, which appear to present “reality”, should be treated as “social facts”, published by organisations to represent their constructed reality (p.79). With this in mind, key documents were analysed in their own right to glean insight into the constructed realities behind the documents. Documents were also analysed for ‘factual’ information, such as dates, named individuals, times and reported progress etc, which was used to help build a picture of the case study and corroborate (or challenge) claims made by interviewees.

As the initial stage of analysis in the project, key documents were reviewed first allowing for the identification of additional documents referenced within these main documents. Documents were then separated into two broad categories:

Set 1: Documents pertaining to the process of designing and producing Sauchiehall Street (including those relating to Glasgow City Council and sources external to the project, such as newspapers).

Set 2: Documents pertaining more broadly to the technical design of streets and active travel infrastructure (in Scotland and more generally).

In keeping with the data analysis method, documents from set 1 were initially skim read and high-level themes identified, before more thorough reading was undertaken. Initial analysis of the first tranche of documents therefore included identification of information relating to:

- the development of the Avenues Programme
- the development of the design of Sauchiehall Street
- the process of construction of Sauchiehall Street
- design documentation relating to the proposed design of Sauchiehall Street
- key agents or groups involved in the Sauchiehall Street pilot
- additional contextual factors.

A second stage of analysis was carried out for the documents in set 2, identifying which guidance and standards would have been applicable to the design of Sauchiehall Street at the time of conceptualisation. These technical documents were considered more objective, and less interpretation of the set 2 documents themselves was therefore required. However, the identified content was used during the interview analysis phase to understand how these documents had been interpreted by those tasked with designing Sauchiehall Street.

The use of the socio-technical transition framework (Geels, 2002) at this stage allowed for identification of themes relating to 'niche' elements of the design, and evidence of regime and landscape factors shaping the Avenues Programme. This informed the development of the interview questions and later provided a grounding for development of the quantitative phase of the research. Key documents were revisited several times during the research process to cross-check claims made by interviewees and allow for comparison where these claims differed from written material.

5.5.2 Interview analysis

Qualitative interviews produce a rich data source but one that tends to be too large to enable analysis of every word. Thematic Analysis (TA) was applied here to first disassemble, then reassemble the data, prior to interpretation (Yin, 2016). Guest et al. (2011) describe a necessary process of 'winnowing' data through aggregation into a small number of themes. Having data from just 15 elite participants meant that each interview was quite specific. It was clear that a systematic approach would be required firstly to identify themes but also to ensure that important data were not prematurely lost from the process (Guest, 2005).

As such, a process based on that suggested by Creswell and Creswell (2017) was employed, which included coding the data and developing themes (Figure 32).

1. **Organisation and preparation**. Interviews were transcribed manually by the researcher to maximise familiarity with the data prior to coding (Castlebury and Nolen, 2018). Additional notes were typed up and visual material (mainly photographs) catalogued. The transcripts and photographs were uploaded to the Nvivo software programme where they could be viewed and analysed more easily.

2. **Read or look at all the data**. During transcription, an initial parse was made through each transcript to provide a general sense of the information and an opportunity to reflect on the overall meaning. A second and third parse enabled identification of general ideas expressed by participants and their tone. This was analysed alongside the researcher's reflexive journal to help ensure as much validity as possible (Cresswell and Miller, 2000).

3. **Start coding the data**. Nvivo software was used to create codes by bracketing sections of text across different transcripts and tagging these with a descriptive label. Two types of code were identified: expected (based on literature and common sense) and surprising (things that could not have been anticipated). Stage 3 focussed on expected codes initially and then progressed to surprising codes as the data became more familiar.

4. **Generate a description and themes**. Codes were firstly used to generate a description of the case study, including events, people, disruptions and outcomes. They were also used to analyse thematic patterns, by identifying themes across transcripts, as well as combining participant sentiments to build a phenomenological analysis.

5. **Representing the description and themes.** Decisions were made based on the emerging analysis to represent much of the description and themes in narrative form with illustrative quotations from participants. But this was to be interspersed with shorter descriptive sections pertaining to more factual information, images, and visual representations of key themes, generated by the researcher, to build a comprehensive case study.

Figure 32: Process adopted in this research for the analysis of the qualitative interviews. Adapted from Creswell and Creswell (2017).

The virtual nature of the interviews meant that clues relating to the emotional and physical status of participants were missing. For instance, it was not possible to read body language or pick up on more subtle facial expressions. This

required care on the part of the researcher to tread a line between not inadvertently attributing affective context to participants' comments whilst also making use of any visual or auditory clues available to provide richer analysis of the interviews. The researcher's own reflexive journal was of use here as it was possible to cross-reference the affective state of the researcher with each interview, to help assess whether suggestion of the participant exhibiting an affective state was in fact just transference of the researcher's own feelings towards the interview topic (or participant).

5.5.2.1 Developing codes

Having disassembled the data, coding was undertaken to start to reassemble them. Following Creswell and Creswell (2017), detailed in Figure 32, the first stage of analysis involved the generation of descriptive codes, i.e. applying labels to chunks of text to describe the content. A proportion of these descriptive codes were generated using 'latent' or expected themes to help guide the analysis – drawn up in advance based on the adapted theoretical framework in chapter 4 (Figure 27). A further set of codes were 'emergent', or surprising – identified where participants raised unanticipated themes. Following an initial parse of each transcript, the second stage of coding involved identifying additional in vivo codes, using participants' own words to capture key themes through their own eyes. Codes were identified and then returned to several days later to try to ensure intra-coder reliability, as far as possible (Miles and Huberman, 1994). Figure 33 provides examples of each type of code.

Examples of descriptive and in vivo codes

Latent: **'Disciplinary background**: "I'm a city planner, a landscape architect, a designer, and an urbanist. So I'm chartered in planning, landscape design and design. But I'm really, first and foremost, I'm an urbanist" (Senior Urban Designer).

Emerging: **'Design compromise'**: "What they said was it would be a 7-figure total. So we obviously couldn't do *that*. And so the, these artistic trees, lighting columns were installed rather than just taking the trees out and just leaving it blank" (Senior Highways Engineer at GCC).

Example of in vivo codes: **'I went on a journey'**: "At that time I was a roads guy so this was strange to me: what do you mean putting trees in the street? Do you know what I mean? It was tarmac and normal kerbs, do you know what I mean? Standard radii. So I went on a journey as well" (Delivery Project Manager).

Figure 33: Examples of descriptive and in vivo codes generated in stage 1 analysis.

It is common within TA to make use of a coding framework. This reflects the predominately theoretical or 'top-down' nature of the approach, which uses the overarching theoretical framework of a research project to structure analysis of the data. Figure 34 details the initial coding framework developed using previously identified themes to guide the analysis, which generated a series of latent, emergent and *in vivo* codes. Note that Figure 34 shows the high-level codes only for reasons of brevity – some of these high-level codes contained more detailed codes nested within them.

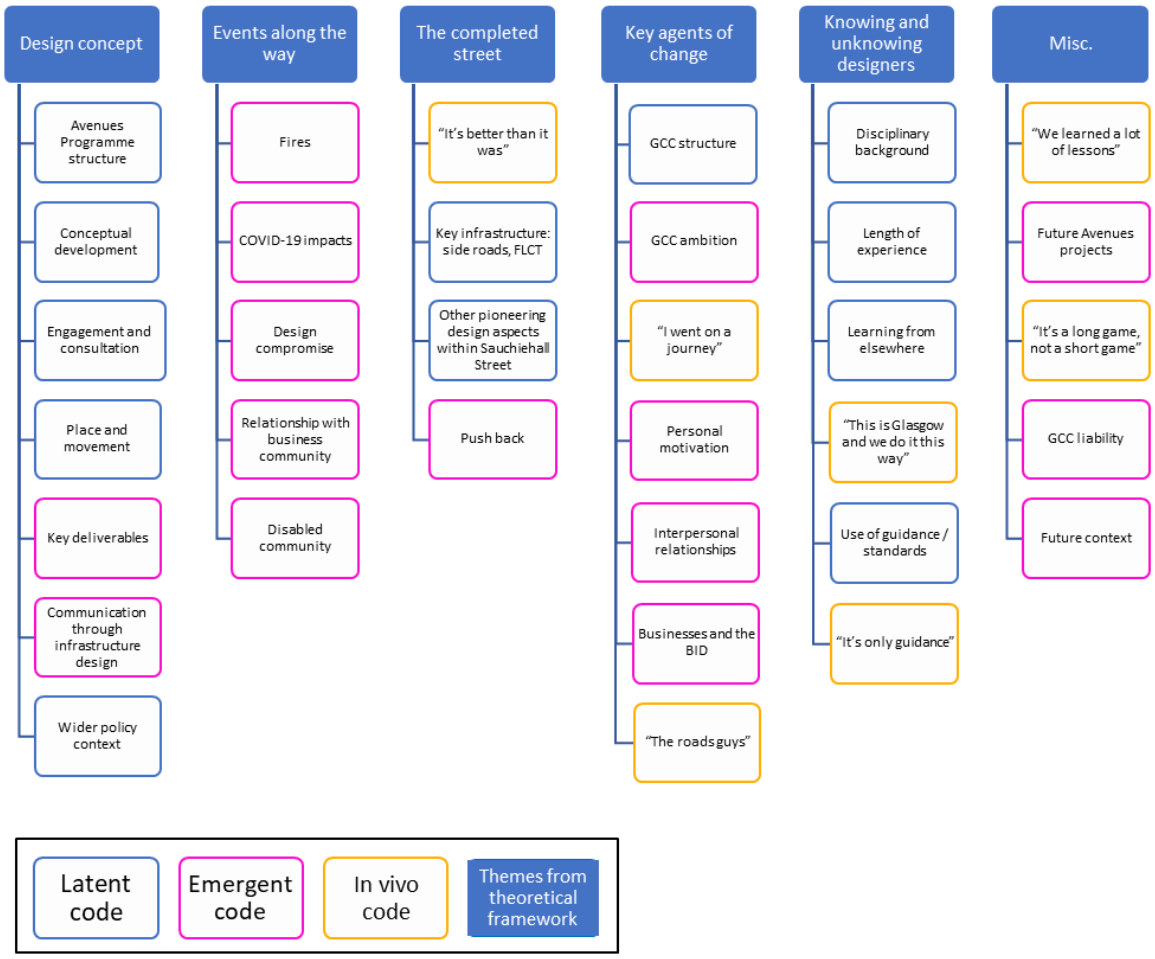


Figure 34: The initial coding framework developed at stage 1 to guide the analysis using themes from the theoretical framework, showing initial latent, emergent and in vivo codes.

Having identified the initial descriptive and in vivo codes, a process of hierarchical analysis was undertaken to systematically group these codes and to identify broader thematic and conceptual ideas within the research (Miles et al., 2014). During this phase of the analysis, some of the initial codes were amalgamated or moved into new coding categories, whereas others were carried through as higher-order themes. This was partly guided by the weight afforded to each code, as measured by the extent to which it cut across participants and the number of references individual participants made to it (Braun and Clarke, 2006). Figure 35 details this thematic coding framework.

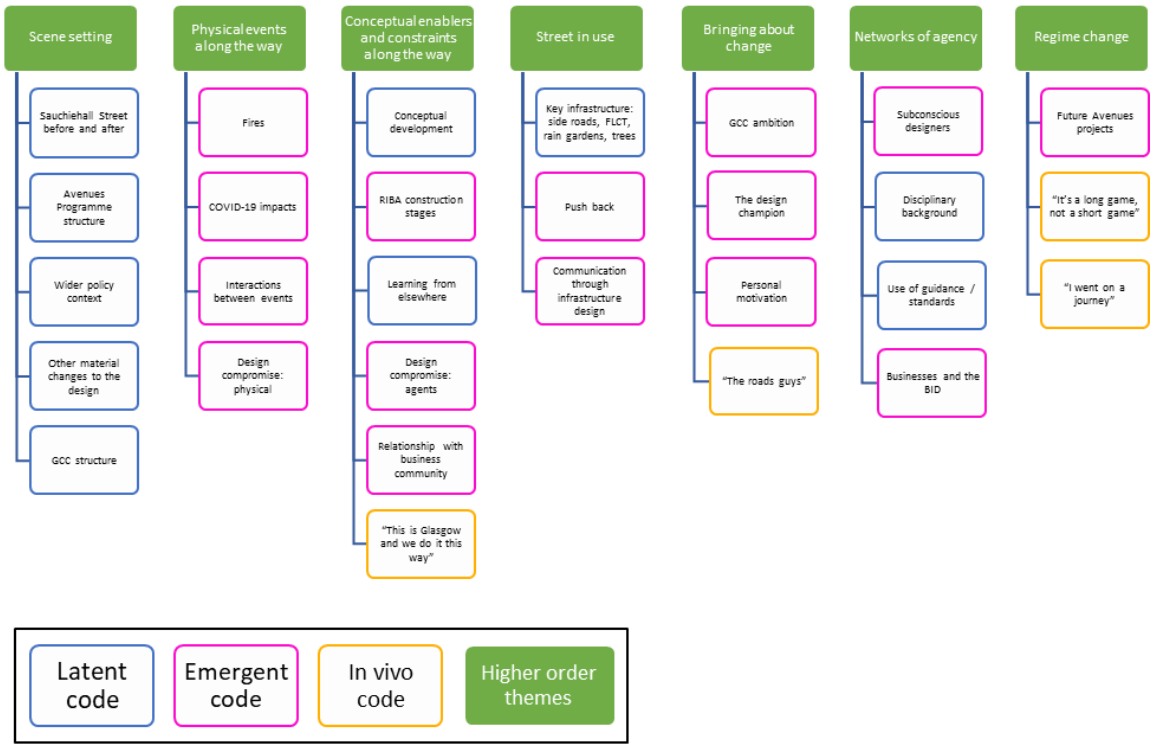


Figure 35: Thematic coding framework developed during stage 2 of the analysis.

The themes detailed in Figure 35 were ultimately carried through to provide the thematic structure for the qualitative analysis in Chapter 6, along with the structure afforded by the results of the document analysis. Figure 36 outlines the coding structure underlying the final section of Chapter 6 in more detail, as this deals with the design continuity gap, an important conceptual contribution from this research.

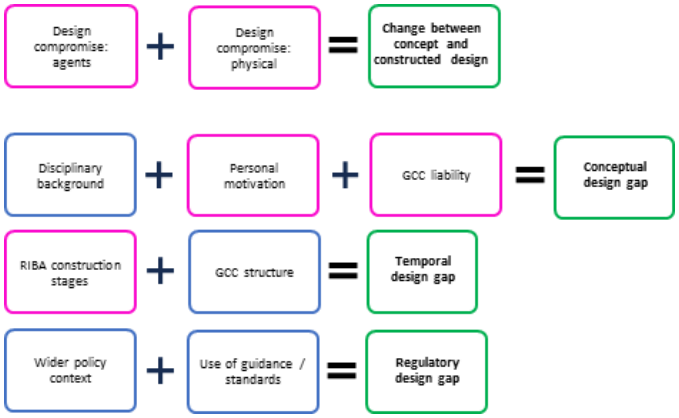


Figure 36: Coding structure underlying development of "design continuity gap" theme.

5.5.3 Triangulating the data sources

Having reassembled the qualitative document and interview data, triangulation was used to dovetail the findings from each type of data in order to support the overall interpretation of the data. Natow (2020), in a meta-analysis of 122 peer-reviewed articles concerning elite interviews, found that combining elite interviews with document analysis was the most often used form of triangulation. Denzin (2009) refers to this as a form of within-method triangulation, where multiple qualitative methods are used. Reflecting the findings of Natow (2020), document analysis was used in the current research in various ways: to identify elite interviewees, to inform development of the interview protocol, and to provide a check on any bias or inaccuracy within data provided by the elite participants.

It is useful here to consider Yin's concept of chronological ordering within case study research (Yin, 2009) to frame the way the document analysis and interview analysis were integrated. Yin notes that a major strength of case study research is that is possible to trace events over time. He suggests that this can be used descriptively, but also analytically, when analysing causal events, because "the basic sequence of a cause and its effect cannot be inverted" (p.148). The various documents in set 1 were analysed initially to provide an indicative timeline for the key events that took place during the development of the Sauchiehall Street pilot. This analysis was used to structure the interview questions, and the interview data were then analysed to probe participants' interpretation and experience of the events. Likewise, analysis of the data from the set 2 documents (comprising engineering and design guidance) was used to probe participants' understanding of this guidance, the extent to which they were familiar with it, and how they were interpreting it relative to the design of the street.

The chronological element became particularly important for triangulating the impact of 'administrative' type events e.g. a Glasgow City Council Committee decision relating to a design stage, on the actions and experiences of the Avenues project team. It was also useful to chart the influence of what was unpublished guidance at the time, such as the *Highway Code* (DSA, 2022), which was nevertheless 'in the pipeline' and therefore impacted the design despite not having been published.

The next section details the analysis methods employed for the quantitative in the research.

5.5.4 Quantitative data analysis

This section describes how the three different types of data collected in the observational phase of the research were analysed.

5.5.4.1 Lingering behaviour

Following data collection, the three sets of lingering data were as follows:

1. Public bench occupancy: occupancy rates, and socio-demographic and activity data for occupied benches.
2. Commercial outdoor seating occupancy: occupancy rates, and socio-demographic data for occupied seats.
3. Location, socio-demographic and activity data for other instances of lingering behaviour.

Two sets of data were collected per street, per season, giving six sets of data per metric in total. Data were inputted into separate Microsoft Excel spreadsheets. Excel was used to calculate descriptive statistics for peak and off-peak times, as a proportion of total observations per collection season and overall. This was undertaken for the pedestrianised and non-pedestrianised sections of both Sauchiehall and Argyle Street.

5.5.4.2 Footway-level cycle track

Following data collection, the two sets of data were as follows:

1. Pedestrian and cyclist behaviour whilst using an unobstructed section of the footway-level cycle track on Sauchiehall Street. Equivalent data for Argyle Street comprised pedestrian and cyclist behaviour whilst using an unobstructed section of the main street.
2. Pedestrian and cyclist behaviour at a ‘pinch point’ obstruction in either the footway or cycle track along the footway-level cycle track on

Sauchiehall Street. Equivalent data for Argyle Street comprised pedestrian and cyclist behaviour at an obstructed section of the main street.

Two sets of data were collected per season for the obstructed and unobstructed section of each street, giving six sets of 'obstructed' data and six sets of 'unobstructed' data in total. Data were inputted into separate Microsoft Excel spreadsheets. Excel was used to calculate descriptive statistics for peak and off-peak times, as well as eastbound and westbound travel, as a proportion of total observations per collection season and overall. This was undertaken for the pedestrianised and non-pedestrianised sections of both Sauchiehall and Argyle Street. This allowed for calculation of the total proportion of walking and cycling behaviour occurring in the intended portion of the street, i.e. walking along the footway, cycling along the cycle track (or lane).

Additional analysis was carried out to assess the total proportion of all observations that included someone using a mobile phone, as well as analysis pertaining to the effect of moving as an individual or as part of a group.

5.5.4.3 Side roads

Data comprised pedestrian and driver behaviour at the three side roads (Scott Street and Pitt Street on Sauchiehall Street, and Mitchell Street on Argyle Street). Two sets of data were collected per side road, per season, giving six sets of data in total. Data were inputted into separate Microsoft Excel spreadsheets. Excel was used to calculate descriptive statistics for peak and off-peak times, as well as eastbound and westbound travel, as a proportion of total observations per collection season and overall. This allowed for calculation of the relative proportion of full, significant, minimal and no deviation behaviour amongst people walking and people driving. Additional analysis was carried out to assess the effect of moving as an individual or as part of a group.

Following the calculation of descriptive statistics, it was possible to identify the proportion of behaviour falling within each category for each mode. Fisher's Exact tests were performed to calculate whether the distribution of the observed behaviour differed significantly from the expected distribution. This was calculated separately for people walking and people driving to help assess the impact of the different side road designs.

5.5.5 Integrating the qualitative and quantitative data

Having collected the qualitative and quantitative data, integration of the two types of data took place at several points during the analysis. Firstly, the findings emerging from the initial analysis of the qualitative interviews and document analysis were used to inform the development of the observational phase, in keeping with the exploratory sequential approach (Creswell and Creswell, 2017). The quantitative data were, likewise, initially analysed separately but informed by the additional qualitative observational data that had been collected in parallel.

The penultimate stage of Thematic Analysis is interpretation of the data and at this stage, the full sets of qualitative and quantitative data were integrated by means of the conceptual STT framework. For instance, interpretation of the quantitative data – how behaviour was manifesting - was framed by the processes and events that had been identified through analysis of the qualitative data. The analytical framework presented towards the end of Chapter 8 has been developed based on these integrated data sets and, indeed, a key premise behind the conclusions emerging from this research are that the design and analysis of mixed-use streets *should* be informed by integrating qualitative and quantitative data.

5.6 Reflections and limitations

This final section offers overall reflections on carrying out the data collection, focussing initially on the walking interviews and then proceeding to the observational work.

5.6.1 Online walking interviews

Overall, it was considered that the online walking interviews were more successful with some participants than others. A comparative study would be required to assess whether different data were elicited compared to a standard

online interview. But it appeared that many participants were at least using the photos as prompts and some were locating themselves spatially, for instance by referring to elements of the street not visible in the photo. The method was particularly interesting when used with a visually impaired participant, requiring the researcher to audio describe each photo.

A reflexive journal was kept by the researcher throughout the project, reflecting on the interviews and observation. This is included in Appendix 8, firstly by way of adding context to the positionality of the researcher and secondly as it was used alongside the interview data to help capture the broader context in which the interviews took place.

A key theme was the recognition that interviewing online is at least as mentally taxing as interviewing face-to-face, especially with the addition of a PowerPoint and screen-sharing. The broader COVID-19 context made this particularly acute as, owing to relatively poor broadband quality at home, the researcher was required to book one of the limited rooms on the university campus to carry out the interviews. This added pressure to the interview scheduling and introduced an additional degree of risk in terms of contracting COVID-19.

It was also noted that the researcher experienced various emotional states relative to each participant. Some interviews offered a space where the interviewer was able to draw on existing competencies as a practitioner and it was easy to build rapport. Two interviews were notable for being very uncomfortable situations during which the researcher felt patronised and ineffective. It is undoubtedly the case that the data obtained from these latter interviews were not as comprehensive as they could have been. However, it was also possible to build rapport unexpectedly with a more sensitive participant and this led to some highly useful data. This also provided a personal ethical dilemma for the researcher, however, in that having built rapport and elicited opinion, analysis of the data then presented this individual as relatively obstructive within the project. Whilst not objectively unethical, this felt uncomfortable.

The reflexive journal drew out themes relating to the researcher's positionality. As someone who walks and cycles everywhere, with a lifelong commitment to environmental sustainability, it was not possible to entirely decouple personal affect from the research process. Indeed, during an informative session of the

Active Travel Postgrad Network (founded by the researcher), Professor Ian Walker suggested that far from it being possible to decouple, it is perhaps incumbent upon the 'activist' researcher to activate their research in the world (Cox, 2021). The researcher was aware of emotions such as anger and frustration arising in response to what might be considered poor design on Sauchiehall Street, as well as occasional sadness in response to the run-down state of the street. Identifying these emotions was key to maintaining an appropriate degree of researcher objectivity and ensuring that they did not overly colour the analysis (Diefenbach, 2009).

5.6.2 Observational methods

The nature of spending many hours standing alone on two city centre streets exposed the researcher to many occurrences, some of which were emotionally distressing, others heart-warming. Alongside the ethical issues noted in Section 5.7, the research provides the opportunity to reflect on the nature of observational research in the 21st century.

Several limitations occurred during the quantitative research phase. Many of these pertained to the nature of performing research 'on the ground'. The use of Argyle Street as a control was intended to improve the reliability of the data but it did not prove that useful for the footway-level cycle track and side road observations, owing to key differences in the design compared to Sauchiehall Street. Likewise, it was difficult to control variables such as the 'pinch points', which were not reliably available. This led to one missing set of data on Sauchiehall Street for this variable because there were no suitable obstructions available (a noteworthy piece of data, however, as the street is intended to be free of obstruction).

Indeed, it is important to reflect on the more general limitation of a lack of baseline data in this sort of research, which focusses on an entire street as a unit of analysis. Whereas this particular research breaks the entire street down into discrete elements of analysis (such as the continuous footway and FLCT), these are the object of focus precisely because they are novel and therefore do not possess pre-existing comparators. In addition, whilst they are being observed as discrete elements, their overall functioning is analysed relative to the context

of the rest of the street. It is difficult to control for the absence of a novel infrastructure when the impact of that infrastructure on behaviour is to a large extent related to the holistic impact of the entire identity of a street changing.

There is a challenge inherent, therefore, in identifying a suitable control, even at a theoretical level. Applying the more standard rationale of quantitative research, especially in natural science disciplines, it could be argued that a wholly 'untreated' mixed-use street would provide the best control. However, identifying such a street in Glasgow would require going outwith the city centre, which would introduce other confounding variables such as an altered context in terms of trip generators and commuting patterns etc. In this case, this limitation is exacerbated by the retrospective nature of this research, which meant it was not possible to collect baseline data on Sauchiehall Street itself prior to the Avenues commencing. As Sauchiehall Street is the pilot street for the Avenues Programme, there were no baseline data available for equivalent streets in the Programme.

An attempt was made to overcome these limitations by selecting Argyle Street as a control. It was felt, given the factors outlined above, that the wider context of the street, i.e. city centre, commuter routes etc, was the more important element to attempt to control for. As discussed above, however, this provided a restricted control for the continuous footway and further research with a more traditional side road would have helped to better contextualise the impact of the designs on Sauchiehall Street. Likewise, the analysis of the FLCT should perhaps be viewed as a useful snapshot into how that infrastructure is functioning relative to its design intent in *that particular context*. However, broader conclusions relating to the ability to bring about longer-term transitional change would require treating the data set generated in this research as baseline data. The use of this baseline data in follow up studies on both Sauchiehall Street and also future Avenues streets to provide longitudinal analysis could form an opportunity for future research.

The nature of observational methods means that only high-level sociodemographic data can be collected, the accuracy of which cannot be guaranteed, and the opinions of participants are not sought. Lee (1993) suggests that observation is inferentially weak and should only be used alongside other methods. Kellehear (2020), conversely, argues that it is precisely this ability to

document actual rather than self-reported behaviour that makes this approach valuable. Indeed, eliciting participants' opinions as to why they behaved like they did would form a natural follow on to this research, but the absence of this insight is not considered to undermine the usefulness of the current research.

Lastly, two limitations relating to manual methods were noted. It was observed that beyond a certain threshold of people, the researcher became 'saturated' and was unable to accurately process and record every individual. The use of an app with a simple categorisation interface may extend this threshold. Carrying out manual research is also cognitively and physically tiring, pointing to the usefulness of video methods where footage can be paused and returned to. It is argued, however, that situated, manual observations provide a richness to the data that could not be captured from video footage alone. Whereas physically inhabiting the street and observing whilst also recording to allow for later analysis would increase the time commitment of the approach, it may overall provide the most valid outputs.

5.7 Ethical considerations

Guillemin and Gillam (2004) propose the framing of two different types of ethical issues: procedural ethics and "ethics in practice" (p.262). This helpful framing posits that whereas processes such as formal ethical approval are useful (and essential), the researcher is likely to also encounter unanticipated ethical issues whilst out in the field. Whereas these cannot entirely be planned for, anticipating their nature, and adopting a continuous reflexive practice, can mitigate their impact.

Attending firstly to the procedural ethics, a Data Management Plan was drawn up early in the research process outlining steps to protect the long-term security of the data. Prior to commencing the interviews, ethical approval was sought from the University of Glasgow College of Social Sciences Ethics Committee. This included the preparation of a Consent Form, Participant Information Sheet and Privacy Notice, all of which were distributed to participants by email as soon as they agreed to an interview. Verbal consent was sought to record the interviews prior to starting the recording and interviewees were informed that they could withdraw as they wished.

The small number of interviewees, many of whom were well known both to each other and generally within the sector, made it challenging to guarantee total anonymity. Pseudonyms were felt to be inappropriate because participants' professional roles were an important analytical piece of information. As such, generalised forms of participants' job titles (Appendix 3) were used in the analysis to protect their identity as far as possible but it was necessary to include a line in the consent form explaining that total anonymity would not be guaranteed.

Separate ethical approval was sought prior to the observational phase of data collection and granted on 7 September 2021. However, this differed from the process phase approval in that participants were not being specifically recruited, nor informed of the research. Naturalistic observation can also include 'covert' methods, which have a somewhat divisive history as they often involve deliberately manipulating or deceiving participants (Kellehear, 2020). As such, it was important to clearly specify how the approach adopted in this research would guard against this occurring. A Participant Information Sheet was created with intent to share this, if necessary, with individuals who desired more information during the fieldwork. An observation proforma was submitted alongside the ethics form, as well as a fieldwork risk assessment. Together, these helped to minimise the risk of harm to both participants and the researcher.

The quantitative phase of the research produced more ethical issues in practice. Some of these issues centred on the nature of observational research, which requires a degree of subjective judgement on behalf of people being observed. Care was taken, especially around written language, to ensure that these judgements remained descriptive rather than derogatory in any way. Other issues pertained to the positionality of the researcher, as well as potential vulnerability.

Whereas the potential risks of undertaking research in the field are increasingly well documented (e.g. Mukherji et al., 2014), these studies tend to refer to research carried out in objectively dangerous, often remote locations. There has been a concurrent tendency to under-report challenging experiences during fieldwork, especially amongst postgraduate researchers where there is the underlying pressure to complete fieldwork in a limited time (Caretta and

Jokinen, 2017). Undertaking fieldwork a mere 2.5km from the researcher's home, in a 'field' which comprised the busy centre of a modern city, did not feel to grant the researcher permission to own the issues described in these 'proper' fieldwork settings. However, this did not preclude difficult situations and emotions arising.

There were many occasions where individuals were behaving in a manner that made the researcher uncomfortable. This was generally low-level discomfort and indeed, experiencing it felt to be a necessary component of really *embodying* the street, encountering its inhabitants, and living the research. On two occasions, however, individuals were judged to be sufficiently threatening for the researcher to pause data collection and move to another vantage point. Neither of these individuals were *actively* threatening towards the researcher – it was a 'hunch' – but as such, it was necessary to avoid developing a cognitive bias against certain individuals in the street.

On several occasions the researcher was approached by people, generally with an initial degree of suspicion about the clipboard, but most of whom were content with a short answer and continued without further conversation (although on one occasion the researcher was invited into a nightclub!) One notable exception was a man who approached the researcher at an evening side road observation on Argyle Street in January and proceeded to talk for 20 minutes about everything from his single that he'd just released, to his philosophical despair at much of the world, even crying briefly. The ethical dilemma here concerned the balance between showing compassion for this man and conversing with him, whilst also maintaining a sensible degree of personal safety, as agreed to in the ethical approval for the research. It also meant pausing the data collection session, thereby delaying its completion, with knock-on effects for the 'check-in' protocol put in place with the researcher's supervisor.

This event, along with other interactions, drew sharp attention to power dynamics at play. On the one hand, the inherent privilege of the researcher; able to "unplug" and return to "life somewhere else" (Caretta and Jokinen, 2017, p.278). But on the other hand, the inherent vulnerability of a lone woman inhabiting a street at night and the presumed authority of this man to engage her in conversation, one of many gendered power dynamics noted by feminist

scholars (Ballamingie and Johnson, 2011). Ultimately though, in terms of the researcher's own personal integrity, it felt important not to 'write him off', and to engage in a level of conversation.

A final ethical dilemma concerned the witnessing of illegal behaviours whilst performing observations. Whilst observing side roads, several drivers were observed using mobile phones whilst driving. It would theoretically have been possible to note down the numberplates and report these drivers, however this would have entailed multiple disruptions to the observations and impacted the reliability of the data. Whilst observing on Sauchiehall Street one morning, the researcher also witnessed what appeared to be a drug deal between two men. It was possible to note down details without pausing the research but, as with the illegal driving, it felt difficult to decide whether these events were in and of themselves data points. Were they integral to the public life of the street, research phenomena co-created by the researcher observing them? Or were they the equivalent of an interview participant divulging a safeguarding matter, and should therefore be reported to the police? Arguably, other 'crimes' were observable on the street that would have been far less compelling for police attention – obvious drug abuse, low level domestic abuse, plentiful driving offences. The extent to which observation of these "ethically important moments" (Guillemin and Gillam, 2004, p.265) creates an onus on the observer to act upon them is perhaps one of the most challenging ethical issues within observational street research.

5.8 Summary

This chapter has provided detail on the methodology adopted for this mixed-methods research. Having recapped the research aims, objectives and questions, the exploratory sequential research strategy was then outlined. This included details of the two data collection phases focussing on process (qualitative document analysis and interviews) and behaviour (quantitative and qualitative observation). The 'instrumental' case study design was then introduced, and the Sauchiehall Street pilot identified as the main focus of this study.

The second part of the chapter gave an overview of the three data collection methods – document analysis, interviews and naturalistic observation - including their relationship with the RQs. This was followed by an explanation of how the various types of analysis were carried out for each data type using Thematic Analysis as an overall process, but also how these data were triangulated and ultimately integrated through the use of the adapted conceptual framework. The chapter concluded with a discussion of the use of the various methods and reflections on ethical issues encountered during the research project.

Chapter 6: How did the street come to look as it does?

6.1 Introduction

The key aims of this research are to ask firstly how Sauchiehall Street came to look as it does, including a focus on what the designers intended, and secondly to ask whether people are using the street as intended. The following two chapters will present the findings from the two phases of data collection that were undertaken to address these questions. The analysis in each chapter is framed by the adapted STT framework presented in Chapter 4.

This first chapter addresses **RQ1: How was the design of the Sauchiehall Street Avenues pilot project shaped by the conceptualisation, delivery and construction process?** In order to do this, the chapter looks behind the scenes, presenting a case study of the project and the design journey. This will seek to interrogate the events which took place, the context in which these occurred, and illuminate the network of agents designing, shaping and ultimately delivering the street.

The chapter that follows this addresses **RQ2: Is the design of Sauchiehall Street enabling and encouraging the intended behaviour?** It takes a clipboard and pen out onto the street, to paint a picture of how people are using the street: who's there, how they're negotiating the newer infrastructures of the street, and whether there is observable public life. By incorporating presentation of the results with discussion, these two chapters will together address the research questions, ultimately informing the implications of the research for practitioner and academic audiences.

Chapter 4 introduced the theory of socio-technical transition theory (STT, Geels, 2002) and the multi-level perspective (Geels, 2002; Geels and Schot, 2007), ultimately presenting an adapted framework for analysing the Avenues Programme and particularly the events that took place within the Sauchiehall Street pilot. A fuller discussion of the role of the project in bringing about wider socio-technical change will take place in Chapter 8, using STT to position the question "how did the street come to look like that?" within a wider context of what that final design might *mean*. In this analysis chapter therefore, the

Sauchiehall Street pilot will be framed as a 'niche' event – a radical technological innovation (Schot, 1998). It will seek to identify 'landscape' features – deep, structural trends (Geels, 2002) – sitting 'above' the project and evidence of 'regimes' – belief systems or prevailing practices that govern the behaviour of individuals, groups or systems (ibid.) – acting to shape the project.

The first section will present an overview of the agents involved in the project and an analysis of the street 'before and after'. The subsequent section analyses the changes that took place between the intended and final designs, including consideration of the conceptual development of the programme, and the events that took place during the Avenues Programme and the Sauchiehall Street pilot that came to shape the final design. The final section then puts a particular focus on the actions of individual agents and networks of agency within the project, concepts contained within STT.

6.2 What does the street look like now and how did that change?

Regardless of the 'success' or otherwise of the change, it is undeniable that Sauchiehall Street (west of Rose Street) has undergone a significant physical transformation. Many of these changes are apparent just from comparing 'before' and 'after' photographs (Figure 39 and Figure 40) but interviewees were able to provide additional information, which helps to build a more complete picture of the level of significance and complexity involved in each change.

6.2.1 Who was involved?

The Avenues Programme was developed and is managed by Glasgow City Council (GCC). The Avenues Team that took forward the Sauchiehall Street pilot consisted of a relatively small number of key actors with direct involvement and then a wider group of people who had a level of influence. These key agents came from various teams within GCC, and also the urban design consultancy Urban Movement, who were pivotal in designing the street. It was noted in Chapter 2 that this practice of local authorities outsourcing expertise to private sector consultants is not unusual (Carmona et al., 2008), and it might be

expected that these individuals were involved with shaping the public policy arena as well as the actual designs (Linovski, 2016).

Figure 37 shows the core team (in yellow), each of which were interviewed for the current research. As the Avenues Team was newly created for the Avenues Programme, individuals transferred internally from other departments within GCC, as indicated.

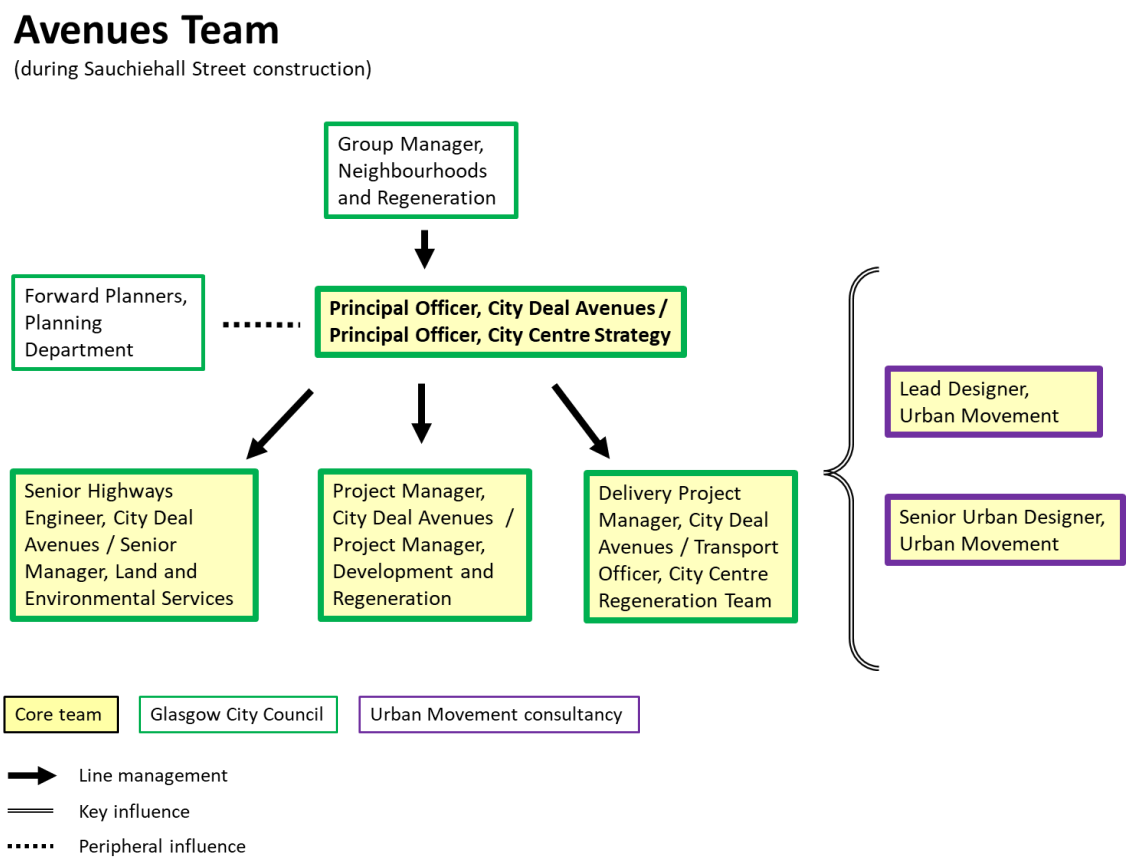


Figure 37: Key agents involved with the Avenues Programme, including the core Avenues Team from GCC and Urban Movement. GCC positions indicate role prior to secondment and current role, shown as [Avenues Team position / former position within GCC].

The Sauchiehall Street pilot was a joint project, not only between the Council and Urban Movement, but also involving several different teams within the Council. Individuals forming the core team came from what is effectively the

Highways[3] and Transportation department (Land and Environmental Services), and the Planning and Regeneration teams both for the city centre and more generally. Section 6.4.2 returns to agency and the role of this network of individuals in the project in more detail.

6.2.2 What did the street look like before and after the project?

The section of Sauchiehall Street relevant to this research is approximately 1km long, running east-west between Buchanan Street and Charing Cross, but contains two markedly different sections, bisected by Rose Street. The section east of Rose Street has been entirely pedestrianised since 1972 (The Glasgow Story, 2004), whereas the section between Rose Street and Charing Cross retained full vehicle access. It is this section which formed the focus of the Sauchiehall Street pilot (although there are future plans to reform the section east of Rose Street, known as 'Sauchiehall Street Precinct', as part of the future Avenues Programme[4]). Note that Sauchiehall Street continues west of the M8 at Charing Cross (to the left of the map in Figure 38) but this section does not feature in the Avenues Programme.

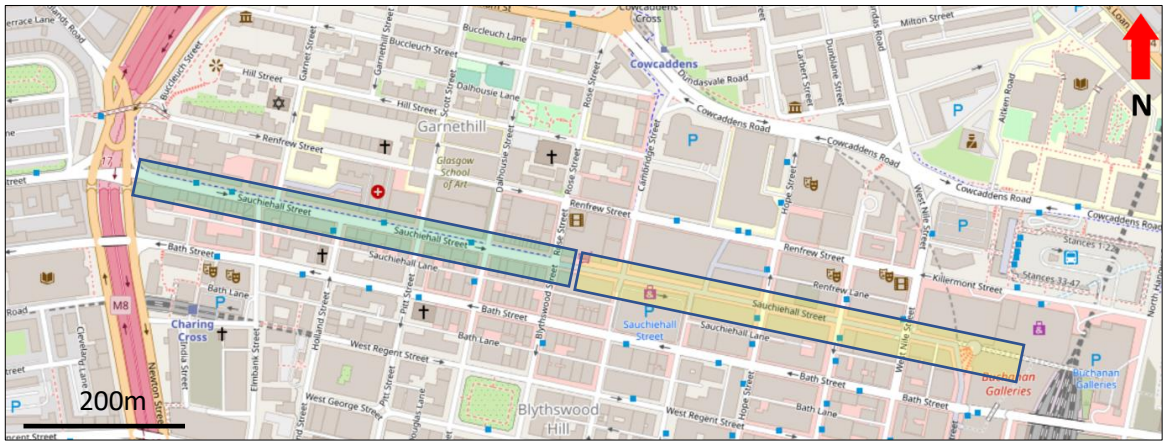


Figure 38: Sauchiehall Street from Charing Cross in the West to Buchanan Street in the East, showing the pilot project area (green) and pedestrianised section (yellow). Map © OpenStreetMap Contributors.

[3] Note that there is no definitive practice in the UK regarding the use of the term 'highways' or 'roads'. As such, a 'Roads Manager' can be working in the 'Highways Team' and vice versa. The two terms should therefore be considered interchangeable for the purposes of this research.

[4] The Sauchiehall Street Precinct project (east of Rose Street) will primarily entail refreshing the public realm with new materials, replacing failing street trees and upgrading the intersections where the street is bisected by carriageway to improve non-vehicle priority. Along with other Avenues projects, construction has been delayed and is now due to commence in Spring 2023.

Prior to the Avenues Programme, Sauchiehall Street (west of Rose Street) consisted of four lanes of eastbound carriageway, two of which primarily catered for parking and bus stops, and no dedicated cycling facilities other than a few cycle racks (Figure 39). The footways were wider than many UK streets, but were constrained by obstructions, such as bus stops, and required people to walk directly next to the carriageway. Lighting was provided primarily by white bulbs mounted on buildings and there were no trees. Side roads consisted of a traditional kerb and carriageway, offering no visual or legal priority to pedestrians crossing, and there were limited opportunities to cross the street, other than two signalised crossings.

Figure 39: Sauchiehall Street prior to the Avenues Programme, looking West towards Charing Cross. Image © Urban Movement Ltd. Reproduced with permission.

A key element of the redevelopment of Sauchiehall Street is the re-profiling of the street through the removal of vehicle lanes, which has given more space for people not in vehicles. As such, the footway has been widened on both sides of the street to give more space for people walking and a bi-directional cycle track has been introduced running parallel to the footway on the north side of the

street (Figure 40). The re-distribution of space has also allowed for a central median (or 'furniture zone') containing trees between the cycle track and the carriageway. Other new street furniture has been introduced along the street, including increased cycle parking and benches, and high-quality paving materials (Caithness stone) and lighting have been used throughout.

Figure 40: Sauchiehall Street after the Avenues Programme showing widened footway, bi-directional cycle track (prior to painted lines) and furniture zone with benches, trees and cycle parking. Image © Urban Movement Ltd. Reproduced with permission.

The scheme also includes several examples of 'pioneering' (or niche) infrastructure that is relatively new in the UK, if not uncommon in international contexts. The first of these is the introduction of the footway-level cycle track (outlined in *Local Transport Note 1/20* (LTN 1/20), DfT, 2020), whereby a bi-directional cycle track is located adjacent to the footway. The design of this infrastructure has necessitated the inclusion of several pedestrian crossing points over the cycle track to allow people walking to access bus stops and to cross the main road, some of which are informal zebra crossings and others signalised. Some of these also connect with formalised crossing facilities across

the two remaining lanes of vehicle traffic to allow people to cross the entire width of the street using signalised crossings.

This design also necessitates the introduction of a raised delineator kerb (visible in Figure 40 to the right of the cycle track) to demarcate the cycle track from the footway. Best practice suggests that this should be physically raised to a height of 20mm to ensure it is detectable by someone with a visual impairment using a long cane (DfT, 2020). Whilst not specifically the subject of this research, it is worth noting that this, and other aspects of the design of Sauchiehall Street, have been campaigned against by some (not all) disabled persons organisations on the grounds that the street does not provide a safe enough environment for people with a visual impairment (National Federation for the Blind UK, 2022).

A second pioneering piece of infrastructure in the context of UK streets is the attempt to install an element of continuous footway at side roads (Figure 41). This design seeks to visually reinforce the legal priority of people on foot crossing side roads over vehicles turning into, or out of, the side road. There is no established tendency to give way when turning left into a side road in the UK, as happens in many European countries. Driving culture and, consequently, pedestrian culture, tends therefore to presume driver priority at side roads. The UK lacks definitive standards for the design of continuous footway and designs in the UK differ between locations. *LTN 1/20* (DfT, 2020) now provides some guidance as to the design of continuous footway, supported by the recent changes to the *Highway Code*, which were brought in to enhance pedestrian priority at side roads (DSA, 2022). But neither of these updated documents were published at the time when the Avenues were being conceptualised and designed. The attempt on Sauchiehall Street to create continuous footway, along with the continuous cycle track at side roads, should therefore be recognised for being more pioneering at the time than it may appear now. However, the design contains some flaws, and these will be explored in greater detail below, as well as in Chapter 7.

Figure 41: Sauchiehall Street after the Avenues, showing the design of the side roads, lines on the cycle track and carriageway reduced to two eastbound lanes. Image © author.

An additional pioneering element of Sauchiehall Street, which is perhaps less obvious from the photographs, is the number and relative maturity of trees that were installed as part of the project. Several interviewees referred to this element of the project as the most pioneering aspect of the whole street, with the Principal Officer describing the trees as "the main win on Sauchiehall Street", even going on to suggest that the street was "designed 'trees first'. Then everything else fitted in" (Principal Officer, interview, 2021).

6.2.3 What changed between the intended and final design?

In September 2015, Urban Movement published a design report outlining their vision for Sauchiehall Street and a conceptual overview of how they considered the street could look (Urban Movement, 2015). This is a relatively high-level report, but it contains recommendations covering a wide range of aspects, including:

- Removing the need for road markings by introducing a Restricted Parking Zone
- Introducing segregated cycling facilities
- Planting trees and ground cover shrubs to ‘humanise’ the street
- Installing frequent seating with back and armrests.

Notably, the report refers to replacing the existing signalised crossing facilities with “strongly defined courtesy crossings” (p.24) and providing raised, continuous footways at each ‘break’ point. However, the latter recommendation is caveated with an instruction to “employ current best practice (as exemplified in the city centre)", which at the time was not strongly defined in design guidance (Section 6.4.1). The ‘best practice’ examples refer to continuous footway that was installed at a handful of side roads in the city centre in the 1980s, some as part of a regeneration scheme focussing on the Merchant City area (Figure 42). Despite there being no relevant guidance at the time, these footways are closer in style to ‘best practice’ Dutch continuous footway (see Figure 46) than the more recent attempts in Glasgow. The more basic version uses continuous paving and a narrow junction, whilst the other version has short, steep ramps. Figure 42 shows two examples of this 1980s ‘best practice’ continuous footway in Glasgow, the left more basic and the right with more expensive materials.

Figure 42: Examples of 1980s continuous footway in Glasgow. The version on the left is more basic but has continuous paving and a narrow junction. The version on the right uses more expensive materials but has a short, steep ramp to clearly signal pedestrian priority. Images © Robert Weetman. Permission to reproduce this image has been granted by Robert Weetman

Figure 43 shows the proposed conceptual layout for Sauchiehall street, as designed by Urban Movement. Figure 44 demonstrates this layout in cross-sectional form.

Figure 43: Conceptual layout for Sauchiehall Street indicating footway along both sides of the street, a bi-directional cycle track, regular trees in a median zone with benches parallel and perpendicular to the carriageway, loading bays on the north and then south of the street, as well as a zebra crossing indicated across the carriageway. © Urban Movement Ltd for GCC. Permission to reproduce this image has been granted by Glasgow City Council.

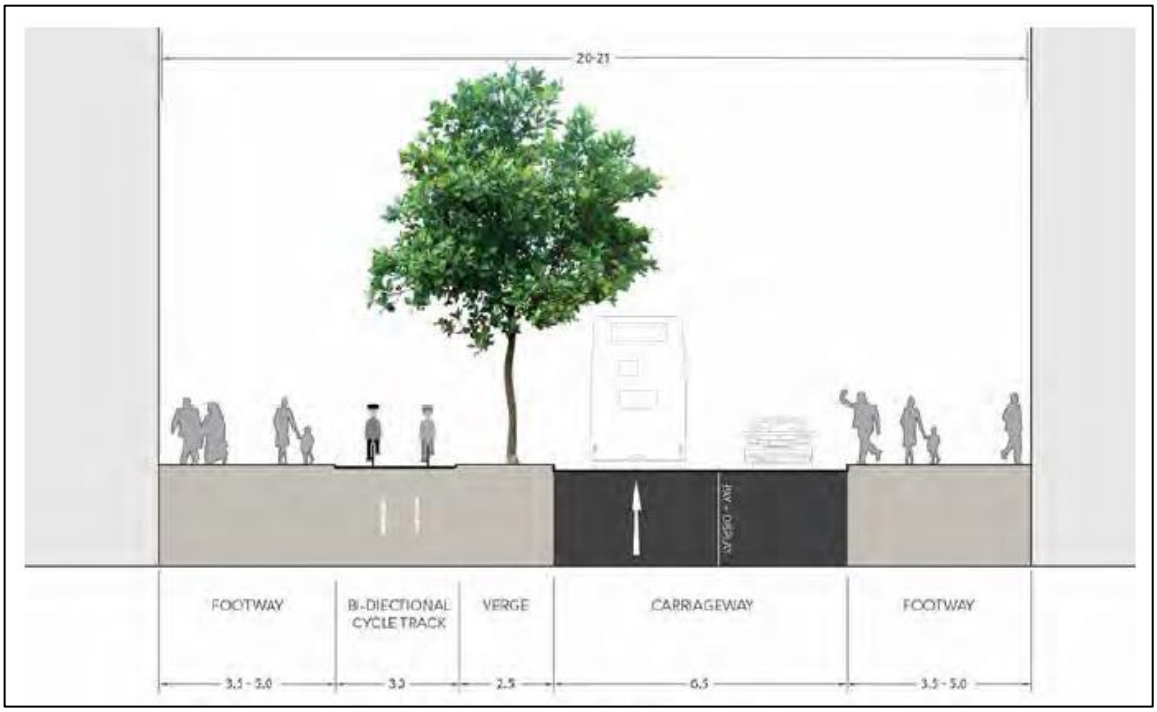


Figure 44: Section through Sauchiehall Street, looking East. © Urban Movement Ltd for GCC. Permission to reproduce this image has been granted by Glasgow City Council.

The following sub-section discusses some of the more specific aspects of the street that changed between this conceptual vision and final design.

Physical constraints

A key constraining factor in the final design was the location of utilities under the street. A significant gas main was discovered after the original concept had been developed, which came to dictate several aspects of the design, including the requirement to locate the cycle track on the north side of the street, and also to place the 'furniture zone' between the carriageway and cycle track. This allowed for sufficiently generous tree pits to support the planting of relatively mature trees for a UK street but required the benches to be located between the cycle track and carriageway (Senior Highways Engineer at GCC, interview, 2021).

This general layout has also meant that it was not possible to provide inset loading bays without disrupting the cycle track, so loading bays are instead provided in one lane of the carriageway. It was decided not to provide dropped kerbs to these bays due to the impermanence of premises requiring loading

access (Delivery Manager, interview, 2021), but this requires loading operators to navigate a full height kerb. It was not unusual during the data collection stage of this research to see vehicles ‘bumped up’ on the footway to unload and multiple vehicles parked along the length of Sauchiehall Street, despite a general restriction on parking and waiting (Figure 45). The Lead Designer shed some light here, explaining that GCC were reluctant to use a Restricted Parking Zone, which would have placed a blanket restriction on parking across the whole area, rather than requiring the use of double yellow lines to control parking in specific areas (Lead Designer, interview, 2021). In addition to requiring the sorts of yellow lines that were described as indicators of vehicle priority above, this decision also makes the restriction of parking very difficult in the absence of constant enforcement. In this case, it appears that the existing regime that has developed through years of vehicle-dominance has acted to constrain the decision made concerning the controlling of parking, perhaps through a reluctance on the part of GCC to be seen to be curtailing drivers’ freedoms.

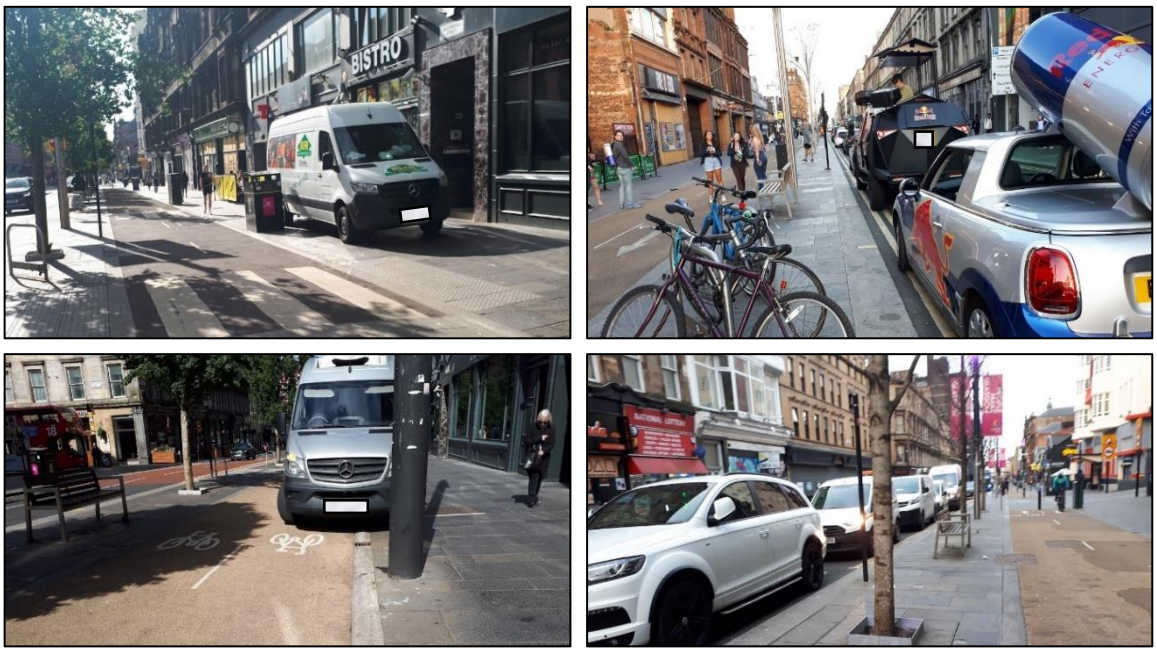


Figure 45: Evidence of drivers 'bumping up' onto the footway for loading and parking along the length of the street, despite double yellow lines. Images © author, taken 2022.

Side roads

When asked directly, interviewees primarily referred to the side roads and trees as the two elements that had changed the most throughout the project

(Principal Officer, interview, 2022; Senior Urban Designer, interview, 2021). The Lead Designer reiterated that the original design intent for the continuous footway was that “the cycle lane and the footway were continuous across the side street”, adding that there were “no signifiers of vehicle priority in that space at all when I originally designed it” (Lead Designer, interview, 2021). He went on to describe how retrospective additions to the ‘finished’ street had undermined this design intent, including double yellow lines, which signify vehicle priority, and even tactile paving, which signifies to an extent that people walking need to be warned about a danger to which they might need to give way.

The paving was also altered from the original intended design, from the existing footway material on the rest of the street to a darker grey material at side roads, which the Lead Designer again suggests signifies highway (rather than footway). He describes the result as a compromise between his intention to fragment the vehicle network to give the footway priority and the status quo of vehicle priority (Lead Designer, interview, 2021). The Project Manager at GCC explained that the yellow lines were added because of a retrospective safety audit provided by consultancy AECOM, but that AECOM only recommended this because they’re a “standard sort of consultancy service who don’t really know about these kinda schemes”. He also added that “for me that defeats the whole purpose” (Project Manager, interview, 2021).

The Project Manager at GCC also referred to the original desire to continue the cycle track across the side road in the same material but that this “was a step too far for my colleagues, they just felt cyclists would barrel through and get hit by vehicles turning in” (Project Manager, interview, 2021). This comment shed light on a particular dynamic that had occurred within the project with the design and construction team, who were reluctant to embrace the concept of continuity at the side roads in the absence of engineering standards ratifying the safety of the design. Ultimately, it was the job of the highways engineers in this team to finalise the design of the side roads and instruct the safety auditors afterwards, which placed the control of the design in their hands.

These findings provide several clear examples of regime-constrained actions. The niche, the newly designed continuous footway, was not sufficiently protected in this case (by design standards or governance) and the incumbent

engineering regime acted to re-shape it back towards the established concept of ‘side road’. Interestingly, the resulting design is a combination of the intent to provide continuous footway and the actions to revert it back to a ‘normal’ side road. In this case, the niche has established itself but the extent to which it has acted to shape the regime will need to be ascertained based on the design of future Avenues side roads.

A further relevant factor here was the choice to include raised tables at the side roads. A raised table, where the height of the carriageway is raised across the whole width and continued for a short distance, is generally designed to slow vehicles down by requiring a driver to drive over a raised hump. Unlike other elements being discussed here, raised tables were included in the original design but their design undermines the principle of continuous footway, where best practice requires a vehicle to navigate a fairly short but steep ramp to cross the footway (Figure 46 shows the equivalent ‘best practice’ design in the Netherlands). The Principal Officer was quick to recognise, unprompted, that the raised tables at side roads were a “mistake” and wouldn’t be repeated in future Avenues streets. However, he also observed that whereas he had the agency to not use raised tables in his own future project work, “unfortunately, some designers in Glasgow City Council have taken it forward and used it wrongly elsewhere” (Principal Officer, interview, 2022).

Figure 46: Example of short, steep ramp used with continuous footway in the Netherlands. Image © Robert Weetman. Permission to reproduce this image has been granted by Robert Weetman

This perhaps demonstrates the importance of the technical design of niche infrastructure being accurate from the outset because it does appear here that this particular niche has acted to alter a design regime, in that it is being replicated elsewhere. Unfortunately, however, the flaws in the design are therefore also being replicated. A strengthened design governance framework, supported by clear design standards, might perhaps re-shape the future direction of this design aspect as it continues to be replicated. Ultimately, the dynamics of the design and construction team significantly changed the design and therefore functioning of the side roads, and this is explored further in Section 6.3.3.

Greening

Having noted that the trees were the “biggest win” on Sauchiehall Street, “pioneering” even due to the technicalities involved, the Principal Officer and other interviewees also suggested that they were the element that had changed the most. The Principal Officer describes how he had intended for there to be a full system of rain gardens along Sauchiehall Street, whereby rainwater and

surface run off would have been captured in tree pits before entering a combined sewer (Principal Officer, interview, 2022). Several interviewees alluded to concerns about maintenance, however, which ultimately led to the curtailing of the full rain garden concept. The Senior Urban Designer recalled that “there was nervousness about rain gardens at the time, about their maintenance … in Glasgow maintenance is a huge factor” (interview, 2021). A Senior Engineer also explained that budgets played a part, in that maintenance would be deemed problematic as it would require revenue expenditure (interview, 2021).

Interestingly, the Principal Officer recalls a conversation whereby the logic of installing rain gardens when the water was ultimately going into a combined sewer was questioned, to which his response was “but that doesn't matter. What I'm trying to sell here in the pilot is the principle” (Principal Officer, interview, 2022). This response demonstrates the passion of the Principal Officer and his desire to use the pilot project as a means for trialling and demonstrating new infrastructure. However, it also suggests that in this instance, the use of a pioneering technology (rain gardens) may not have been the best route to securing greenery in the street, given the nervousness around maintenance and the fact that they would only partially operate as intended. Ultimately though, with three times fewer trees than intended and a lack of ground shrubs, the Principal Officer notes that the street is “maybe a bit more sterile than what it was originally meant to be” because of these changes (Principal Officer, interview, 2022).

Cycle track

It appears that the design of the cycle track did not change much during the project, other than being moved slightly to avoid a gas main. However, the Principal Officer suggested that “the *priority* of cycling was not there in the original vision” (Principal Officer, interview, 2022). The designers did not comment on the cycle track, suggesting that they had always intended to provide something akin to the final design. However, the Professor of Urban Design critiqued the decision to include a ‘fast’ cycle track within the city centre, where the needs of multiple users have to be considered: “I'm thinking

that's not quite the point, really … We're not designing these spaces so that either cars or cyclists or indeed somebody in a wheelchair can go as fast as they're possibly capable of going" (Professor of Urban Design, interview, 2021).

This is interesting, given that the cycling infrastructure is the 'new' element in the redesigned street. Latham and Wood (2015) observe that there has perhaps between a delay to providing dedicated cycle infrastructure because people cycling can oscillate between using the carriageway (as "vehicle") and footway (as "pedestrian"). Sauchiehall Street has been designed to overcome this obduracy very clearly by providing dedicated cycling infrastructure that should, in theory, clearly indicate that people cycling should use the space and people walking should not use it. But in doing so, has this design afforded *too much* priority and effectively created infrastructure that prioritises cycling speed over overall safety?

Indeed, it could be argued that there is a newly emerging regime governing the inclusion of cycling-specific infrastructure in streets, enhanced by both the climate emergency and COVID-19 'shocks' to the landscape. It is notable, for instance, that both of the recent engineering guidance documents that are referred to in more general street design guidance – *LTN 1/20: Design of Cycle Infrastructure* (DfT, 2020) and *Cycling by Design* (Transport Scotland, 2021) – are focussed specifically on cycling. There is perhaps a need to critically examine both the existence and nature of this regime, to ascertain how it is acting to shape street design. The quantitative phase of this research investigates whether this level of design priority has indeed provided a clear enough communication to street users, and whether it has come to create unintended negative consequences.

6.3 How did the street come to look like that?

This sub-section will outline the context surrounding the development of the Avenues Programme and the Sauchiehall Street pilot. It will focus initially on the broader "landscape" contexts governing the city at the time, before analysing the development of the Avenues Programme and pilot project in more detail.

6.3.1 The "landscape" contexts

The built environment is a manifestation of multiple systems that are operating (and have operated) to shape it at any given point (Nielsen and Farrelly, 2019). Whereas this research pertains primarily to the processes that occurred during the Avenues Programme, in attempting to analyse urban design as a process, it is essential to also understand the context of the place, including morphological, and also socioeconomic and cultural factors (Carmona, 2014). A brief analysis of the contexts at the time of the Avenues development allows for the identification of factors that could be considered relevant at the 'landscape' level of socio-technical transition theory.

Figure 47 shows an adapted version of Nielsen and Farrelly's diagram capturing the landscape factors (or systems) that have relevance for the shaping of an individual street.

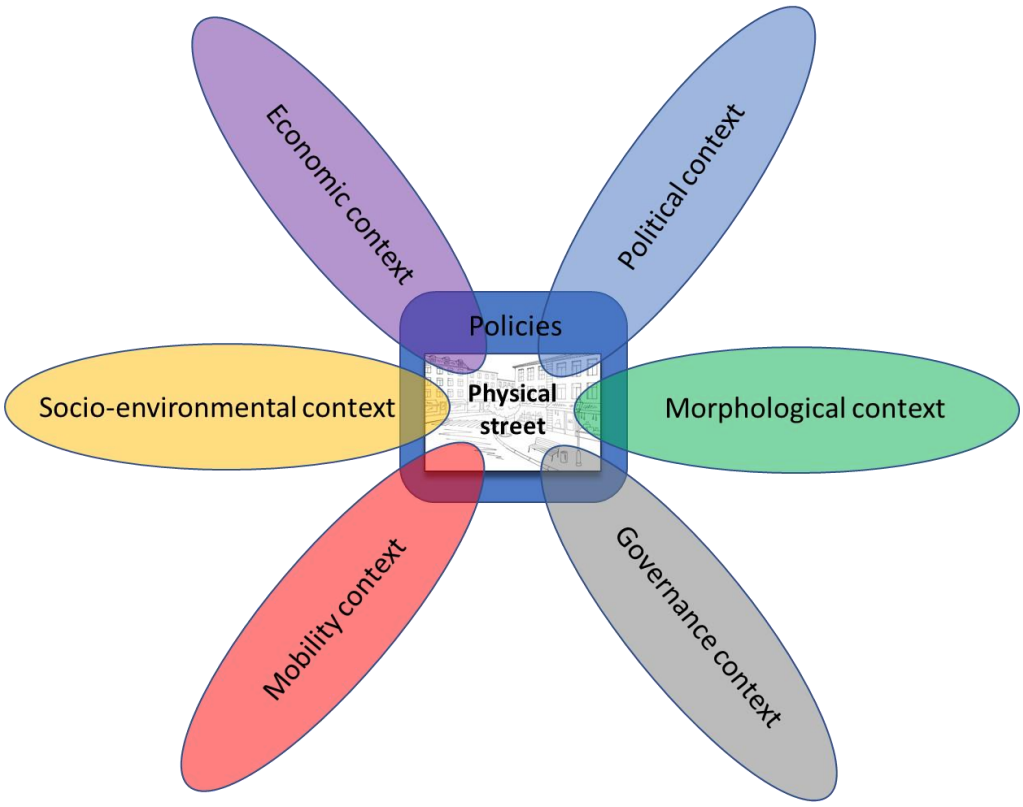


Figure 47: Landscape factors (systems) relevant to the design of a street. Adapted from Nielsen and Farrelly (2019, p.242).

Governance context

The Avenues Programme is part of the Glasgow City Region City Deal and, as such, is governed by the broader objectives and structures of that programme. As a relatively contained infrastructure-based project within the wider Avenues Programme, however, the governance of the Sauchiehall Street pilot was shaped more by the statutory planning and design guidance governing development in the city centre than the regional framework. The influence of the *City Centre Strategy* (GCC, 2014) is discussed in Section 6.3.2, whilst other relevant planning documentation is discussed in the next few points.

Morphological context

Although slightly warmer than most inland areas in Scotland, Glasgow's natural climate is characterised by its consistently high-ranking place in UK rainfall charts, with the second highest mean annual rainfall (94mm, marginally behind Cardiff at 96mm) but also the highest number of rainfall days per month (14.2) of any UK city (Met Office, 2022). The city lies within a river basin and is relatively flat although the city centre rises quite steeply to the north and west.

Glasgow has a predominately grid-based city centre, approximately 2km^2 in size, enclosed to the west and north by the M8 motorway, to the east by the A8 and the south by the River Clyde (Figure 48). Almost every street within the city centre has full vehicle access, except for the primarily pedestrianised "Golden Z", which comprises the eastern section of Argyle Street, all of Buchanan Street and the eastern section of Sauchiehall Street (east).

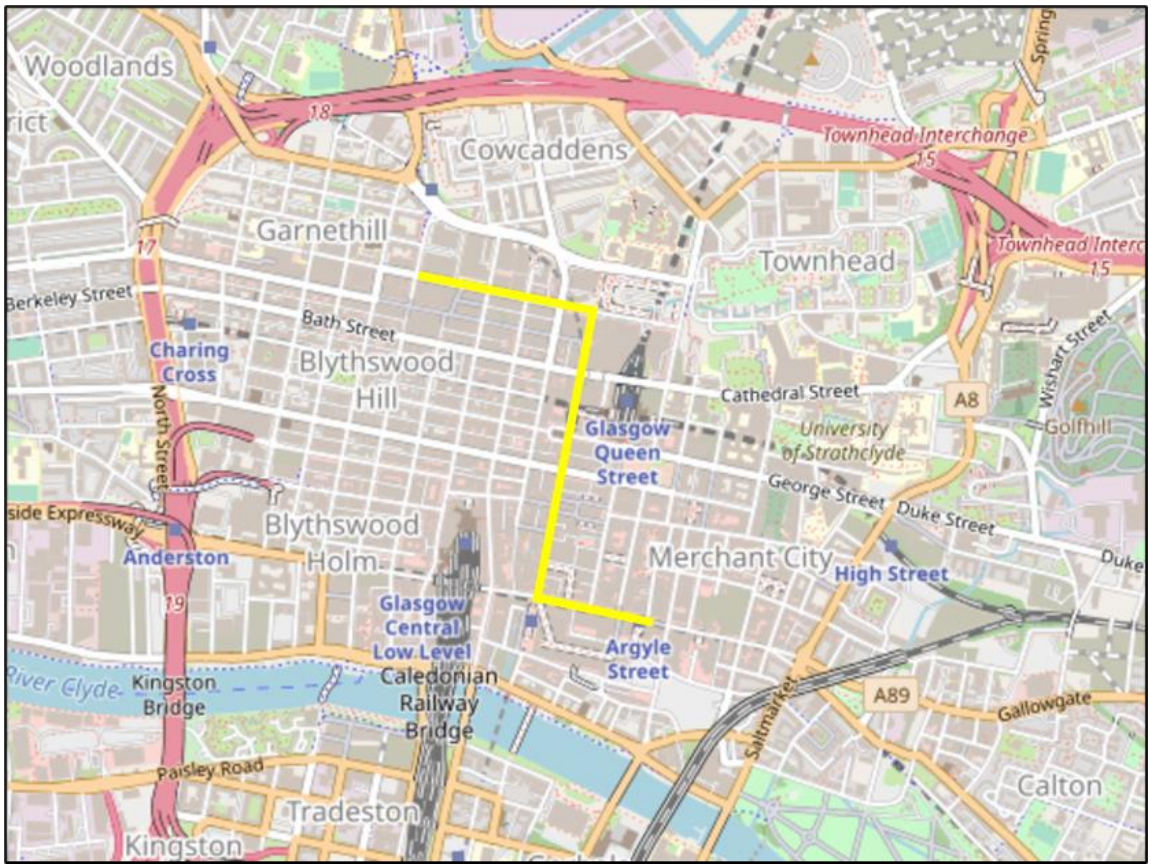


Figure 48: Glasgow city centre is predominately grid-based with full vehicle access other than most of the pedestrianised "Golden Z" shown in yellow here. Map © OpenStreetMap Contributors.

The Project Manager at GCC referred to early conceptual work on the Avenues whereby a 'points system' was introduced to decide which streets to include in the Programme. This included consideration of where cycle lanes and planting would be best placed. Topology was a key consideration (Project Manager, interview, 2021).

Political context

By 2017, Glasgow City Council had been under Labour control for 37 years, including the years when the City Region and Avenues Programme were developed. This long reign came to an end at the start of the Sauchiehall Street pilot, with the Scottish National Party (SNP) becoming the largest party in the 2017 election (albeit with insufficient seats to take overall control). GCC has a Convenor for Sustainability and Carbon Reduction, which includes the portfolio for transport. At the time of the Sauchiehall Street pilot, an SNP Councillor had held that position since she was elected in 2017.

When interviewed, the Councillor indicated that she was “very, very supportive” of the Avenues Programme and that there was support across the board within the Council for the wider aims of the programme (Councillor, interview, 2021). She spoke about the Programme needing to be framed in terms of economic value because of the City Deal funding but was quick to observe that she felt “the sustainable transport and the climate agenda have become ever more prominent”. She noted that in her experience, “even people who don't agree with cycling infrastructure … accept that it's what we have to do for climate”. But referring to public acceptance of investment in what were seen to be active travel measures, she cautioned that she was “not entirely sure whether the economic argument for active travel infrastructure is quite there yet in terms of the messaging” (ibid.).

Economic context

The City Development Plan (GCC, 2017) indicates that in the years leading up to 2016, Glasgow generated £17 billion GVA to the Scottish economy. However, the employment rate (60%) was 11 percentage points lower than the Scottish average, despite a higher proportion than average of working age adults having a degree or professional qualification. At the time, 83% of residents in work were working in the city centre (ibid.).

A new Economic Strategy for Glasgow, published in 2016, aimed to make Glasgow the “most productive city economy in the UK” (GCC, 2016, p.14). It includes reference to the Avenues as a means of achieving this aim and recognises the need to reduce social inequality in doing so. It includes little reference, however, to the increasingly dire predictions around the future of physical retailing and the already failing state of UK high streets (Portas, 2011). Whereas some sectors, including retail, are showing a degree of resiliency through diversification in cities such as Glasgow, the overall vacancy rate in the city centre is increasing (Orr et al., 2023).

Socio-environmental context

The *City Development Plan* (GCC, 2017) paints a somewhat troubling picture in terms of Glasgow's socio-environmental context. The population (almost 600,000 in 2011) is rising again after decades of decline. However, one quarter of adults in Glasgow city were obese in 2016 (with the rate having increased markedly in previous decades) and despite improvement, only 4 out of 10 adults were achieving the minimum recommended amount of physical activity. The mortality rate, 15% at the time, remains the highest in any UK city, despite people living longer than ever before (ibid.).

Environmentally, Glasgow is not faring much better. The entire city centre was declared an Air Quality Management Area (AQMA) in 2014 due to illegal levels of NO_2 and PM_{10} particulates, with additional AQMAs in other local centres (GCC, 2014). As a result, a Low Emission Zone was introduced in the city centre in 2018, initially just for buses but recently extended to include all vehicles from June 2023 (GCC, 2021b). The *City Development Plan* also notes a growing risk of flooding, requiring major investment in drainage networks, both in the city and across the metropolitan region (GCC, 2017).

More broadly, climate change was already well on the agenda by the time of the Avenues, with the 2009 Climate Change (Scotland) Act committing Scotland to achieving at least an 80% reduction in greenhouse gas emissions compared to the 1990 baseline (Scottish Parliament, 2009). The updated 2019 Act commits Scotland to reaching net-zero emissions by 2045, with a 70% reduction by 2030 (Scottish Parliament, 2019). Glasgow City Council declared a climate emergency in May 2019, followed by a target to become a carbon neutral city by 2030 (GCC, 2021a). Despite this declaration taking place after the Sauchiehall Street pilot, it is indicative of how quickly the climate agenda was rising to prominence during the lifespan of the project. In socio-technical transition terms, this is an example of an external 'shock' to the landscape level, applying pressure and potentially allowing new regimes to form.

Mobility context

In 2016, 41% of people in Glasgow were commuting to work by car, 30% by public transport and 27% by walking or cycling but the *City Development Plan* also notes that Glasgow has a larger traffic volume than any other Scottish authority (GCC, 2017). This is perhaps not surprising given that 25% of the city centre was given over to road space with just 8% given to pedestrians prior to the Avenues (Glasgow Connectivity Commission, 2019). In terms of cycling, the *Glasgow Strategic Plan for Cycling 2016-2025* quotes the Scotland target of 10% of all journeys to be made by cycle by 2020 (GCC, 2015a) but does not provide an update as to whether this was obtained. Published just after the Commonwealth Games in 2014, the strategy is optimistic about the future of cycling in Glasgow, reporting that levels had risen by 69% between 2001 and 2011 (albeit from a very low baseline).

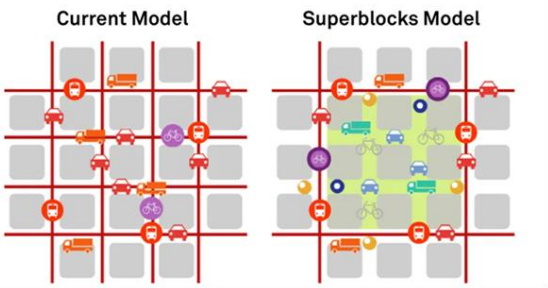
The Avenues development fell within the period covered by the *City Centre Transport Strategy 2014-2024* (GCC, 2015b). This document provides an instructive insight into the extent to which GCC recognised that urgent change was required in terms of reducing vehicle dominance in the city centre but also the extent to which ambition was lacking to really make a difference. For instance, that strategy notes that "congestion has a negative impact on the pedestrian and cyclist environment, as well as bus passengers" (p.25) but the 'peripheral' car parks proposed as a solution are still located within the city centre and therefore ultimately encourage vehicle use. Reference to the Avenues is accompanied by the explanation that "the selection criteria for which streets are to become Avenues will be based on existing traffic levels and the need to maintain vehicle access to balance … conflicting demands of motorised traffic and other modes" (p.43).

Whereas the management of transport will always be complex in an urban situation, the prevailing norms around transport in Glasgow (indicative of a strong regime, in STT terms) perhaps point to the level of pioneering thinking that had been required on the part of the Principal Officer and his team to even *consider* a project such as the Avenues. This traffic-dominated context undoubtedly governed and constrained the development of the Sauchiehall Street pilot at times, as discussed in the next sub-sections.

6.3.2 What shaped the development of the Avenues concept?

As outlined in Chapter 1, The Avenues Programme, according to Glasgow City Council, “will result in a transformation of the city centre's streetscape and public realm - making it more "people-friendly", more attractive, greener, more sustainable and more economically competitive” (GCC, 2014). The focus on infrastructure as an enabling component of regeneration in the Programme can be traced back to the *Glasgow City Centre Strategy and Action Plan* (2014), which includes the provision of “enabling infrastructure” (p.21) as key to achieving the three main objectives in the city centre vision: economic growth, sustainability and inclusion. The Avenues Programme objectives thus include the specific intention to create a network of connected streets “redesigned to protect and prioritise space for cyclists and pedestrians, improve connectivity, introduce sustainable green infrastructure through attractive streetscapes and [enhance] biodiversity and improve the way public transport is accommodated” (GCC, n.d.). This supports the idea that street regeneration can be used as a means for bringing about wider transitional change.

During the interviews, the Principal Officer stated a clear claim to the conceptual idea behind the Avenues. As an ecologist, he describes having become frustrated by public realm increasingly becoming a sticking point in ecology projects and this being his motivating factor for the eventual commissioning of an internal workstream report within GCC on neighbourhoods and public realm, which he co-wrote with a member of the Forward Planning team. The original idea for the Avenues, he claims, emerged during a workshop looking at climate adaptation in relation to public realm, which took place in 2012, facilitated by design agency 7N on behalf of GCC. He cites the combination of sketches produced by architects during a ‘brainstorming’ session at that workshop and the Barcelona Superblocks (Figure 49) as the main inspiration for the eventual Avenues Programme (Principal Officer, interview, 2022).



The Superilla, or 'Superblocks' in Barcelona refer to a transformational programme by the Ajuntament de Barcelona (the city authority) to make the city more liveable. The name comes from the traffic calming aspect of the programme where through traffic is being prohibited from certain streets in the grid to create 'superblocks'. Access controls tend to be playful street furniture, such as giant planters, rather than barriers, and the calmed streets are often painted with patterns and games.

Figure 49: The 'Superblock' concept in Barcelona. The top left image and description demonstrate the concept (image © Ajuntament de Barcelona, description added by the author). The bottom two images show the comparative density of the street grid in Barcelona (left) and Glasgow (right). The red square is a Barcelona block superimposed onto the Glasgow grid, indicating that each block in Barcelona is equivalent to nearly four blocks in Glasgow. Map images © Google Images, annotation added by the author.

The Principal Officer was very clear in describing the Avenues Programme as an economic regeneration mechanism. He explained that the Programme meant it was possible to procure investment for the public realm directly, noting that it is often difficult to fund public realm via developments on a street because it tends to fall outwith developers' boundaries. He describes his original concept as "a series of avenues throughout the city centre, predominately there for the movement of people, but ultimately they're there as an economic regeneration project" (Principal Officer, interview, 2022). Although it is difficult to verify his account, the Principal Officer appears to self-identify strongly as a leader and shaper of the project. His accounts of devising the Avenues concept and strategically shaping the early stages of the project give an indication both that he is acting as a 'knowing designer' (Carmona, 2014) and embodying the role of the project 'champion' (Kemp et al., 2001). Given his background as an ecologist, rather than a designer, he is perhaps also an example of the 'regeneration professional' identified by Ward (2011), albeit a knowing one. No interviewees refuted his position as leader. Indeed, the Delivery Manager

reported that he had “stepped into [the Principal Officer’s] team” and confirmed that “[the Principal Officer] basically dreamt up these ideas of avenues”. But he added that he was “just sort of floating over me … he was the manager, but he’s also moved on now” (Delivery Manager, interview, 2021).

The Principal Officer went on to explain how GCC had strategically brought the Avenues concept into policy, by enshrining the idea within the *Districts Strategy of the City Centre Strategy 2014-2019* (GCC, 2014), intending originally to procure funding incrementally for each stage. This ensured that a lump sum of £6-7m was made available for developing Sauchiehall Street as the core project within the *Sauchiehall District Regeneration Framework*, which included procuring urban design consultancy Urban Movement at this stage to draw up the conceptual ideas for the street. This was done in the knowledge that City Deal money was on the horizon, however, and the Principal Officer explained how he was able to strategically stall the City Centre Strategy by a year (it was originally planned to run from 2013-2018) to allow time to develop the strategic business case for the Avenues, based on the then early-stage concept design for Sauchiehall Street (Principal Officer, interview, 2022). The £6-7m funding originally allocated to Sauchiehall Street was strategically repurposed to other projects within the *City Centre Strategy*. The Principal Officer attributes this idea to the Group Manager, describing her as “a very, very astute player” and “hugely influential in assisting me” (ibid.).

This makes the Avenues a particularly interesting case study when it is considered that the concept behind the pilot street for the programme originated outwith the programme itself and was only latterly adopted as the pilot at a point when it was already somewhat developed. The focus on infrastructure within the Avenues was primarily a lever to procure City Deal funding, given that this was a core focus of the City Deal remit. However, this case study also points to the strategic use of the *City Centre Strategy* to mobilise the conceptual idea of the Avenues and incorporate a number of different policy hooks that could be used to procure various different sources of funding.

In essence, the Avenues concept was born of several different objectives and was shaped both by, and for, several different external levers. Whereas infrastructure and active travel both featured within the concept from the early

stages, these needed to compete with a multitude of other objectives, some of which needed to take precedence to secure funding at various stages. It is interesting therefore to examine how something as specific as the design of the street carries through this broader complexity. Despite developing a strong steer over the project, the Principal Officer emphasised that he did not want to dictate the design of every Avenue, describing the original concept as “broad brush because I didn't want to state ‘this is an avenue’ and then every single avenue will be constructed in this manner… we wanted overarching ethos and principles of the avenue” (Principal Officer, interview, 2022). The extent to which this openness will result in different designs across the subsequent avenues in the city centre will perhaps only be clear once the later stages of the programme have been developed. But it is noteworthy that a long-term programme of this nature, dealing with the design of functional infrastructure, does not have its own design guide to at least ensure some continuity of design between different streets.

6.3.3 What shaped the design of Sauchiehall Street?

The strategic move to develop Sauchiehall Street as the pilot project for the EIIPR programme allowed GCC to “take a step back”, in the words of the Principal Officer, and use the new funding to appoint a consultancy to review the whole Avenues concept (Principal Officer, interview, 2022). Given the relatively low value of the tender, the Principal Officer was able to invite Urban Movement to tender directly. At this point, they had already been part of the team drawing up the initial designs for the *District Regeneration Framework*, along with Gehl Architects, an international urban design agency founded by the world-renowned urban designer, Jan Gehl. The Senior Urban Designer referred to this stage as developing the Avenues *strategy*, explaining that they were “looking at the city afresh and going ‘so, where should the Avenues be?’” (interview, 2021). The Principal Officer made it clear that he had aspirations to appoint a consultancy who he trusted to deliver the sort of project he envisaged, having seen an example of Urban Movement’s work in Clapham, London: “So that was actually the very first piece of work that I saw that Urban Movement had done. And then from that, I tracked them. I went to other projects that they

had done down in Brighton and other places. And that then led to similar projects, but by other consultants. So I just followed my way through" (Principal Officer, interview, 2022). This again points to the Principal Officer's role as champion and the extent to which this project was shaped by a knowing designer.

Having completed the initial strategy development, Urban Movement were retained to develop the design of Sauchiehall Street to Royal Institute of British Architects (RIBA) Stage II, which is the conceptual design stage. GCC then took the project forward from RIBA II to construction, which includes the detailed design stages. Urban Movement were retained beyond RIBA II but only to continue developing work with the median (the zone between the cycle track and carriageway where the trees and benches are located) rather than the rest of the street (Lead Designer, interview, 2021). This practice of commissioning external consultants to develop a design to a certain extent before bringing it back 'in house' is not unusual (Royal Institute of British Architects, 2020) but it does have potential implications for how the final design changes relative to the concept, which will be explored in more detail below. Despite this, the Senior Urban Designer at Urban Movement described the project as "quite a collaborative process", explaining that "it wasn't so much that we did a design and then handed it over, we did work with the Council" (interview, 2021).

During a conversation about his inspiration for the conceptual design of a place and movement-based street, the Lead Designer concluded that "well, I mean it's such a simple thing, in itself, you know. It's *so* simple [italics added]" (Lead Designer, interview, 2021). This statement followed a discussion about the use of international examples as design precedents, where he explained that his designs were loosely based on designs in Berlin and Copenhagen but that he considered that "most European cities have managed to lay out their streets in a much more comfortable way for pedestrians and cyclists. And they kind of live more on the street. Whereas we tend to sort of live behind closed doors and let the street just be a sort of almost no-go zone where you need to be in a car to feel safe" (ibid.). He described the international influence therefore as "subconscious" for him, a concept that he had introduced earlier in the interview when noting that Urban Movement had been applying forward thinking design principles (the sort enshrined in *Manual for Streets* and *Designing Streets*)

for a long time, even before these design manuals “legitimised” these approaches. He was not, however, basing the design directly on European examples, hence the use of the term ‘subconscious’ (ibid.).

This raises an interesting question as to whether Carmona’s typology of self-(knowing) and un-self-conscious (unknowing) design (Carmona et al., 2003) might be extended to include the notion of a “subconscious designer”, i.e. a type of knowing designer, but one so steeped in practice that consulting design manuals and related guidance (examples of regimes) may not be considered necessary in every instance. Clearly this act of subconscious design could also work to the detriment of a project, depending on the contextual regime constraints, and this theme is explored in more detail later in the chapter with reference to the detailed design stage of Sauchiehall Street.

In describing how he intended to achieve this ‘liveable streets’ concept, the Lead Designer stressed how important he perceived the reallocation of carriageway space to be as the key step for creating space for seating, tree planting and cycling. He highlighted seating as a particularly important element in the creation of public space and described what he considered to be a reciprocal relationship between place and movement functions: “the two go kind of hand in hand. The more people you get walking and the more people you get cycling, the more the place, the more the street has the potential to become a kind of public space in its own right” (Lead Designer, interview, 2021).

With regards to the side roads, the Lead Designer was quick to observe that the final design was not constructed as he had originally designed them (Figure 50) and that he believed that GCC had even changed them again beyond the final design. He outlined his intent to design fully continuous footway and cycle tracks across the side roads with clear intent for vehicles to give way, citing his work in Clapham as a precedent (Figure 51). But noted that various signifiers of vehicle priority had been retrofitted, including double yellow lines and non-continuous paving (Lead Designer, interview, 2021).

Figure 50: Visualisation of continuous footway at Elmbank Street, as incorporated by Urban Movement at the conceptual design stage. Image © Urban Movement for Glasgow City Council. Permission to reproduce this image granted by Glasgow City Council.

Figure 51: Continuous footway designed by Urban Movement at the side road at the junction of Brommel's Road and The Pavement, Clapham. Image © Google Maps, captured May 2021.

The latter stages of the design of Sauchiehall Street were overseen by the Senior Highways Engineer at GCC once the conceptual designs had been brought back in house. When asked what he perceived to be the objectives of the Avenues Programme, he was also quick to point to the desire to increase accessibility based on reallocating road space away from private vehicles to give more

priority to active modes. He also inferred that guidance such as the original *Cycling by Design* (Transport Scotland, 2011) had been used for the cycle tracks, in conjunction with "standard design manuals" for the design of the road (Senior Highways Engineer, interview, 2021). He was also quick to draw attention to the challenge inherent in trying to design a multi-modal street, such as Sauchiehall Street, in the absence of one single design guidance document: "[we were] trying, for want of a better phrase, [to] combine the design requirements of *all of them* into something that will fit. That's the difficult bit is trying to get a combination of things that *is* satisfactory to everybody [italics added]" (ibid.).

When asked specifically to comment on which elements of the design had changed between the concept and final iteration, he initially commented that there had been very few changes, other than the removal of a few trees due to the gas main and some alteration to the layout of the parking bays. But after some reflection, he added that he "believed that the client wanted continuous cycle lanes across the junctions, but that's not something that Glasgow is happy to, the *design side* is happy to take on at the moment [italics added]" (Senior Highways Engineer, interview, 2021). Later in the interview, when asked more directly, he then offered that he *thought* the detail of the side road design had changed too, stating that "with the unease with this, with the design, going on, there were certain changes like including, making sure that the kerb lines and all that were in place; lining and signing" (ibid.). The implications of these changes are discussed in Section 6.4.1.

6.4 What other factors were important in shaping the street?

Whereas the concept and design set the framework for the street, other events took place which also came to have a bearing on the final design. These ranged from very literal events, such as a significant fire breaking out, through to more conceptual factors, such as the setup of the project. Key within each of these factors were the agents involved at each stage and it is these individuals who form the main focus of this final section.

6.4.1 The design continuity gap

Throughout the course of the interviews with the various officers involved in the project, an overall picture emerged of Sauchiehall Street having been born of economic regeneration origins but having undergone further conceptual shaping by various agents. At times, it was clear that a particular conceptual idea was broadly supported in theory – for instance, reallocating carriageway space to active travel infrastructure and planting a significant number of mature trees – but it was not merely physical constraints that acted to alter these concepts. Rather, it was more philosophical reservations.

The structure of the project – the local authority developing a broad idea, then outsourcing the conceptual design work to consultants, before completing the detailed design in-house – is important to consider in terms of how it shaped the eventual outcome of the street, especially because this procedure is not unusual in public realm projects (RIBA, 2020). In this case, despite the formation of a new Avenues Team incorporating individuals from different disciplinary backgrounds, the detailed design work was drawn up by the Roads Team, whereas the original concept had come from the City Centre Strategy Team (Delivery Manager, interview, 2021; Senior Highways Engineer, interview, 2021). This introduced several different agents directly into the design process, each with different skills, experience and knowledges. In addition, each of these agents was working within their own disciplinary structure of design standards and guidance: effectively within, and constrained by, their own regimes, in socio-technical transition terms.

The final design of the side roads on Sauchiehall Street forms a particularly illustrative example of what might be termed the *design continuity gap* inherent within the setup of the project. In this instance several interviewees, including both the Lead Designer from Urban Movement and the Senior Highways Engineer from GCC, spoke about the changes that had occurred to the side road design between the concept and final iteration (see Section 6.2.3). At the conceptual design stage, the rationale is clearly for a design that unambiguously communicates pedestrian and cycle priority over vehicles at the side roads, brought about primarily using materials (continuous paving) and minimal engineering (Lead Designer, interview, 2021). But several interviewees referred

to what they considered to be an unhelpful level of ambiguity in the final design, where there is no clear priority for either drivers or active modes (Delivery Manager, interview, 2021; Planning Consultant, interview, 2021; Senior Urban Designer, interview, 2021). The Delivery Manager admitted that the finished design did not look at all how they wanted it to look and suggested that ultimately, the Avenues Team should either have “done it” or “not done it”, rather than settling for ambiguity (Delivery Manager, interview, 2021). This sentiment was seconded by a Councillor who expressed that she suspected there had perhaps been a lack of courage to really commit to the full continuous design (Councillor, interview, 2021).

A Professor of Urban Design, when interviewed, summarised his thoughts about the side road design by quoting the lyrics from *The Hedgehog’s Song* by the Scottish outfit The Incredible String Band: “you know all the words, and you sung all the notes, but you never quite learned the song” (Professor of Urban Design, interview, 2021). His point was that he felt the final design had been done through regulation, rather than design, and had therefore failed in urban design terms. This sentiment was echoed strongly by the Lead Designer who stated unambiguously that the side roads “kinda look increasingly a bit of a mess, really”, with reference to the elements that had been retrofitted contrary to the concept, such as the double yellow lines (Lead Designer, interview, 2021). This echoes Carmona’s concerns about street design projects increasingly substituting design with regulation (Carmona, 2016). His concerns relate to ‘placelessness’ occurring due to this substitution however the effect described here is perhaps the infrastructural equivalent of placelessness: an example of how placelessness manifests where place meets movement infrastructure, ultimately undermining the public life-giving potential of this piece of infrastructure.

A Planning Consultant, who also raised the issue of ambiguity in the design, similarly concluded that the side roads had not worked in terms of urban design or how the design reads (Planning Consultant, interview, 2021). There had been an in-depth discussion during the interview about the lack of engineering standards but over-proliferation of guidance for instances where streets are re-profiled to incorporate these sorts of novel infrastructures. He drew attention to the “grey area” that this creates, suggesting that “the greyness actually crystallises in that photo that you've got there (Figure 52) … in the combination

of the place elements and the transport and how they combined together and the greyness … the added ambiguity in all those things; the project objectives, the design standards, is kind of writ large on that picture" (ibid.).

Figure 52: The image of Scott Street side road shown to interviewees on Microsoft Teams during the virtual walking interviews. Image © author.

This raises an interesting point about the difference between compromise in the decision-making process, which is largely inevitable and can perhaps be a good thing if it leads to more equitable outcomes, and compromise in the final product, which in this case has undermined its functioning. Indeed, this appears to be the one significant change to the design between concept and final iteration that occurred almost entirely because of conceptual disagreement and compromise, rather than because of physical constraints. At this stage, then, it is useful to understand the perspective of the Senior Highways Engineer at GCC, whose team authored the changes.

Although seemingly hesitant to refer to the side road design initially, later in the interview it became clear that the Senior Highways Engineer at GCC was deeply uncomfortable about the concept of continuous footway, perceiving it to be potentially unsafe and stating that it was "going to take an awful lot of education, or all parties to behave in the way that you would have to at junctions before these would be safe, as far as I am aware" (Senior Highways

Engineer, interview, 2021). As the interview unfolded, he shared a few personal experiences that had led to him being “very wary”, explaining that on a previous project “there were several accidents. And obviously, with the police getting involved and everything then, it's not a very nice process” (ibid.). He even went further, referring to his personal experience outwith his professional life: “first thing I taught my children was when you get to the kerb, you stop. Erm, [pause] if you don't have that kerb, then how do you teach your children to cross a road safely?” (ibid.).

Interestingly, the Principal Officer, who otherwise presented as a pioneering individual, appeared to support the hesitancy on the part of the highways engineers, responding to the notion that local authorities should just go ahead with continuous footway regardless of design standards with “yeah, that's fine, but there *will be* an accident and then there *will* be a court case. And if a local authority has just gone it alone against government advice, against what’s written in law, then where do we stand?” (Principal Officer, interview, 2022). Despite some suggestion by the Delivery Manager, himself a highways engineer, that the concept of liability does not actually exist in the sense that is being described here, it is clearly a spectre that is looming large over the officers charged with designing these sorts of projects and as such, the nature of its reality perhaps doesn’t matter so much as the fact that the notion is held to exist. It is perhaps an embedded component within the regimes constraining the engineering profession.

It is clear from these conversations that the changes to the side road design are not simply a result of a lack of awareness of newer designs or an arbitrary failure to follow them. The Senior Highways Engineer’s rationale for his decisions demonstrates a heavily ingrained mindset spanning all spheres from personal to professional. This appears to indicate a clash of regimes, whereby the urban designers and related design professionals were advocating for a design-led, concept-driven street with continuous footway. The highways engineers, on the other hand, were operating within a regime that is heavily guided by a perception that the safety offered by the status quo – full vehicle priority at side roads – would be undermined by any significant change to that design.

It was also notable in the interview that the Senior Highways Engineer at GCC was avoiding being drawn into concrete answers on several subjects, including

the design manuals that had been used in drawing up the design, stating several times that he would need to go away and check details (Senior Highways Engineer, interview, 2021). This echoes a profession (engineering) that adheres rigorously to design standards as a tool for ensuring safety. This could be contrasted with professions such as Urban Design that are generally content to rely on guidance, to the extent of specifically avoiding the dictation of design in favour of an openness that reflects elements such as local context (Scottish Government, 2013).

It is argued here that this indicates the presence of what, in this thesis, is termed a *conceptual design gap*, indicative of conflicting regimes, rather than merely a difference of opinion. As such, efforts to overcome this would need to address the constraining regimes, rather than simply concluding that this event was a result of individual opinion (even if it was, to some extent). This is exacerbated by what is termed a *temporal design gap*, born simply of the nature of handing a design over midway through a project. The Lead Designer observed that at the point where Urban Movement were no longer retained as design consultants, he then lost his agency over future iterations of the design (Lead Designer, interview, 2021).

A further point of note here relates to what might be termed a *regulatory design gap* that existed at the time when Sauchiehall Street was being designed. Until recently, as alluded to by the Planning Consultant, the UK lacked any concrete engineering standards for the design of such streets (interview, 2021). Since the street was completed, two key documents have been published, firstly the *Local Transport Note 1/20* (DfT, 2020), which details more specifically how to design for cycling in streets such as Sauchiehall Street, and also the revised *Highway Code* (DSA, 2022), which gives legal weight to pedestrian priority at side roads. The Avenues Project Manager from GCC, noting the difficulty of expecting the highways engineers to contravene what they perceived to be safe, shared that he hoped the revised Highway Code “changes things” because he believed it “should be a gamechanger” (Project Manager, interview, 2021). He also noted that organisations like the Chartered Institute of Highways and Transportation were quite involved in the process of reshaping the relationship with guidance for highways engineers.

The extent to which these new regulatory documents will plug the regulatory gap in the design of future Avenues could usefully form the subject of future research in this area. But it is clear from the interview with the Senior Highways Engineer at GCC that he had experienced a level of personal conflict during the Sauchiehall Street project, evidenced in him eventually describing his lack of willingness to include continuous footway as “probably a failing of mine”, but going on to state that his prior experience with the accidents was “just not something I wish to repeat” (Senior Highways Engineer, interview, 2021), understandably so. Ideally, the conceptual regimes constraining urban design and engineering would be shaped such that each of the professionals within these disciplines feels enabled to perform their roles safely and with integrity, rather than these significant design decisions becoming the product of potentially just one individual’s personal discomfort.

The discussions above suggest that some of this shaping could be achieved through policy levers (by updating the legal regulatory framework to give more confidence to engineers) but also by clearly delineating the implications of liability for project officers. This could be enhanced by updating the training offered to project officers and engineers in these contexts (discussed further in Chapter 8). It may also be useful, especially where a street is trying to achieve movement and place objectives through public realm design, to understand where urban design guidance perhaps needs to be a bit more prescriptive in order to help ensure the sort of systemic safety that engineers require. The future Avenues could provide an interesting testbed for this approach, for instance if a specific Avenues design guide were to be published in light of the recent regulatory changes in the *Highway Code* (DSA, 2022) incorporating engineering and urban design into one holistic guide.

6.4.2 Development of individual agency and a network of actors

The Sauchiehall Street pilot, as with similar public realm projects, had a small but influential team steering the design and construction journey. Interviewees from the core project team drew notable attention to the dynamics of individual members of the team and the nature of the working relationships. Individual agents operate both as enablers of change and agents of constraint throughout the project, as well as undergoing journeys of their own at times. Given the

scale of the full Avenues Programme and the intent to learn from Sauchiehall Street as the pilot street, it is useful to draw attention to where these individual agents and networks of actors have clearly influenced the final project. This also informs RQ3 concerning what can be learned from the project for similar work elsewhere.

Figure 37 at the start of this chapter lists the key agents making up the Sauchiehall Street project team. Figure 53 outlines the nature and the shape of the relationships between these key agents, as well as the influence of other agents external to the project team.

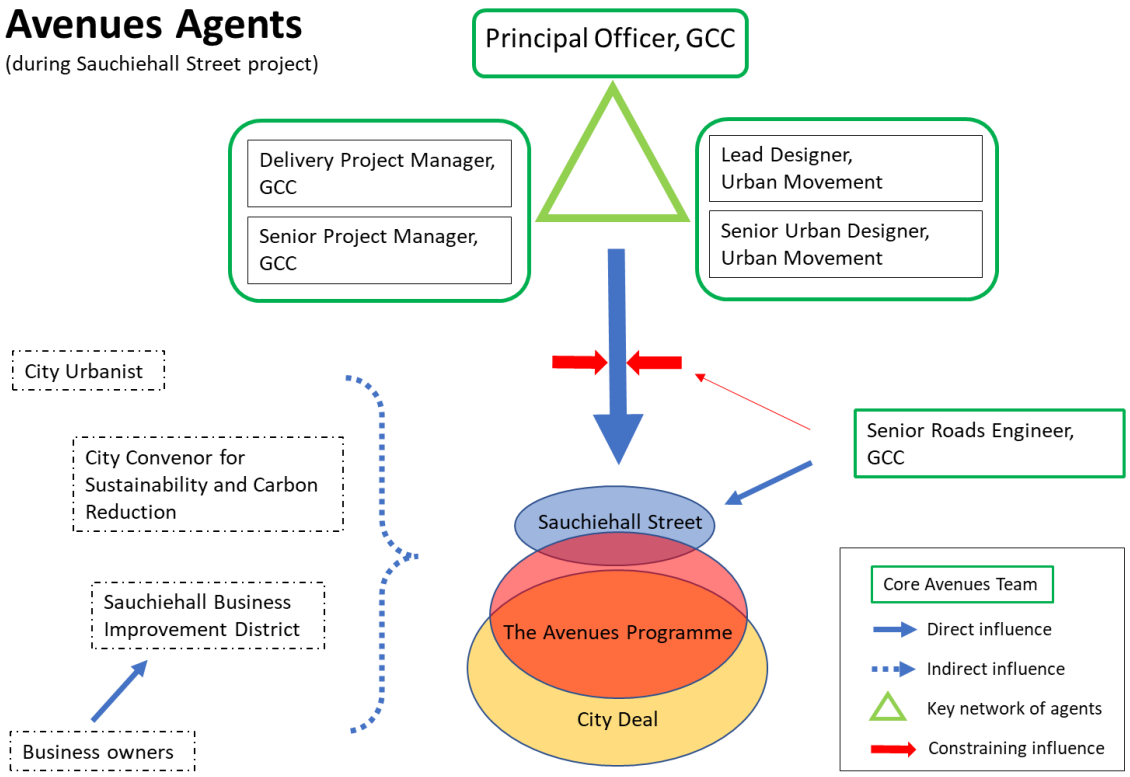


Figure 53: The nature and shape of the relationships between key agents involved in the Avenues Programme during the Sauchiehall Street project.

The interviews illuminated a small group of individual actors who exerted a significant level of agency throughout the project, individually but also through the network that they created. At the centre of this network was the Principal Officer, self-appointed to an extent, but also referred to as such by other interviewees, including the Delivery Manager (interview, 2021). Having claimed responsibility for the Avenues concept, it is evident that this individual was able

to exert a significant level of strategic direction over the project, acting shrewdly at various points to help bring about the project outcomes. This strategic direction is particularly apparent from his description of how he assembled the Avenues Team within GCC where he reflected on his deliberate appointment of two relatively junior engineers, having identified the gaps relative to his own skills and abilities:

> "And so we deliberately put out an open internal offer and when I saw those names coming up, I was like ok, as long as they interview well, then I am gonna push to get engineer officers. Because I was an ecologist, so I needed fresh engineers who came from those core facets of the Council service that would keep me right. Because I didn't need anybody for aspiration, I didn't need anybody to push on climate mitigation, didn't need anybody to push on the overall quality look and feel, placemaking" (Principal Officer, interview, 2022).

This ability to apply a level of reflexivity to his own abilities and the wider needs of the project almost certainly influenced the course of the project, to the extent that it shaped the skills and knowledges available internally, but also how the project team were able to influence and connect externally. This leadership on the part of the Principal Officer appears to have manifested the form of design governance identified by De Magalhães and Carmona (2009), such that it has enabled the team generally to "pull in the same direction" (p.113), albeit not across every facet of the project.

The two engineers referred to above were appointed to the roles of Project Manager and Delivery Manager. Both officers, when interviewed, demonstrated a similar type of reflexivity regarding their own journey through the project. The Project Manager referred openly to how his background as a roads engineer had presented him with several challenges, especially regarding the design of the continuous footway: "for me that was a learning curve. After the concept then I went away and kind of looked at stuff in London etc, the continuous footways, and convinced myself that they made sense" (Project Manager, interview, 2021). In his own words, he "went on a journey" of self-motivated learning, ultimately culminating in him being able to take other highways engineers on site visits to other precedents (ibid.).

This forms one of many examples where the Project Manager and the Delivery Manager were able to effectively fulfil the role of mediators within the project, both internally with other officers within GCC but also with external stakeholders, later in the project. The Principal Officer's suggestion that he hired these engineer officers specifically to "keep him right", and also because they were "a solid engineer" (the Project Manager) and "good at talking" (the Delivery Manager), suggests that there was a degree of deliberateness in enabling these mediating roles (Principal Officer, interview, 2022). Certainly, in terms of the internal relationships within GCC, it appears that the existing familiarity between the Project Manager and the Senior Highways Engineer, born of the former's background as a highways engineer, enabled a beneficial degree of honesty with the latter stating that "the Project Manager and I have known each other for a long time, so it's not as if it's something new that you're wary about saying something wrong to somebody" (Senior Highways Engineer, 2021). Ultimately though, in the case of the side road design, despite the benefits of a trusting working relationship, this was not enough to allay the highways engineers' fears sufficiently to secure the fully continuous footway. It could be argued therefore that there was an over-reliance in this instance on the mediating ability of project agents at officer level and that a more senior managerial influence was required, ultimately to bear the responsibility of this 'new' design. Indeed, the Lead Designer from Urban Movement explained that the Venn Street scheme in Clapham, which the Principal Officer cited as his inspiration for the Sauchiehall Street side roads, was only realised in its "purest form" because the Head of Highways there insisted that the scheme was built as per the design, even when the contractors were threatening to refuse to construct it on the grounds of safety fears (Lead Designer, interview, 2021).

The interviews painted an overall picture of a project strategically steered by a 'knowing' designer, the Principal Officer, which then became a vehicle for creating and shaping other knowing designers. A factor that appeared to be key within this was the creation of a network of knowing designers, external to the Council, again steered by the Principal Officer. Following on from the clear intent to commission Urban Movement (and Gehl Architects, earlier) because of their observable credentials with mixed-use streets similar to Sauchiehall Street, the Principal Officer reflected that he also greatly benefited from being linked in with a wider community of practice via these consultancies. He described how

Urban Movement "allowed me to be part of their circle, to gain access to their client group, so I was meeting like-minded officers from other areas in the country who were pushing this type of idea, this re-imagining of streetscape" (Principal Officer, interview, 2022).

This points to the importance of recognising co-production (effectively peer learning) within a community of *practitioners*, as opposed to presuming that this only occurs between practitioners and lay people. A powerful triad appears to have formed between the design team of the Principal Officer, Project Manager and Delivery Manager at GCC, and the Lead Designer and Senior Urban Designer at Urban Movement (Figure 53). This triad was self-learning and self-motivated, spanning boundaries (Probst et al., 1998) and applying a sense of forward momentum to the project. The Senior Highways Engineer at GCC, whilst contributing positively in other ways, also appears at times to act as a sort of brake, or reverse momentum, slowing or even halting the progress of the design team. Reflecting Caniëls and Romijn's (2006) observation that the practice of community is important for the successful development of a 'niche' project, nurturing a space for internal "sociability, argument, disagreement [and] negotiation" (p.15) may be important for enabling individuals such as the Senior Highways Engineer to voice their fears. Ultimately this may be key in reducing the reverse momentum.

How, then, might the role of the Senior Highways Engineer at GCC, along with other highways engineers, be considered within this network of knowing designers? A cursory glance at the side roads, as detailed in Section 6.4.1 above, might suggest that these were ultimately the work of an unknowing, or un-self-conscious, designer – someone working without knowledge of the wider implications of their decisions (Carmona, 2013). As discussed above with reference to the *conceptual design gap* however, the interview with the Senior Highways Engineer at GCC demonstrated that he was working very much as a knowing professional within his own realm, to the extent that his decisions were reasoned and justified on the grounds of safety and risk management. It could be argued that this demonstrates the influence of an individual who was unknowing in urban design terms. However, it may be more productive to view the side roads as the product of a *network of knowledges*, where each individual 'designer' can be termed 'knowing' but where the product ultimately reflects

the absence of a ‘knowing’ policy framework. Or to frame it in socio-technical transitions terms, the side roads are perhaps the product of a network of individuals governed by their own knowledge regimes, suggesting that stronger protection would have been required around the niche, most likely achievable through policy, supported by statutory guidance, to have avoided it becoming the “hopeful monster” (Mokyr, 1990).

6.4.3 Informal networks of knowledge: the business community

A feature of Sauchiehall Street that carries strongly through the consultation documents is its identity as a key commercial street in Glasgow. By day, Sauchiehall Street functions as an important retail centre, as well as hosting offices and cafes. By night, the area to the west, particularly, transforms into a core hub of Glasgow’s nightlife with several clubs and pubs operating well into the night and early morning. The former chair of the Sauchiehall Business Improvement District (BID) described Sauchiehall Street as having "a 24-hour day", indicating that this was something he felt the design team had not immediately understood (Former BID Chair, interview, 2021). During the interviews with the Avenues Team, it became clear that the relationship with particular members of the business community had formed an important aspect of the project. Interviews were subsequently carried out with the Director of a company that owns several nightclubs on the street, as well as a Business Liaison Officer from GCC. These interviews provided valuable insight into the roles and experience of businesses on the street before and during the project. It became clear that Sauchiehall Street’s ‘public life’ is as much the people spilling out of clubs into taxis at 2am, as it is the people sipping lattes in the afternoon.

A key thing to note here is the nature of a project that pertains to a ‘one-off’ physical regeneration scheme on a street that will continue to exist as a live entity for many more years. The business community would undoubtedly have had some sway over the initial design of the street through the consultations. However, reflecting Carmona’s (2014) concept of ‘space in use’, it is arguably the ongoing use and management of the street, once the construction project is complete, that is key in terms of understanding its potential to bring about longer-term transitional change. In the case of Sauchiehall Street, events that

took place *during* the construction, discussed below, had a significant effect on how the process was carried out. This also shaped the relationships between the Avenues Team and business stakeholders. Whereas these events may not have significantly changed the final design of the street, they undoubtedly shaped how the finished street was received, and the relationship between business owners and the street itself. GCC have effectively provided the physical canvas of Sauchiehall Street, but how this canvas was provided matters because it is the businesses and other users of the street that will [continue to] provide the paint.

It is pertinent at this point to note a few of the more significant 'force majeure' events that took place on Sauchiehall Street during construction that were external to the project. The street might perhaps be deemed especially unlucky because having already suffered the effects of a significant fire at the Glasgow School of Art in May 2014, a further two fires broke out during the construction (Figure 54). The first, in March 2018 at the eastern end of the street, destroyed a number of buildings. But it was a second major fire at the School of Art in June 2018 that destroyed the newly renovated Art School, neighbouring nightclubs and restaurants, and also forced the closure of the entire street for several months. Construction carried on despite this, but several businesses were displaced, and the street remained cordoned off, leaving a scene that the Nightclub Director described as "a horrible dark experience, the streetlights were all off … and I hate to say, it looked like Beirut for a period of four or five months" (Nightclub Director, interview, 2021).

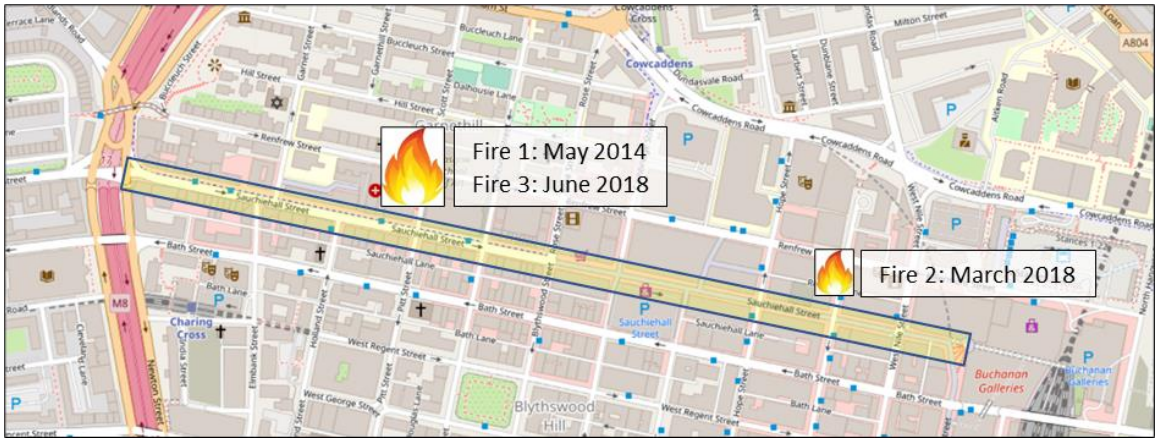


Figure 54: Map of Sauchiehall Street showing the location of the three fires that occurred on the street during the pilot project. Map © OpenStreetMap Contributors. Annotations added by author.

The street eventually reopened, and construction was substantially completed in late summer 2019. But a mere five months later, the UK entered the first of what became several lockdowns due to the COVID-19 pandemic, where most shops and businesses on the street were shut for over a year. Much will continue to be written about the impact of the COVID-19 lockdowns on UK streets but for the purposes of the current research, it is the nature of the management of the two fires in 2018 that is considered key in terms of the relationship between the Council and business owners during the project.

It appears that a somewhat perverse effect of the fires was the strengthening of relationships between the Avenues Team and business owners due to the deployment by the Council of a Business Liaison Officer in the aftermath of both fires. This not only provided distressed business owners with a direct point of contact in the immediate aftermath, but also came to strengthen business relationships with the Avenues Team, as the lines became increasingly blurred between the second Art School fire and the pilot project (Delivery Manager, interview, 2021). After the second Art School fire, the Nightclub Director recalled the street outside his nightclub looking like a “bombsite” and the situation feeling “very, very, very, very confusing at the time”. However, he described the Business Liaison Officer as being “all about enterprise and trying to help the businesses through this sticky patch”, going on to explain how the Avenues Team also came to be involved “because the roads were all getting mixed in with it … along with the fire” (Nightclub Director, interview, 2021). The Project Manager eventually joined the Business Liaison Officer at the fire response meetings because there was so little distinction between the impact of the fire and the impact of the construction (Business Liaison Officer, interview, 2021).

Despite the business owners implying that there had been an inevitable level of negativity towards the Council during the project, the interviews painted an overall picture of a positive, mutually reinforcing relationship between the Avenues Team and key business owners with both parties able to recognise the other’s role in the ongoing flourishing of Sauchiehall Street. This points to the importance of not just building relationships in the early stages of a project, but proactively maintaining these during the actual construction. Indeed, the

shaping through ‘space in use’ occurred right from the outset of construction in this case, not just once the ribbon was cut on the completed street.

The previous section in this chapter discussed the role of the network of ‘official’ agents in the wider project team but the interviews with the business leaders revealed what might be considered to be a parallel network of informal agency operating amongst stakeholders before and during the project. The former Chair of the BID indicated that this informal network appeared sometimes to be more instructive than the official communications from the Council. He described being in a meeting, “literally sitting with, you know, top level people and they couldn't give us an answer … but then we left the meeting and I went on to one of the WhatsApp groups and one of the construction guys had been in buying a paper and had detailed out to the guy – the newsagent – what was going to be happening, when it was happening…” (Former BID Chair, interview, 2021).

Conversely, the Nightclub Director shared how he had been able to use these informal communication networks to his advantage, explaining how he got contact details for the construction team on site and spoke to them daily, adding “probably shouldn’t say this, but when I went to Greggs for my coffee I brought them a packet of doughnuts every day, alright? Because I know that at certain points I had to get deliveries in and I wanted *my* section of the street to be open when I needed it [italics added]” (Nightclub Director, interview, 2021). These anecdotes demonstrate the level of informal agency taking place within the project, largely outwith the control of the Avenues Team.

To return to the idea of the knowing designer (Carmona, 2013), these informal agents may not entirely fit the image that this concept implies however they undoubtedly demonstrated their own types of knowledge and ways of knowing. One aspect of this was just simply how long they had been involved with the community and how well they were therefore known. The Nightclub Director recognised his position within the community, stating that “I would like to think, being in the street for so long, that I may be recognised as a person to come and speak to” (interview, 2021). This knowing was also manifest in the notable level of intimate knowledge that the former Chair of the BID, in particular, possessed in relation to the street, which he reeled off entirely unprompted during the virtual ‘walk’ up the street. Whilst certainly not “heroic form-givers” in design

terms (Bentley, 1999), these individuals arguably embody the concept of champion (Kemp et al., 2001) and the existence of this *informal network of knowledges* is perhaps key in understanding some of the ongoing functioning of Sauchiehall Street today. It is also worth reflecting that in this case, the relationships with key business owners were largely well-managed and mutually positive, however there may have been a different longer-term outcome to the street had this not been the case.

6.5 Summary

This chapter has reported and discussed themes resulting from analysis of the process phase of this research. A socio-technical transition lens was applied, framing the Sauchiehall Street pilot as a ‘niche’ innovation, and discussing the observable ‘regimes’, and ‘landscape’ contexts, surrounding it. Interview participants from several disciplinary backgrounds provided rich insight into the events and agency relationships that occurred during the project. Discussions centred around the nature of knowing and unknowing design (Carmona et al., 2003), with particular reference to the construction of the side roads, positing the existence of an additional ‘subconscious’ designer in this research. This suggested that existing concept of ‘knowing’ might be expanded to include acknowledgement of *networks of knowledges*, wherein agents are knowing, but constrained by their disciplinary and experiential regimes. Likewise, *informal networks of knowledges*, comprising agents outwith core project teams, might also be considered key in the championing and ongoing management of a 'niche’, such as Sauchiehall Street.

The analysis draws attention to the importance of identifying and mitigating (where necessary) the existence of regime-constrained practice in a street regeneration project. In the case of Sauchiehall Street, the actions of agents demonstrating regime-constrained, ‘subconscious’ knowledge have impacted the eventual design of infrastructural components, such as the side roads. The continuous footway niche received sufficient protection to allow it to be constructed, but it has since undergone regime pressure, including by its continued shaping through use, which has resulted in the final design changing to a more ‘watered down’ version with less inherent priority for active modes. It is

argued that this process has occurred firstly due to an overall *conceptual design gap*, caused by conflicting disciplinary regimes amongst project officers, but has been exacerbated by the existence of the *temporal design gap* inherent within the nature of established project processes that pass a design between the local authority and an external consultant, who then lose agency when the final design is taken back 'in-house'. These gaps are further exacerbated by an overarching *regulatory design gap*, which manifested at various points throughout the design and construction. In this instance, the lack of updated engineering standards demonstrating the acceptability of the continuous footway principal to the engineering profession allowed the incumbent regime within the profession to revert the final side road design to something more 'traditional'.

This initial analysis demonstrating the *conceptual design gap* suggests that the niche infrastructural components of the street may not have received sufficient protection to enable them to function as intended. Chapter 7 explores the extent to which this is the case and sheds light on further evidence of regimes operating to shape and constrain the functioning of the street.

Chapter 7: How are people behaving on Sauchiehall Street?

7.1 Introduction

This chapter presents and discusses the results from the observational phase of this research. Following on from the discussion of the design process in the previous chapter, this chapter primarily addresses **RQ2: is the design of Sauchiehall Street enabling and encouraging the intended behaviour?** The review of the literature in Chapters 2 and 3 identified the importance of place, movement and public life functions in the successful operation of a mixed-use street, each of which has anticipated behaviours associated with it. This chapter also focuses on the street as 'space in use' (Carmona, 2014), adopting the philosophy that behavioural regimes (in socio-technical transition terms) will be important in shaping how people instinctively use street infrastructure. The methodologies developed for the observational data collection were designed to allow for analysis of these regimes and the implications for the infrastructural niches.

The redesigned street contains relatively novel infrastructures in the UK context, such as footway-level cycle track, mature street trees, and continuous footway at side roads. However, the analysis presented in Chapter 6 indicated that the planning and conceptualisation process had impacted the final design of some of these infrastructures, potentially undermining their operation. These novel infrastructures therefore form the focus of this phase of the research, which ultimately seeks to investigate how people are behaving on the street and what the implications of this are for the wider potential for sustainable transitions.

The chapter focuses on three specific aspects of the street, allowing for analysis of place, movement and public life: (1) 'lingering' behaviour (Gehl, 1987), (2) the functioning of the footway-level cycle track in different conditions, and (3) behaviour at side roads. The newly regenerated section of Sauchiehall Street (Figure 55) forms the main experimental focus, whilst the older pedestrianised section of Sauchiehall Street and sections of Argyle Street form controls (Figure 56). The data presented here are primarily quantitative, however, qualitative narration is provided alongside to provide a richer sense of the data, echoing the

approach adopted in other public life research (e.g. Whyte, 1980; Gehl and Svarre, 2013).

Figure 55: Pedestrianised (left) and regenerated, non-pedestrianised (right) sections of Sauchiehall Street. Images © author.

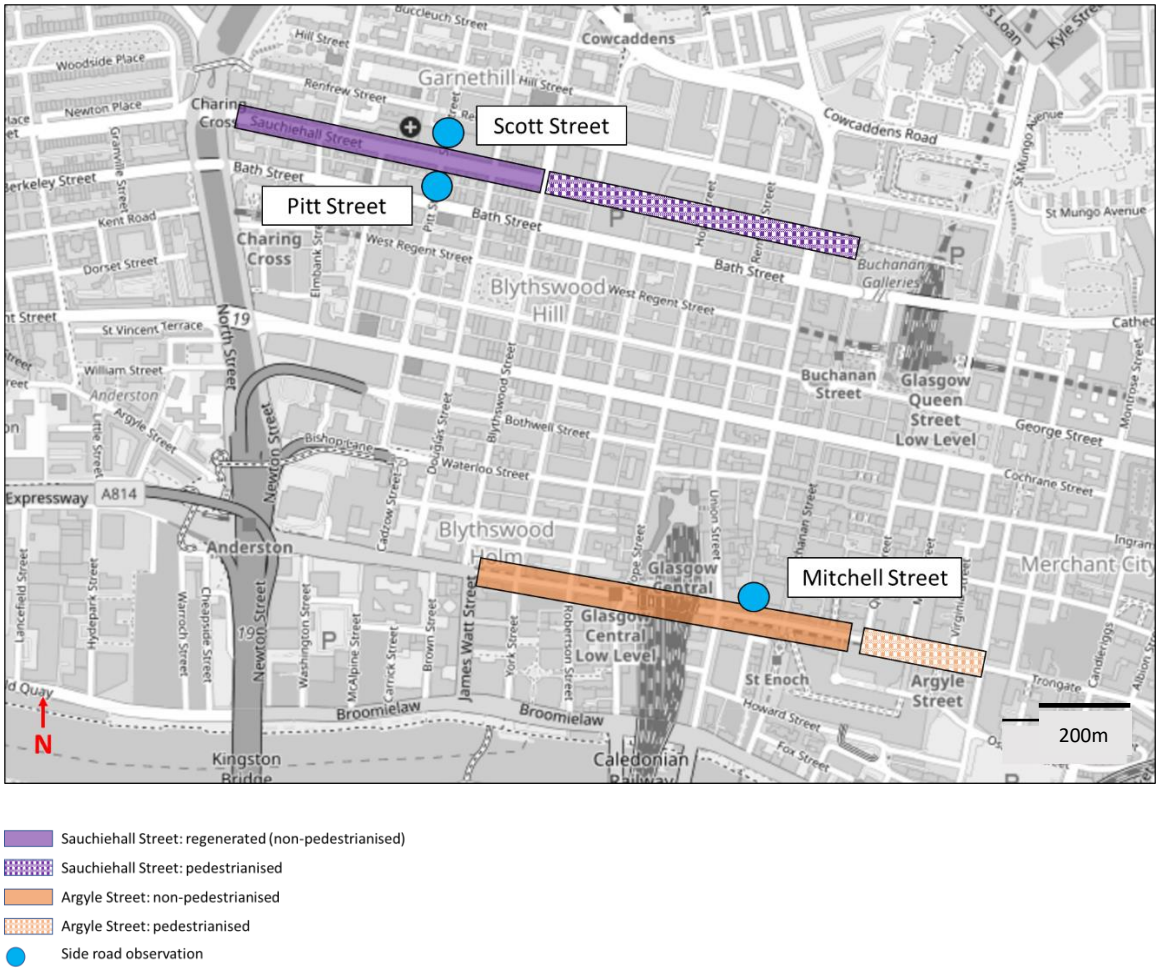


Figure 56: Location of study sites within Glasgow city centre. Map © OpenStreetMap Contributors. Annotations added by author.

7.2 Lingering behaviour

As discussed in Chapter 3, the public life of a street is conceptualised by Gehl and Svarre (2013) as a function of public space. This can be characterised as the liveliness of the street, which can be measured by capturing what Gehl describes as lingering behaviour (2010), a key aspect of the social sustainability of a street. The first sub-section presents the observational data relating to public bench and commercial seating occupancy on Sauchiehall Street, identified by Whyte (1980) as a key indicator of lingering behaviour. The second sub-section presents an overview of other lingering behaviour that was observable on the street, concluding with a discussion of whether the street is enabling optional and social activity, rather than merely necessary activity (Gehl, 2010), as well as the type of sociability behaviour that was observable (Mehta, 2019).

7.2.1 Bench occupancy

This first sub-section presents the results of observations made of the benches along Sauchiehall Street and Argyle Street.

7.2.1.1 Types of benches

Benches form a key component of the newly regenerated section of Sauchiehall Street with new, fixed seating located at regular intervals along the length of the street (Figure 57). Businesses along the street can also apply to place commercial seating outside their premises on the footway – ‘pavement café’ style – which provides additional, paid-for seating.

Figure 57: Benches installed at regular intervals in the central median along the length of the new section of Sauchiehall Street. These are wooden with backs and armrests, oriented such that they face the street with their backs to the carriageway directly behind. Image © author.

There are older benches along the length of the pedestrianised section of Sauchiehall Street, mainly made of metal, with armrests and backrests sometimes present (Figure 58). Argyle Street, conversely, consists of a mix of benches and stone pillars along the length of the pedestrianised section. It is not clear what the intended use is for these – they are perhaps anti-hostile vehicle measures – but because of their height and flat top, they afford a level of seating. Indeed, some appear to have had a wooden top retrospectively fitted, perhaps to make the sitting more comfortable (Figure 59).

Figure 58: Seating located along the older section of Sauchiehall Street. These benches are metal with various combinations of armrests and backrests, some of which are missing. Image © author.

Figure 59: Secondary seating on Argyle Street where stone pillars have been topped with makeshift wooden seats. These appear to afford temporary resting space for people. Images © author.

7.2.1.2 Bench occupancy rates

Sauchiehall Street has 70 public benches in total, of which 29 are in the regenerated section, 41 in the pedestrianised section. Argyle Street has fewer benches: 28 in total, of which 11 are in the non-pedestrianised section and 17 in the pedestrianised section. However, it also has 24 posts in the pedestrianised section, providing a total of 52 theoretical seating opportunities.

The heatmap in Figure 60 shows the bench occupancy rates along both sections of Sauchiehall Street averaged across all data collection sessions. The green-blue areas show benches with the highest occupancy, whilst the red areas indicate benches that were not occupied at all during observations.

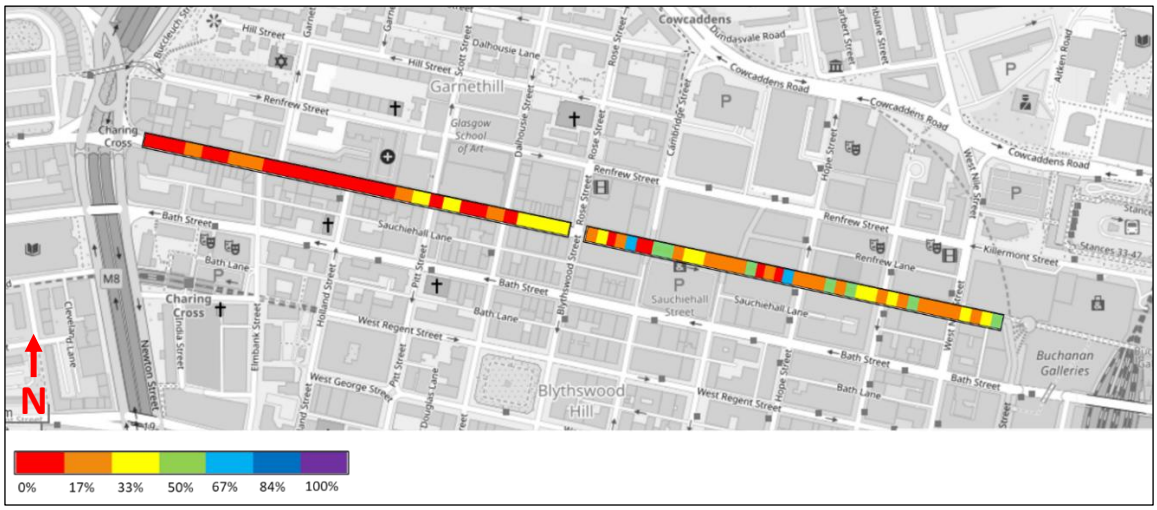


Figure 60: Bench occupancy rates on Sauchiehall Street, indicating proportion of time each bench was occupied relative to all observations. Red indicates that a bench was never occupied during observations. Map © OpenStreetMap Contributors, annotations added by author.

It is noteworthy that much of the 0% occupancy occurs in the regenerated section of the street and that benches along the westernmost portion of the street were almost entirely unoccupied. The overall average occupancy for the pedestrianised section of Sauchiehall street was 26%, markedly higher than the 9% average occupancy in the regenerated section. Whilst it is not possible to definitively explain this pattern, it could be hypothesised that the lower occupancy rates in the new section of the street are a result of it being further away from the core city and retail centre. It could, however, also be due to the type and orientation of seating being offered. Whyte (1980) notes that people

prefer what he terms socially comfortable seating: seats that are ideally moveable, such that people can create their own environment. Gehl (2010) additionally observes that people prefer to sit with their backs covered, to provide protection and a sense of purpose. The benches on Sauchiehall Street are exposed behind to the carriageway, which despite having fewer lanes than before, still provides a relatively noisy environment.

Comparing this to occupancy rates on Argyle Street gives a similar looking picture (Figure 61). As discussed in Chapter 5, it is difficult to identify an entirely reliable control when dealing with a subject as large as a whole street. As far as comparison is possible, it appears that the distribution of occupancy is largely similar on Argyle Street, albeit slightly lower on average. Rates vary between 20-40% in the pedestrianised section (east) with lower occupancy, often 0%, in the non-pedestrianised section (west). This might suggest that people are more likely to choose to sit in the pedestrianised section, both of which are nearer to the shops on the two streets. It could also be hypothesised that people prefer to sit away from the carriageway where noise levels tend to be lower.

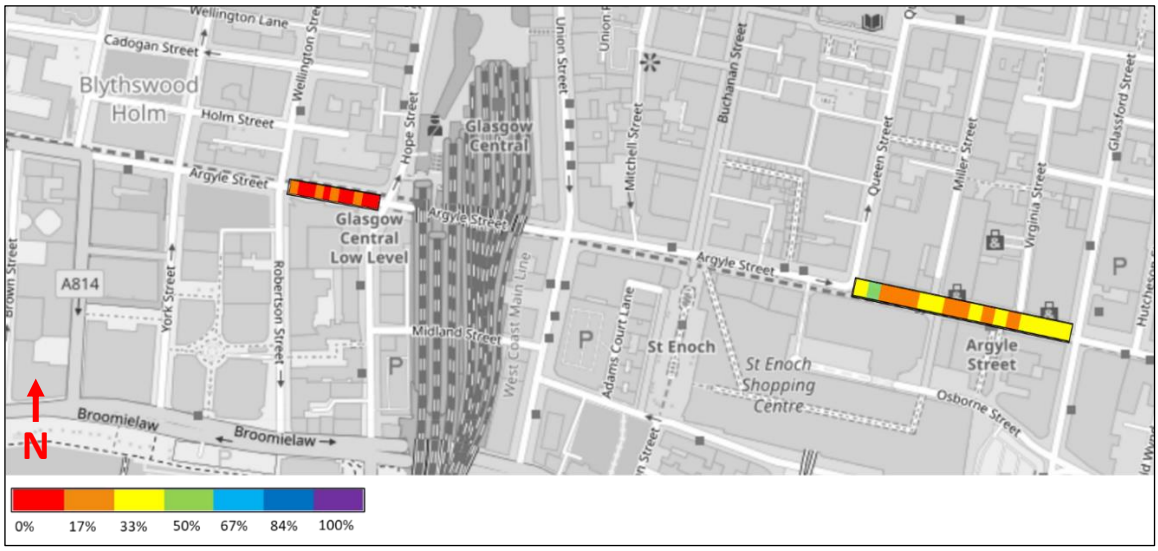


Figure 61: Bench occupancy rates on Argyle Street, indicating proportion of time each bench was occupied relative to all observations. Red indicates 0% occupancy. Map © OpenStreetMap Contributors, annotations added by author.

It is interesting to note that Sauchiehall Street possesses almost nothing that might be termed secondary seating, i.e. the “inherent features” of a street that can be made “sittable”, such as ledges or steps (Whyte, 1980, p.28). This places

a heavy reliance on the benches to provide all publicly available seating. Whilst enabling a cost-free version of 'enduring' sociability – formal socialising, which tends to form the economic backbone of streets (Mehta, 2019) – this perhaps restricts more spontaneous behaviour, in that benches cannot be moved (Gehl, 2010).

Argyle Street, conversely, consists of a mix of benches and stone pillars along the length of the pedestrianised section. It is not clear what the intended use is for these pillars but because of their height and flat top, they afford a level of seating (Figure 59). Table 9 shows that whereas occupancy rates are lower on the posts than the benches, they do provide an element of secondary seating, even if this is also not moveable. They are perhaps less comfortable for longer stays but they provide a space for sitting which can only be occupied by one person. This may well be an attractive aspect if physical space is required in a busy street environment, as well as perhaps providing a safer-feeling alternative to a bench where one could theoretically be joined by a 'stranger'. Even if people are not sitting on them, they offer a degree of definition in the space, akin to Gehl's 'piano effect' where people will tend to linger near objects that afford them a degree of control over their immediate environment (Gehl, 2010).

Table 9: Bench vs. post occupancy rates on Argyle Street.

	Benches (n=28)	Posts (n=24)
% occupancy total	27%	10%
08:30	6%	0%
10:00	20%	11%
17:00	94%	25%
Oct	29%	15%
Jan	6%	2%
Jun	47%	13%

7.2.2 Commercial seating

Sauchiehall Street is primarily a commercial street at ground level with a mix of residential and commercial premises on the upper floors of most buildings. The pedestrianised section comprises mainly retail and some financial premises

whereas the regenerated section offers restaurants, bars, pubs and nightclubs, as it did prior to the regeneration. Cafes are located variously along the full length of the street, and some have applied for outdoor licenses. Commercial seating is another example of infrastructure enabling formal 'enduring' sociability (Mehta, 2019). Commercial seating may offer slightly more flexibility, where it is possible to move individual chairs around, but people must pay to access these seats.

The Lead Designer for Sauchiehall Street suggested when interviewed that the widened footways were in part to allow for this 'café culture' to spill out onto the street (Lead Designer, interview, 2021). Indeed, observation of the street suggests that this is occurring, to some extent, along the full street but that there is noticeable seasonal variation. Figure 62 shows how the presence of outdoor seating in the regenerated section of the street is heavily skewed towards the summer. There were very few places to sit outdoors in October and January along the whole street, particularly in the regenerated section, and of the four premises with seating available in all three seasons, the only place offering seating consistently throughout the day was a Wetherspoons pub (Figure 63).

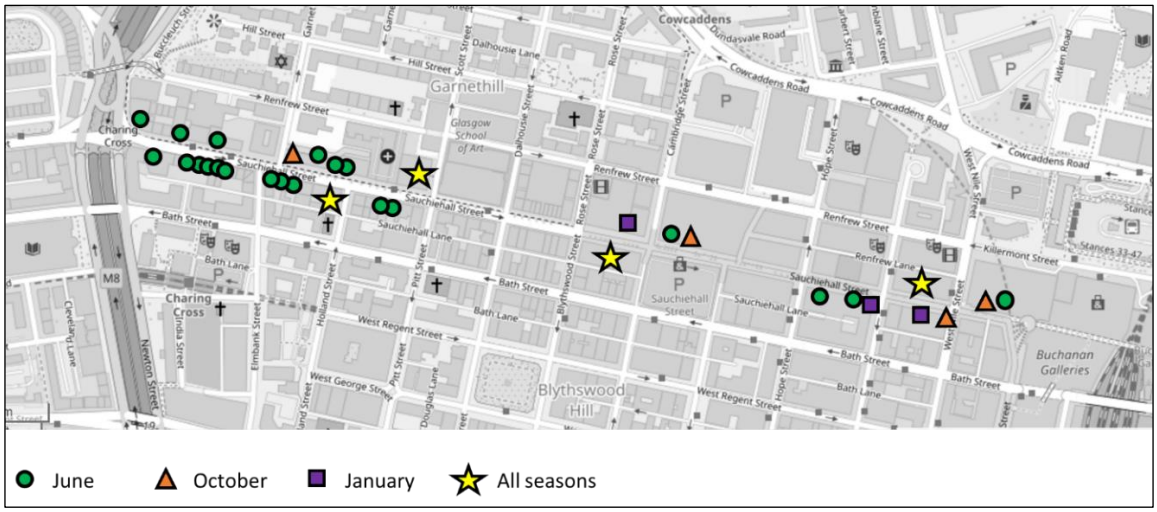


Figure 62: Presence and distribution of outdoor seating on Sauchiehall Street by season. Map © OpenStreetMap Contributors, annotations added by author.

It was notable that despite the widened footway, outdoor seating along the street sometimes caused inadvertent pinch points where people were forced to

give way to others walking, or to walk in the carriageway. The example in Figure 63 is on the south side of the street, without the cycle track, but this effect also occurred where the cycle track was present. This 'pinch point' effect is explored in more detail in Section 7.3.

Figure 63: A Wetherspoons pub on Sauchiehall Street was the only establishment that had seating available outdoors throughout each season and all times of day. Placement of the seating and signage pole here has caused a pinch point on the footway. Image © author.

7.2.2.1 Commercial vs. public seating

Figure 64 compares commercial seating and public bench occupancy rates on Sauchiehall Street, demonstrating a somewhat mixed picture. At the time when the street was observed, there were only five premises with outdoor seating on Argyle Street so Figure 64 below focuses only on Sauchiehall Street.

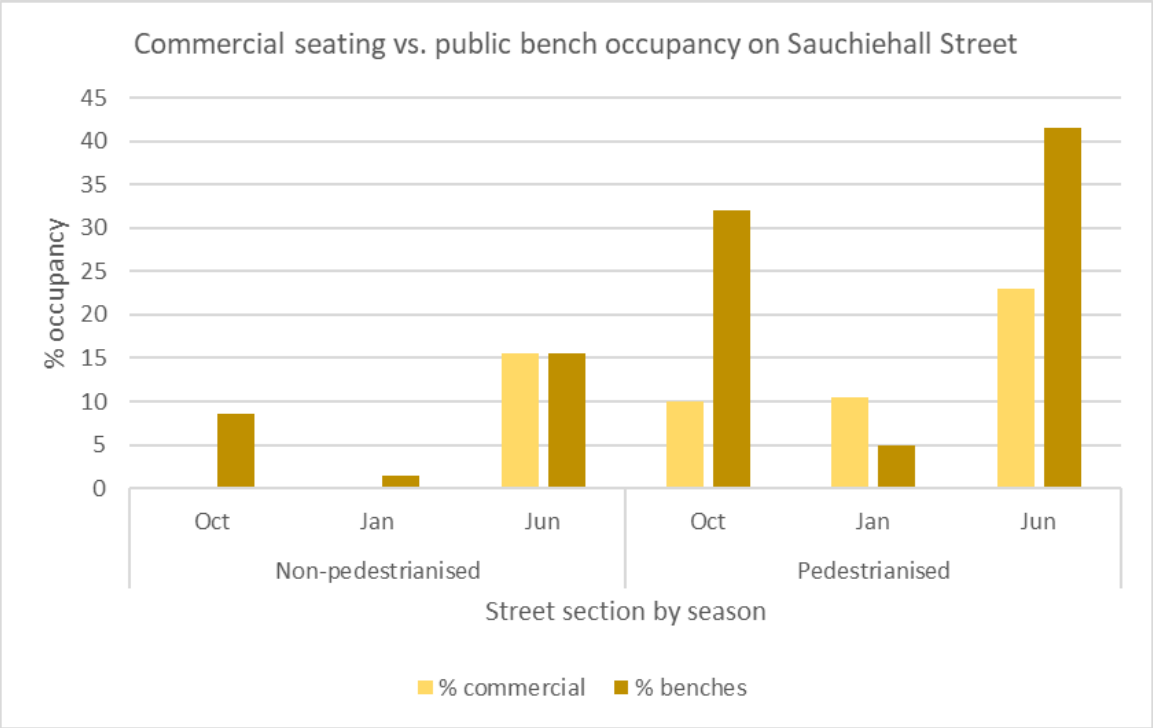


Figure 64: % occupancy on commercial outdoor seating vs. public benches on Sauchiehall Street in each section of the street across three seasons.

In the regenerated section of the street, where the commercial outdoor seating is a core component, no one was observed occupying commercial seating in October and January despite there being some level of public bench occupancy, albeit low. In June, however, the occupancy rates are 16% for both commercial and public seating, suggesting that the café culture effect is occurring to some extent in summer, as might be expected given the climate. It should be noted that the 16% in June is an average of 25% occupancy at 17:00 but only 6% occupancy at 10:00 so this primarily reflects people sitting outside pubs and bars, rather than cafes.

In the pedestrianised section, however, commercial occupancy rates are similar in October (11%) and January (10%), both lower than the average non-pedestrianised rate, whereas public bench occupancy is far higher in October (32%) than January (5%). This could reflect several factors, including people's desire for a hot drink in cold weather and people who would otherwise be sitting inside in January perhaps choosing to sit outside so they can smoke. It may also reflect the relative perceived physical comfort of commercial seating over benches in colder weather, even if this is still 'outdoor' type seating.

In June, the occupancy rates for both types of seating are higher than other months, but the bench rate (42%) is nearly double the commercial rate (23%). This suggests that when the microclimate is conducive, as it more likely will be in June, people are naturally responding to the invitation to linger on the street. That this is occurring more so on public benches than commercial premises suggests that this might perhaps be more spontaneous lingering behaviour, rather than planned activity, as might be expected for a commercial premise at 17:00. It also suggests that people are not necessarily willing (or able) to pay to spend time on the street.

A more critical analysis might therefore conclude that the commercial seating has been allowed, encouraged even, to occupy the prime seating locations on the street at the expense of 'free' public seating. Commercial seating in the regenerated section of the street is far more likely to meet Gehl's criteria for comfort by being located at the edge, with 'safe' cover behind, plus individual, moveable seating (Gehl, 2010) whereas the public benches are left to occupy 'leftover' space, which is exposed to motorised traffic directly behind, comprises only fixed, wooden benches, and requires crossing the cycle track to access it. Figure 65 demonstrates an example of non-active, or 'dead', frontage outside a private building on Sauchiehall Street. This particular example has an overhang and would offer some shelter from prevailing westerly winds. These otherwise 'leftover' spaces might perhaps be used for public benches.

Figure 65: An example of 'dead' frontage in front of a private building on Sauchiehall Street. This space provides an overhang, as well as some shelter from prevailing winds. Could this be a location for public seating? Image © author.

7.2.3 Whether the weather

Glasgow is a notoriously wet city and this will inevitably have some impact on lingering behaviour, especially bench occupancy. Full weather data for the observations is included in Appendix 7 but on average, rainfall was similar in October and January (around 20% of observations with slight or heavy rain) whereas the rate was higher in June (26% slight rain but never heavy). The average temperature in October was 11.5 degrees Celsius whereas in January it was 7.4, rising to 14 degrees Celsius in June. Full cloud (no direct sunlight) was recorded during 86% and 88% of observations in October and January and full sun only occurred during 21% of June observations. Slight to heavy wind was present during every observation, other than four sessions across October and January.

It was notable that the metal benches, particularly, very often looked wet, even if there was no rain during the observation. The location of the benches in the

centre of the street means they are also exposed to easterly and prevailing westerly winds. The commercial seating along most of Sauchiehall Street does not provide much cover from the rain, other than where premises have installed awnings, but it does allow people to sit tucked into the building line and therefore provides slightly more shelter from the wind, as well as (slightly) more inviting-looking plastic seating in places.

When it rained, people were observed sheltering under any available ledge or overhang (Figure 66), as well as in the vestibule of an indoor shopping centre. Many of these individuals were continuing the sorts of tasks they may have been undertaking outdoors – using phones, reading a paper, speaking on a phone. Significant rainfall inevitably deterred a few people from venturing out at all, but a sizeable number of people were observed carrying on regardless, suggesting the importance of providing public space that is as weather-resilient as possible. A few covered benches or outdoor seating spaces with overhangs would perhaps have allowed more people to carry on almost unhindered.

Figure 66: Resilience in a rainy city. In the absence of a bus shelter, people waiting for the bus simply tucked themselves into every available overhanging ledge during more heavy rain. Note that the image here shows George Square, adjacent to, but not part of the study site. Image © author.

7.2.4 The public life of benches

Following Jones et al. (2007), this research adapted the 'day in the life of a bench' to provide a snapshot of behaviours occurring on all benches along the

length of the street. A simple characterisation of observable behaviours offers some insight into the habits and requirements of 'lingerers', as well as providing some potential clues as to the effect of the setting on the potential for behaviours to occur. An initial pilot observation was undertaken to capture the most frequent activities occurring on benches and how people were interacting both on, and between, benches. Figure 67 shows the relative frequency at which these activities were observed, whilst Figure 68 indicates how likely the activities are to occur in both sections of each street. As this measure sought to capture the relative frequency of behaviours, it was possible for individuals to be classified as engaging in more than one behaviour at a time.

Mobile phones, now ubiquitous, are an element of public life that has changed significantly since the pioneering studies (e.g. Whyte, 1980; even Gehl, 2010) were carried out. Phone use was captured as either speaking on the phone ("speaking") or a phone held in a hand, such as might be the case when messaging or using apps etc ("in hand"). Glasgow has a bylaw prohibiting the consumption of alcohol in public places, so the term "drinking" here refers primarily to soft drinks. Interaction behaviour was captured between people on the same bench ("chatting" or "facing" each other) as well as between benches, where their orientation enabled this ("other bench").

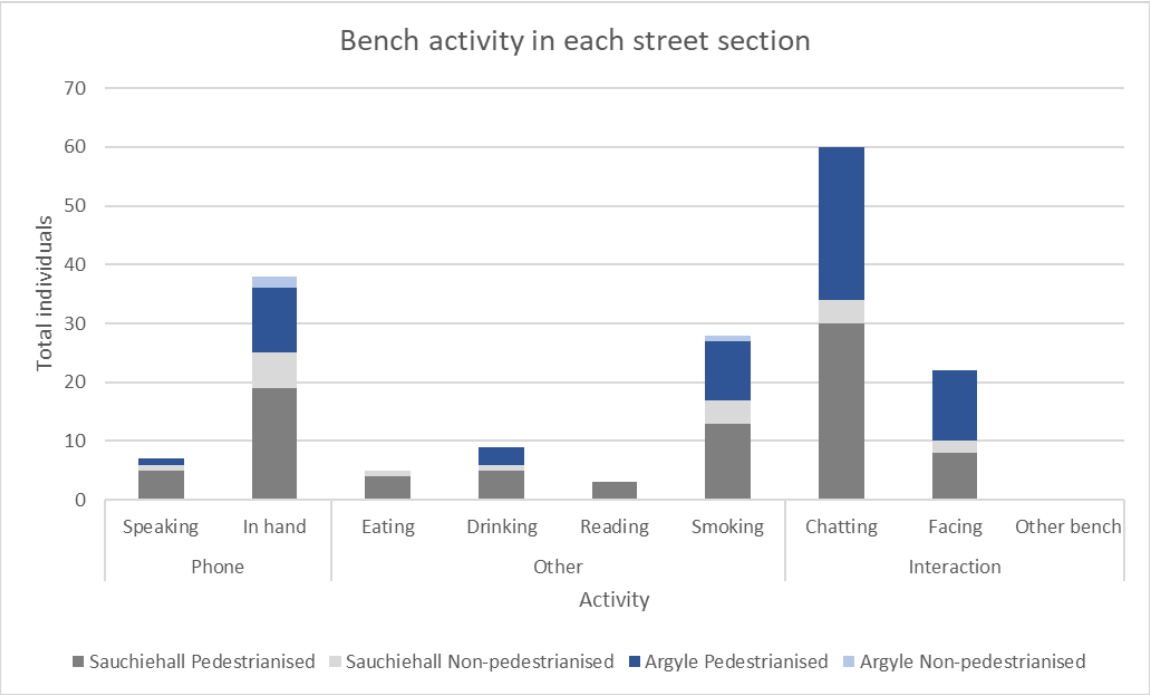


Figure 67: Interaction and activities undertaken by people sitting on benches on Sauchiehall Street and Argyle Street.

Figure 68 indicates the likelihood of each activity occurring within each street section when the number of benches available is controlled for. Smoking and sitting with a phone in hand are the only two activities that occurred in each street section. Indeed, both of these activities were fairly evenly distributed across each street section, i.e. they occurred regardless of the setting. Eating and reading were only observed on Sauchiehall Street and drinking was also more likely to be taking place there. These data do not control for time of day, however, and it might be presumed that eating and drinking are more likely to occur at mealtimes. Speaking on the phone was observed much more regularly on Sauchiehall Street and was slightly more likely to occur in the non-pedestrianised section.

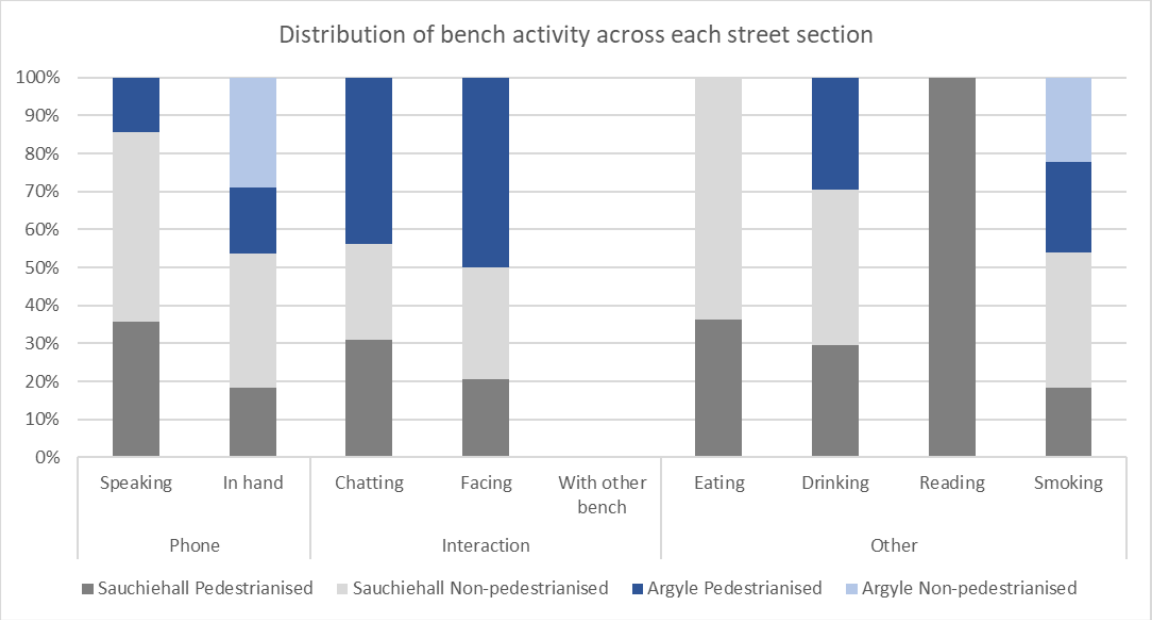


Figure 68: Distribution of bench activity across each street section on Sauchiehall and Argyle Street, controlling for number of benches.

In terms of interaction behaviour, individuals were observed chatting on benches more often in the pedestrianised section of Argyle Street than either section of Sauchiehall Street. Overall, though, the behaviour was occurring equally across both streets. Individuals facing each other on benches showed a similar pattern. It is interesting that no interaction was generally observed between individuals on different benches on either street, despite some of the benches in the pedestrianised sections of both streets being oriented at right angles to allow for

this. Likewise, chatting and facing behaviour were not observed in the non-pedestrianised section of Argyle Street however they were observed in the non-pedestrianised section of Sauchiehall Street. This is possibly indicative of the lack of secondary, flexible seating where people can arrange it to suit their needs.

A notable exception to this was delivery cyclists. It became apparent that delivery cyclists were clustering around certain benches on Sauchiehall Street, predominately those either side of Hope Street (Figure 69). One set of these benches were arranged such that they provided a sort of enclosure around which delivery cyclists could sit, meet and chat. This informal, transient community-making – an example of fleeting sociability (Mehta, 2019) – was observed on more than one occasion on Sauchiehall Street, almost exclusively in the pedestrianised section, but not so much on Argyle Street. It is unknown whether there was any basis to this in terms of proximity to takeaway outlets, but it certainly appeared that the street furniture in this instance was enabling this particular facet of public life to occur.

Figure 69: Transient communities of delivery cyclists waiting on benches on Sauchiehall Street. Two spots appeared popular, both offering some sense of enclosure: either between trees (left image) or where benches were angled such that they provided a sense of enclosure (right image). Images © author.

7.2.4.1 Other bench behaviour

A useful feature of observational methods is the ability to capture micro interactions occurring all over the place on the street, usually rendered invisible to the passing eye. Of little consequence in and of themselves perhaps, when multiplied up to the fullness of an entire street these little interactions can

often come to shape the feel of a place. Take, for instance, the two young children in the pedestrianised section of Sauchiehall Street who were fully engaged in a game that appeared to involve repeatedly clambering up and jumping off a bench, accompanied by squeals of joy. Young children are perhaps a good indicator of public life in a street in that their carefree 'at play' presence suggests an absence of danger that is sufficient both to permit *them* to play but also to allow a guardian to permit their play (Veitch et al., 2006).

Pigeons, in their own way, are also an interesting indicator. On at least two occasions, benches in the pedestrianised section of Sauchiehall Street were so full of pigeons, it would have been impossible for a person to sit there even if they had wanted to (Figure 70). If the natural inclination to shoo them away can be cast aside long enough, it might be considered that the presence of pigeons indicates a street that is both sufficiently devoid of vehicle risk to allow them to linger and is also indicative of a street that possesses a sufficient volume of people (and their rubbish) to attract the pigeons in the first place. On several occasions whilst observing, it was apparent that the well-timed stamp from a child's boot, provoking an entire flock of pigeons to take flight *en masse*, provided a source of great joy for small children. In addition, where children played, there was generally an adult to be found sitting on a bench feeding the pigeons or trying to coax them onto an outstretched arm.

Figure 70: Pigeons inhabiting benches on Sauchiehall Street provide an interesting indicator of public life. Image © author.

7.2.5 Inhabiters and workers

Whyte (1980) focussed much of his work around the study of North American urban space in the 1970s, primarily plazas where people were obviously sitting or standing around. In the case of Sauchiehall Street, even within the pedestrianised section it was difficult to judge who might be counted as 'lingering', as one might do in a plaza or square, because people were rarely stationary (Figure 71). Jones et al. (2007) identified 10 types of pedestrian activities in their mixed-use street study and all of these were observed in the current study. The remainder of this section focuses specifically on 'workers' and 'inhabiters' (ibid.), as these individuals could more often be observed interacting with street furniture, in keeping with the focus of the research. A new category of worker – the delivery cyclist – was also observed, updating Jones et al.'s (2007) typology.

Figure 71: What sort of behaviour might be judged to be 'lingering' in contemporary streets? People were often observed lingering to smoke by bins and there was a degree of what appeared to be 'aimless' lingering, but these individuals were generally transient. Left image taken in the pedestrianised section of Sauchiehall Street. Right image taken in the pedestrianised section of Argyle Street. Images © author.

'Workers' primarily comprised people operating as charity fundraisers, as well as occasional people selling the Big Issue magazine, construction contractors and people busking. Also present in this category were delivery cyclists, working for companies such as Deliveroo and Just Eat. 'Inhabiters', as defined in Chapter 5, refers to individuals who were observed sitting or standing on the street, often asking for money and sometimes with belongings. Sometimes these individuals

were observed sleeping in makeshift bedding. However, the term 'homeless' is avoided because it is not possible to form a judgement pertaining to homelessness based purely on observation. Between them, these individuals were present in all seasons, far outlasting the fair-weather outdoor coffee drinkers, and would often exchange a smile or a few words in return for the same.

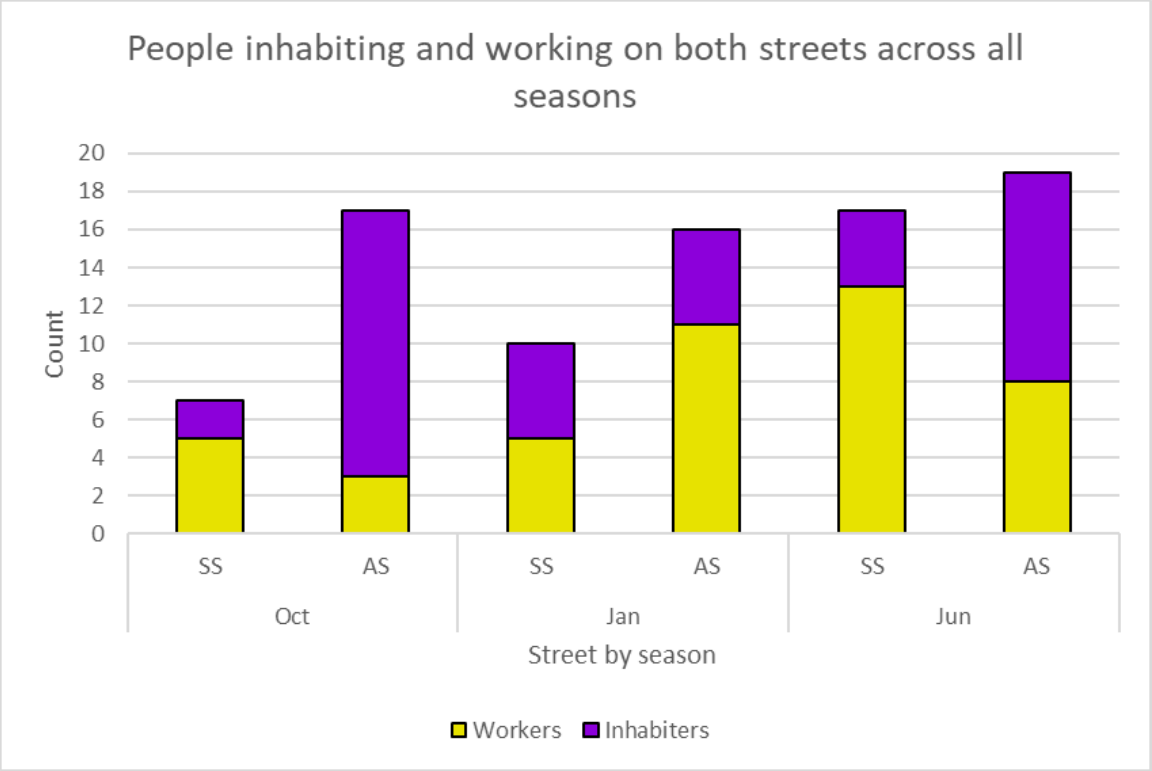


Figure 72: Number and distribution of inhabiters and workers on Sauchiehall and Argyle Street across all seasons.

Figure 72 shows how inhabiters and workers were distributed across Sauchiehall Street and Argyle Street. Over twice as many inhabiters were observed on Argyle Street and of these people, 100% on Sauchiehall Street were male and 91% white, whereas Argyle Street was inhabited by more female inhabiters (23%) and a greater ethnic diversity, mirroring the demographic profile of people lingering on benches. Workers, however, were observed almost equally across both streets and there were nearly as many women as men, although almost 100% of the men were buskers, contractors and delivery cyclists, whereas 100% of the women were charity fundraisers.

7.2.6 Interactions with street furniture

Returning to the subject of street infrastructure – how people are using it and what sorts of behaviours it instinctively affords – 39% of workers and inhabiters on Sauchiehall Street were interacting with some form of street furniture, whilst 73% were doing so on Argyle Street. Figure 73 indicates the type of infrastructure being used.

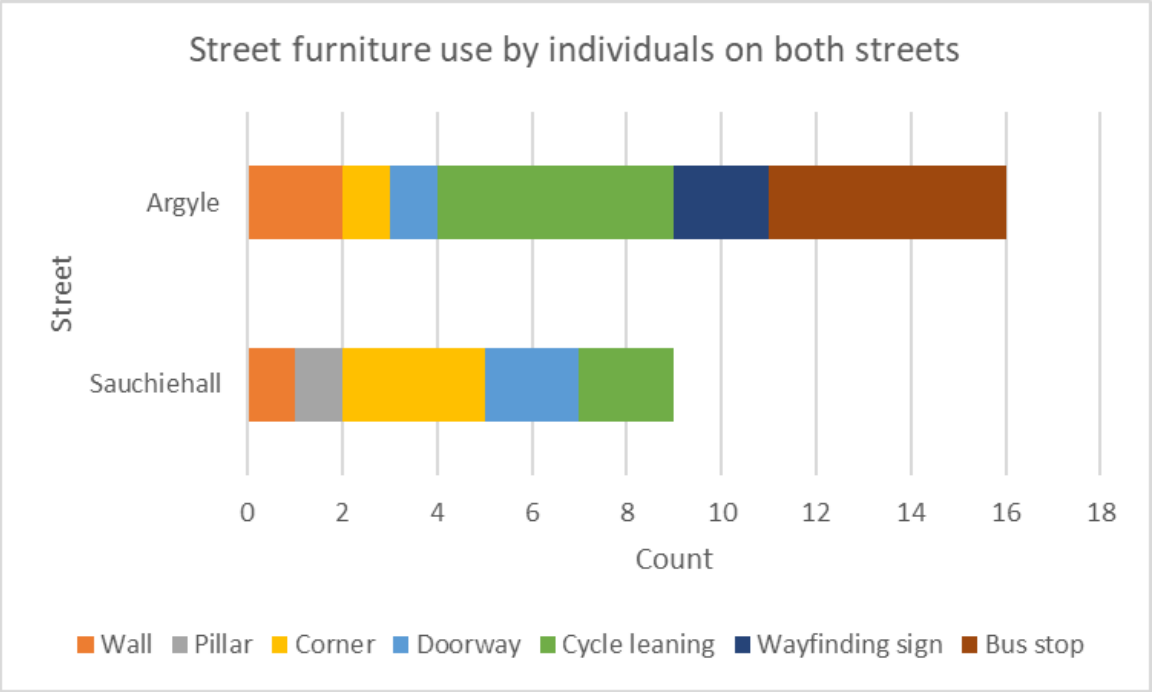


Figure 73: Interactions with street furniture types by individuals on both streets.

As might be expected, inhabiters were often found in doorways or corners, or leaning against walls and pillars. This again demonstrates Gehl's 'piano effect': the tendency to gravitate towards punctuation points in the street (pillars, bins etc) to provide some agency over the immediate environment (Gehl, 2010). Inhabiters are often the target of increasingly hostile design in public streets aiming to deter what is deemed undesirable lingering behaviour (Rosenberger, 2021). It is perhaps particularly important to note that simple street furniture can potentially afford some agency to people for whom socially legitimated private space is unavailable (ibid.).

Buskers were also often observed by punctuation points in the street. On one occasion, a group had fashioned themselves a makeshift stage, framed by two

lamp columns and with ample benches 'backstage' for their belongings. When viewed from behind, the audience 'auditorium' looked quite impressive with the whole street opening out (Figure 74). People were observed sitting on benches and watching the buskers, especially in summer, suggesting that their presence might be enabling fleeting sociability (Mehta, 2019).

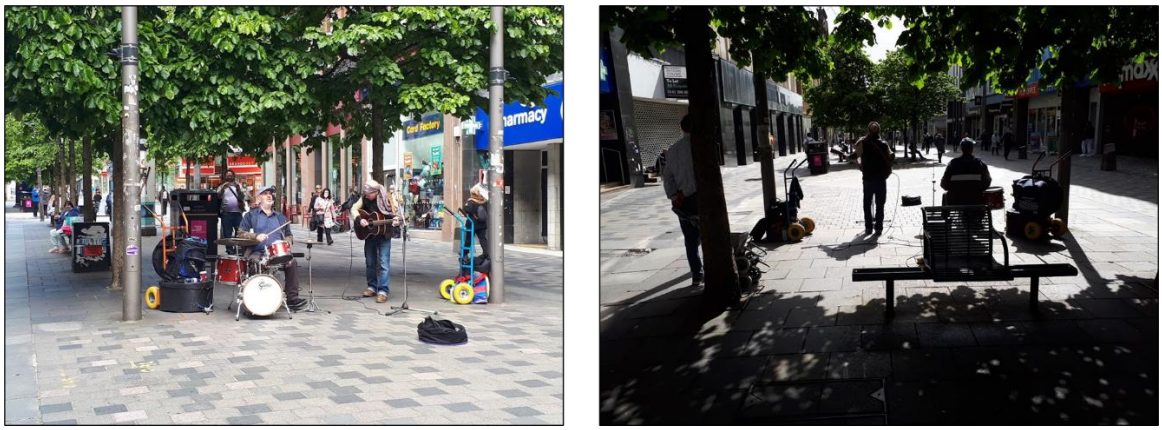


Figure 74: Buskers using street furniture to fashion a makeshift stage. Images © author.

7.2.6.1 Cycle leaning

The category “cycle leaning” is included in Figure 73. This term, newly used in this research, is used to describe individuals, predominately delivery cyclists, who were lingering *on* their cycles and using a variety of infrastructures (trees, railings, bus stops) to lean against to avoid having to dismount (Figure 75).

Figure 75: 'Cycle leaning' to carry out business without having to dismount, in this case using a tree on Sauchiehall Street (left) and a railing on Argyle Street (right). Images © author.

The presence of infrastructure that affords cycle leaning behaviour is perhaps an example of how urban design could specifically consider the distinctive view from the bicycle (Forsyth and Krizek, 2011), without providing infrastructure specifically for cycling. People will instinctively make use of street infrastructure in a myriad of ways once it is provided, lending weight to the idea that everything in a streetscape should be performing at least two functions in order to make the most efficient use of precious space.

7.2.7 The transitional potential of street infrastructure

This section has presented analysis of behaviour manifesting on benches along Sauchiehall Street, as well as various other pieces of street furniture. It was hypothesised at the start of the section that behavioural regimes will be shaping instinctive public life behaviour and this point is considered further here. In general terms, streets need to be attractive enough to be considered destinations in their own right to encourage people to visit them. The increase in internet shopping and out of town retail demonstrates what could be considered as new regimes governing the sorts of decisions that may affect whether people choose to travel to a city centre street at all. Once there, lingering behaviour is perhaps less governed by regimes but more so by the immediate availability and perceived attractiveness of lingering opportunities. It is apparent that benches on the street are enabling a degree of lingering to occur, supporting the public life of the street. However, this differs markedly between the established, pedestrianised section of the street and the newer, regenerated section.

Benches are hardly a new invention, and it is therefore perhaps less appropriate to frame them as technological niches, however some insight can still be gained from considering them as such. In terms of Strategic Niche Management theory (Kemp et al., 1998; Kemp et al., 2001), two important factors in the successful protection of a niche are that the advantages of it are highly desired, i.e due to the regime being under pressure, and that it is open to incremental improvement and evaluation by agents (Caniëls and Romijn, 2006). Whereas it is difficult to predict what sort of pressure may be applied in the future on e.g. out of town retail and internet shopping, if people are to be encouraged back to

UK commercial streets, it is perhaps important to think a bit more creatively about how street furniture could play a role in this by being made as attractive as possible, rather than purely functional. It is interesting to consider whether the concept of 'continual improvement' within SNM theory could be brought about through the availability of e.g. moveable seating, which can be made to be socially comfortable through the agency of people using it. These sorts of micro-level changes to seating, along with, for instance, making sure infrastructure supports cycle leaning, virtual sociability, and comfortable inhabitation, could perhaps lead to the spatial conglomeration of niches described by Ieromonachou et al. (2004), ultimately leading to regime change that would see people instinctively enacting public life behaviour throughout the street.

The next section presents analysis of behaviour on the footway-level cycle track, which runs along the length of newly regenerated section of Sauchiehall Street.

7.3 Footway-level cycle track behaviour

The footway-level cycle track (FLCT, DfT, 2020) installed along the regenerated section of Sauchiehall Street is an example of a relatively novel infrastructure in the UK, especially in the context of a mixed-use street (Figure 76). The design intention is for people to walk on the footway and cycle in the designated direction on the cycle track (see Appendix 6 for a more detailed description). Whilst a version of a shared-use path, it differs in that there is clearly designated space for each mode, physically separated by a raised delineator kerb, and it is located within a mixed-use street. As discussed in Chapter 2, systemic safety principles (Furth, 2019) include the concept of legibility, i.e. that infrastructure must be clearly readable and universally interpreted by everyone using it for it to function safely. Systemic safety, if applied systematically across an entire design domain, would form an example of a regime shaping design decisions.

Figure 76: Footway-level cycle track on the north side of Sauchiehall Street showing footway and bi-directional cycle track, with a 'mini' zebra crossing and tactile paving over the cycle track. Note the raised delineator kerb between the footway and cycle track, designed so someone using a long cane can theoretically detect the edge of the cycle track. Image © author.

Despite the absence of a mainstreamed systemic safety approach in the UK, members of the Avenues Team who were interviewed, whilst recognising that there were a few elements of the final street that could be improved, generally expressed the opinion that the FLCT was operating as designed, i.e. that people walking and cycling were doing so unimpeded and safely. This thesis argues that infrastructures such as the FLCT (and the continuous footway, discussed in Section 7.3) should be evaluated firstly according to systemic safety principles (Furth, 2017) but also according to their ability to enable Gehl's concept of 'life on foot' (Gehl, 2010), rather than merely permitting movement. In this case, it is argued, this would mean that people were interpreting the design as intended, and that the resulting behaviour was enabling everyone to use the street comfortably and safely.

Observing instinctive behaviour offers insight into how people are naturally interpreting the footway and cycle track, which allows for analysis of how well they are functioning relative to the behaviour intended by the design. This section presents analysis of people's instinctive walking and cycling behaviour whilst using the FLCT on Sauchiehall Street and a comparator section of Argyle Street. Behaviour is analysed both in a non-obstructed section of the street and when the footway and/or cycle track are obstructed, as could often be the case in a complex, mixed-use street. It is hypothesised that if the street design were functioning fully as intended, people would be behaving according to established

behavioural regimes, i.e. walking on the footway, cycling in the cycle track, and able to navigate obstructions in both without impeding other users.

7.3.1 Are people walking on the footway and cycling in the cycle track?

7.3.1.1 Sauchiehall Street

Figure 77 shows the proportion of people walking and cycling on Sauchiehall Street across all seasons who were doing so in the 'correct' part of the street, i.e. walking on the footway and cycling in the cycle track. Results are shown for the non-obstructed and pinch point observations.

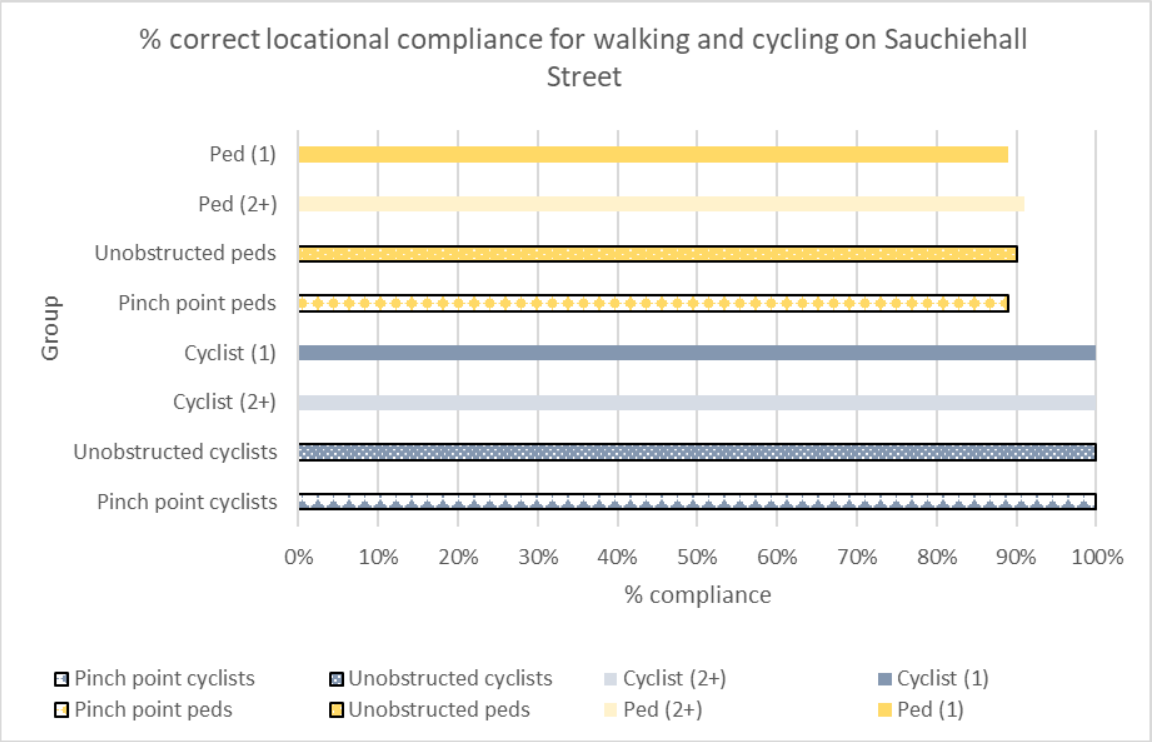


Figure 77: % correct locational compliance at unobstructed and pinch point sites for people walking and cycling on Sauchiehall Street across all seasons.

It is noteworthy that 100% of people cycling were doing so in the cycle track, even when a part of the street was obstructed and there were two or more cyclists traveling together. Pedestrian compliance rates are lower although clustered around 90%, meaning that 90% of people were walking on the footway and around 10% in the cycle track. Compliance is slightly higher for two or more

pedestrians than individuals. Indeed, 'herd behaviour' was often observed i.e., groups tended to either be entirely on the footway or entirely in the cycle track. These results suggest that established behavioural regimes are shaping walking and cycling behaviour, supported by the design of the infrastructure. It appears that when faced with an obstruction in the footway, people were slightly more likely to walk into the cycle track to avoid it than carry on along the footway, which may have required giving way to other people walking. But overall, the 'pinch point' rate is similar to the unobstructed rate, suggesting that the design of the FLCT is sufficiently forgiving, in systemic safety terms, to enable the behaviour intended by the design.

This also suggests, however, that despite having a very wide cycle track with markings, some people are still going to walk along it. This may have implications in terms of the potential speed differential between someone cycling and someone walking, given that the street is designed such that it is possible to cycle free of speed constraints. It is not possible to judge whether this pedestrian non-compliance is deliberate or oblivious behaviour however further research could include the use of intercept interviews to investigate this question further. It also appears that providing a sufficiently wide footway allows people to deviate round an obstruction without impeding the cycle track and likewise, providing a wide, unimpeded cycle track encourages people to cycle along it, rather than the footway. These findings point to the need to investigate more fully how systemic safety principles can be applied in a mixed-use street setting where it is not necessarily possible to entirely segregate walking and cycling.

7.3.1.2 Argyle Street

Data was also collected on Argyle Street at an unobstructed section of the street with comparably wide footway, eastbound carriageway, and a westbound contraflow cycle lane on the carriageway (Figure 78). Two pinch point control sites were used, the first where a bus shelter permanently obstructs the footway (Figure 79) and the second where temporary construction works on the footway caused a pinch point (Figure 80).

Figure 78: Unobstructed control site on Argyle Street with footway, carriageway and contraflow cycle lane. Image © Google Maps.

Figure 79: Pinch point control site 1 on Argyle Street where the footway is obstructed by the bus shelter forcing people to walk behind, in front or into the carriageway. Photo © Google Maps.

Figure 80: Pinch point control site 2 on Argyle Street where construction works forced people to walk either through a small gap between the barriers and advertising screen, or into the carriageway. Image © author.

Figure 81 shows the results of the observations at the unobstructed site and two pinch point sites. The absence of the cycle track means it is only possible to analyse how people walking behaved around the obstructions, not whether they would have impinged on a cycle track had there been one (see Chapter 5 for further discussion about the limitations of real-life controls). The 'correct' location in this case therefore refers to people remaining on the footway at the unobstructed site, on the footway nearest the building line at pinch point site 1 and on the footway at pinch point site 2. The 'correct' location for cycling is the carriageway (eastbound) and the contraflow cycle lane (westbound) for all sites.

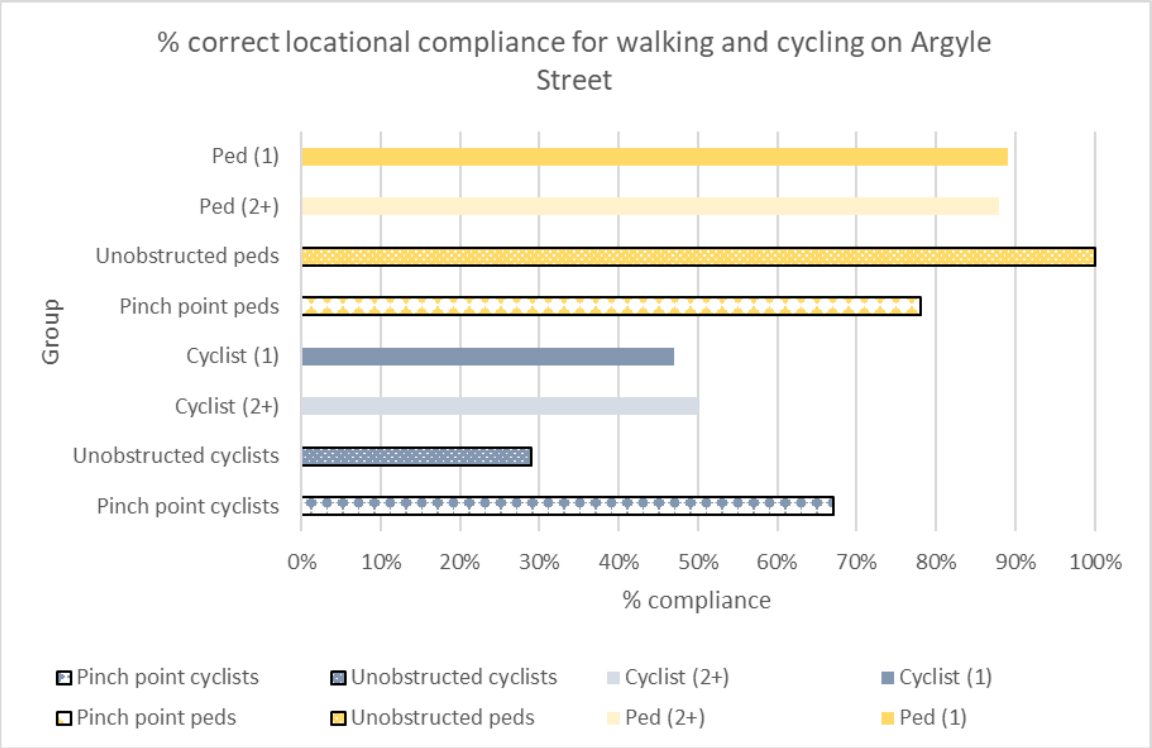


Figure 81: % correct location compliance at unobstructed and pinch point sites for people walking and cycling on Argyle Street across all seasons.

The cycling compliance rates are of particular interest in terms of comparison. The nature of the infrastructure on Argyle Street means that a low compliance rate in this case either means that people were cycling on the footway – the vast majority fell into this category – or cycling westbound along the carriageway into oncoming traffic. Just under 30% of cyclists were behaving as intended according to the design of the street at the unobstructed site. This is indicative of behavioural regimes that suggest it is acceptable (possibly based on perceptions of safety) to cycle on the footway. The pinch points on the footway did not specifically impact the intended cycling locations, other than potentially increasing the number of pedestrians stepping into the cycle lane and carriageway. Somewhat ironically, given that many people were cycling on the footway, these individuals would have been subject to the same pinch point effect as those walking, except diversion to the carriageway in this case would have been the 'correct' option. The higher compliance rate for cyclists at the pinch point sites could therefore just be due to the relatively low numbers of cyclists observed. Whereas there were far fewer people cycling on Argyle Street than Sauchiehall Street, a far higher proportion of cyclists were using the clearly communicated cycle track on Sauchiehall Street.

Pedestrian compliance rates are less suitable for comparison with Sauchiehall Street due to the lack of cycle track however some insight can be gained into instinctive behaviour. In the unobstructed category, 100% of people walked on the footway, rather than carriageway, suggesting that this traditional footway and carriageway layout is communicating clearly to people. 'Non-compliance' in the pinch point category is either a measurement of individual propensity to deviate from the building line to go round the inside of the bus shelter, or to step into the contraflow cycle lane, which only about 1 in 5 people were naturally doing. This relatively comparable rate with Sauchiehall Street might suggest that in the absence of motorised vehicles on the FLCT to signal danger, people are judging it safe enough to simply drift into the cycle track without too much thought.

7.3.2 What is the nature of interaction behaviour on the footway-level cycle track?

There is a discussion to be had about the extent to which a street such as Sauchiehall Street needs to function 100% perfectly in terms of compliance to be judged successful or safe, given that behavioural regimes are perhaps yet to be developed around the 'new' cycling-specific component. The risk of injury – both likelihood and severity – is perhaps lower where interactions are primarily between people walking and cycling, rather than with motorised vehicles. But reduced injury risk may not be the most appropriate indicator of successful functioning. There is very little research focussing on the safety and comfort implications of shared infrastructure, such as FLCT, especially in mixed-use street settings where commercial premises are also present.

Systemic safety (Furth, 2017) includes the concept of forgiving streets, i.e. design that allows for a degree of inevitable human error whilst remaining ostensibly safe. Gössling and McRae (2022) note that it is *observed* risks, as revealed by accident [sic] statistics, that are likely to be used by designers to improve the safety of infrastructures, yet *perception* is more important for predicting whether people will use the infrastructure. Their research found that cyclists perceived cycle infrastructure on the footway to be safer than sharing with vehicles, and that this was further improved by having clear separation

from the footway, especially if commercial activity was also present. Fewer than half of pedestrians in the study, however, perceived the presence of cycle infrastructure on the footway to be safe where commercial activity was also present (ibid.).

The cycle track on Sauchiehall Street, it should be noted, has been designed to be wide, direct and straight, with no design features designed to moderate the speed of people cycling, other than occasional pedestrian crossings. As detailed in Chapter 6, it was suggested that the priority afforded to people cycling in the completed street was greater than had been intended in the original design (Principal Officer, interview, 2022) and that this could negatively impact the overall function of the street (Professor of Urban Design, interview, 2021). Evidence suggests that drivers are more likely to drive faster on straight, open sections of road (Abele and Møller, 2011). There appears to be a lack of evidence as to whether this effect transfers to people cycling but it may be prudent to presume that it could. Indeed, cyclists were observed at times seeming to cycle quite fast, especially with e-bikes, but measurement of cycling speed on Sauchiehall Street would provide more conclusive data.

During the observation sessions (6 hours per street in total), several micro incidents and 'near misses' were observed where people were walking in the cycle track. On several occasions, cyclists swerved round pedestrians in the cycle track, often last minute, at speed (possibly for show) and sometimes accompanied by a barrage of expletives. Other cyclists chose to deal with pedestrians in the cycle track by bellowing at them from a distance or constantly ringing a warning bell, often with the result that pedestrians either froze in the cycle track or scattered, causing even more obstruction. People cycling also occasionally caused their own incidents, including one person spotting an acquaintance across to the far side of the track and swerving towards them, directly into the path of an oncoming cyclist.

Whilst none of the observed incidents resulted in injury, they certainly appeared to cause discomfort on the part of people involved. Aldred and Crosweller (2015) researched 'annoying' and 'scary' incidents, alongside minor and significant injuries amongst people cycling. They found that the total non-injury incident rate experienced by participants was far higher than reported rates, which tend only to occur where an injury has been sustained. They did not include the

perspective of people walking because the research focussed mainly on cyclist interactions with motorised vehicles. The Senior Highways Engineer at GCC reported that no 'serious' or 'fatal' incidents had been recorded on Sauchiehall Street since it opened, therefore suggesting that the street was functioning safely (interview, 2021).

Indeed, given the observed behaviour, it could be concluded that the FLCT is ostensibly functioning as intended and that the infrastructure is forgiving enough to prevent injury occurring even where it is not able to function as designed. The relative frequency of micro interactions, as observed, may also suggest however that it is not necessarily providing an entirely safe and comfortable experience for all users. Further research would be required to ascertain whether people perceived this to be the case, as this potentially has implications for the public life of the street.

A final point concerning the forgivingness of the street relates to an evening observation, which was carried out in January between 20:00 and 20:30 outside a busy nightclub on Sauchiehall Street. The obstruction in this case was a bedraggled and constantly revolving group of clubbers, many seemingly under the influence of alcohol, who were spilling out of the club, and straight onto the FLCT (Figure 82).

Figure 82: Nightclub attendees forming a transient obstruction in the cycle track and footway outside a nightclub on Sauchiehall Street. Images © author.

Given the relatively aggressive nature of the interactions between people cycling and obstructing pedestrians at times during daylight hours, it was surprising to note that despite the unruliness of the obstruction, people cycling

were almost without fail slowing right down, deviating slowly around people, and even sometimes smiling or exchanging words. The regenerated section of Sauchiehall Street comprises a high proportion of nightclubs and late-night entertainment venues and it was insightful therefore to note that this forgiving behaviour appeared to be occurring instinctively. Whereas it is not possible to deduce reasons for this in the absence of intercept interviews, a certain kind of public life appeared to be occurring here, even to the extent of encouraging the fleeting sociability (Mehta, 2019) that was observed between people cycling and those standing in the cycle track. This also highlights the importance of understanding how public life functions on a mixed-use street, which may have a 24-hour day.

7.3.3 Roving sociability

Section 7.2.4 discussed the notable presence of mobile phone use amongst bench dwellers on Sauchiehall Street. During pilot observations, it was observed that a number of people walking (and occasionally those cycling) were also using mobile phones whilst moving. These were either held in people's hands, as if sending a message or using apps etc, or people were speaking into them. There has been increased attention recently on the 'plight of the distracted pedestrian' in light of increased pedestrian injuries and deaths where phone use was a factor (Simmons et al, 2020). Research has tended to frame this as a road safety issue and make recommendations to restrict phone use, or at least to build in complex solutions to reduce risk, such as automatic warnings on the phone screen when approaching a crossing (Rahimian et al, 2018). Much of this research focuses on managing pedestrian risk but there does not appear to be any research focussing on the role of mobile phones in the contemporary social life of the street, especially where this involves movement.

Many adaptations are being made to vehicular modes of transport to enable people to carry out everyday sociable or necessary activity whilst on the move, such as charging points and Wi-Fi on buses and trains, and the introduction of increasingly autonomous vehicles. The FLCT is designed to provide continuous passage along the street for people walking and cycling, as well as safe horizontal segregation from vehicles. Given the ubiquity of mobile phones and their role in social (as well as business etc) communication, might it be

appropriate therefore to ascertain whether infrastructure could enable the safe use of mobile phones for equivalent everyday sociable or necessary activity for those walking (or cycling)?

Clearly, it is not possible to deduce why people are using their phones without asking them but given the extent to which phones are used for sociable purposes, it would seem appropriate to presume that a proportion of the observed behaviour was being carried out for sociable purposes. In keeping with Mehta's (2019) typology, this behaviour might perhaps be framed as *roving sociability*, i.e. that people are not necessarily stopping and lingering on a bench to carry out every day sociable tasks, but doing these on the move. This is a significant difference compared to the 1980s when Whyte was observing, where 'sociable' behaviour by default had to include there being more than one person physically there. Whilst framed in terms of sociability here, the same premise could apply to people being able to safely undertake e.g. business communication whilst on the move.

These days the social life of the street should perhaps as much be framed as people sitting on a bench or walking alone, whilst communicating with someone not physically present, as it is people gathered physically. Roving sociability might perhaps be viewed as an extension to Mehta's (2019) concept of passive sociability, which he defines as the social behaviour of being alone in public space, i.e. to be in the presence of others but without seeking direct verbal contact. However, it is argued that roving sociability is distinctly different in that it requires movement infrastructure to enable it to occur safely and comfortably, in addition to the sheltered alcoves and niches that Mehta argues are necessary stopping places for enabling passive sociability.

7.3.3.1 Phone use when walking

Figure 83 shows the relative proportions of people walking on Sauchiehall and Argyle Street who were observed using a phone either in their hand or to speak into whilst in motion. It was not possible to tell through observation whether people using headphones were on the phone or just listening to something, so these individuals were discounted unless a phone was clearly visible.

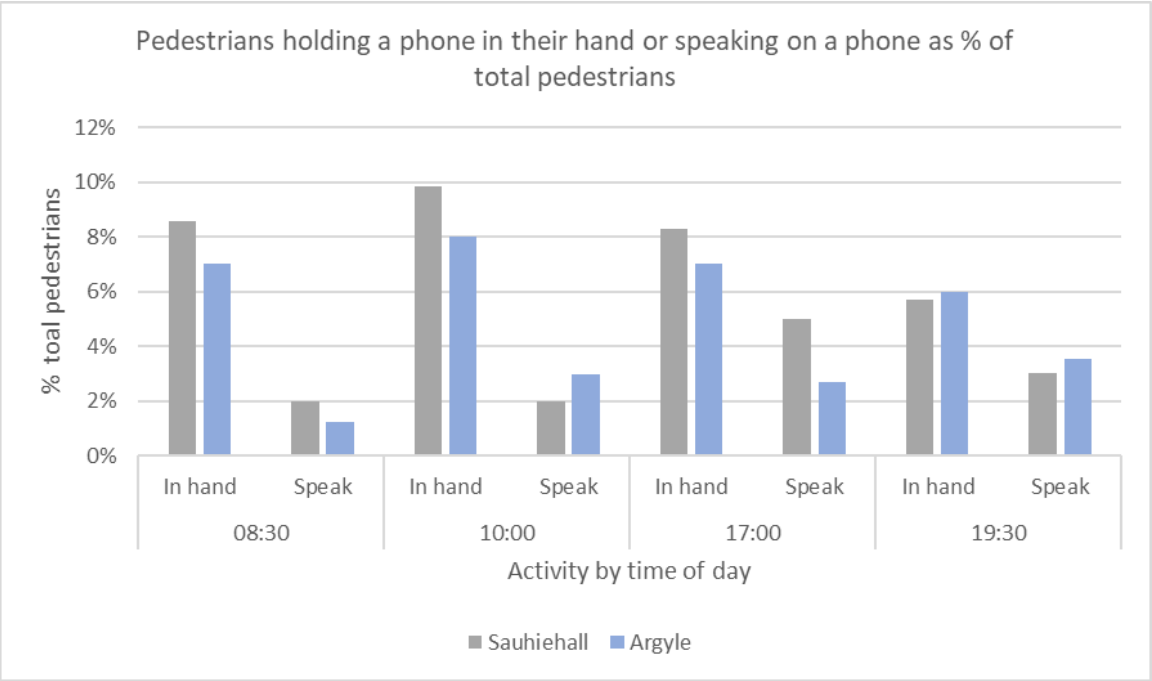


Figure 83: Proportion of total individuals walking who were using a mobile phone whilst moving either in their hand or to speak into.

Overall, between 6% and 10% of people were holding a phone whilst walking and this tended to be slightly higher on Sauchiehall Street than Argyle Street. Higher proportions of people were holding a phone than speaking into one, but at least 1% of people were observed using a phone across all observations.

The number of people holding a phone was higher on Sauchiehall Street than Argyle Street at all times of day except for 19:30, where fewer people overall were observed using a phone. Speaking rates were more variable with no clear difference between the two streets but notably higher numbers on Sauchiehall Street at 17:00 than other times. This perhaps indicates that people were using their commute to undertake sociable or necessary activities on the phone. This research did not record whether people using phones were also using the correct part of the street – this would be a useful subject for future research.

7.3.3.2 Phone use when cycling

Figure 84 shows the equivalent data for people cycling, as a total of all cyclists observed. It should be noted that the total figures for cycling were low and the

relative proportions of phone use even lower. But observations are nevertheless reported here to note their specific characteristics.

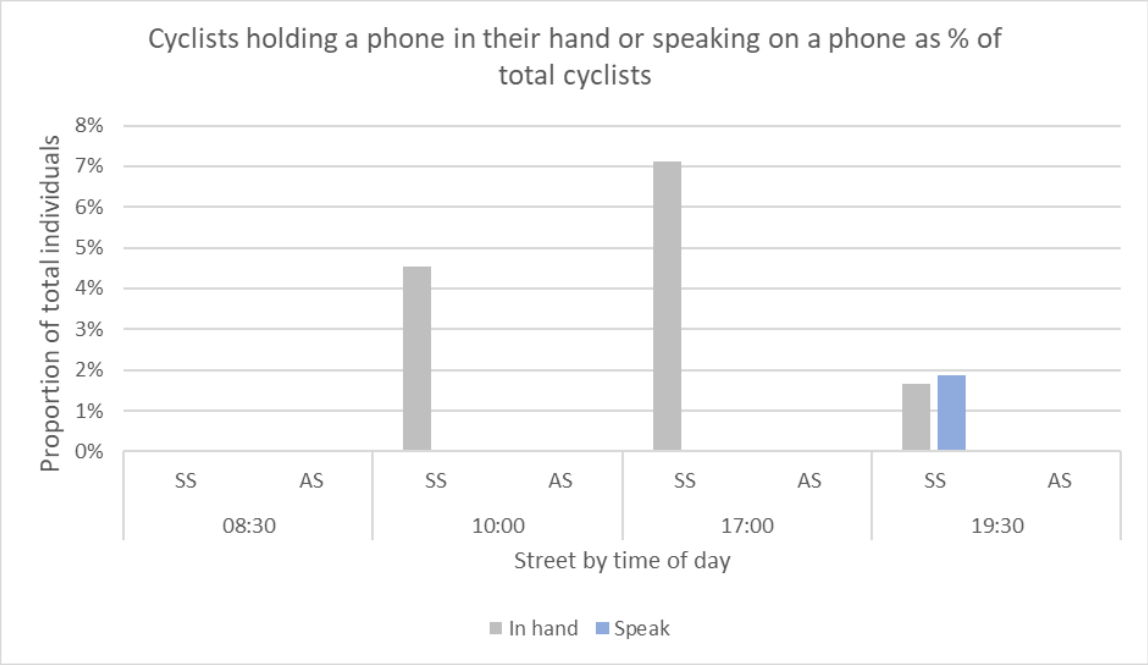


Figure 84: Proportion of total individuals cycling who were using a mobile phone whilst moving either in their hand or to speak into.

As with walking, higher rates of holding a phone in hand were observed than speaking into one. Unlike walking, phone use was only observed on Sauchiehall Street, lending weight to the argument that high quality infrastructure was enabling, and even encouraging, this behaviour. In this case, a high proportion of the cyclists observed holding phones in their hands were food delivery cyclists. On Sauchiehall Street, the average proportion of people cycling who were delivery cyclists at 17:00 and 19:30 was 30% and 67% respectively however the highest recorded total for 19:30 was 90% of people cycling. An emerging body of literature focussing on these delivery cyclists demonstrates the pressure they are often under, and the corresponding risky behaviours engaged in, including mobile phone use when on the road (Lachapelle et al., 2021; Oviedo-Trespalacios et al., 2022). Infrastructure such as FLCT might perhaps make the inevitable use of phones by people cycling safer for everyone.

7.3.4 The public life and transitional potential of the FLCT

This section has identified several behavioural regimes, including those governing where people instinctively walk along the street. It is argued that the FLCT on Sauchiehall Street is supporting these behavioural regimes, and, in this case, they are compatible with the street functioning safely. Section 7.4 discusses behaviour at side roads, where the incumbent behavioural regimes, especially on the part of drivers, need to be overcome for the infrastructure to function safely. The identification of roving sociability taking place on the street is perhaps also indicative of an emerging behavioural regime connected to ubiquitous phone use in contemporary life. It is argued that if a street is to support transitional change, infrastructure should be designed such that these behaviours can occur safely, rather than trying to design them out. If roving sociability is considered as an extension of passive sociability (Mehta, 2019), it can be seen how the design of the FLCT in this instance is supporting this public life behaviour.

Having analysed how behaviour is manifesting on the benches and the FLCT, the next section analyses the side roads, another novel design element of the streets, but one that the analysis in Chapter 6 showed was somewhat constrained by the design process.

7.4 Side road behaviour

The literature review in Chapter 3 painted a somewhat messy picture in terms of research into side road treatments in the UK, particularly concerning the definition and design of continuous footway, which is highly variable (Living Streets Scotland, forthcoming). The Lead Designer stated that he had intended for the side roads on Sauchiehall Street to be continuous footway, i.e. designed to afford full and unambiguous priority to people walking and cycling over people driving (interview, 2021). However, he and other interviewees described the eventual design as pioneering, but ultimately undermined by compromise (Lead Designer, interview, 2021; Project Manager, interview, 2021; Planning Consultant, interview, 2021; Principal Officer, interview, 2022). Chapter 6 details how late alterations were made to the intended design by highways

engineers at Glasgow City Council who were concerned about safety, but several interviewees expressed concern that the ambiguous priority in the final design would undermine its functioning (Professor of Urban Design, interview, 2021; Project Manager, interview, 2021).

Reiterating the discussion in Section 7.3 it is argued that infrastructures such as continuous footway should be evaluated for their safety and movement function, but also for their ability to enable 'life on foot' (Gehl, 2010). This is perhaps particularly key for continuous footway given that it is both relatively new in the UK, and involves a change to the established priority of people walking (and cycling) relative to people driving. This therefore also necessitates overcoming established behavioural regimes for both drivers and pedestrians that support driver priority. There is high onus on the physical design therefore to communicate clearly and universally to drivers to avoid fatal collisions. How the design communicates to pedestrians is also, arguably, important because pedestrians need to know unambiguously that they have priority to cross, even in the presence of a vehicle.

This final section therefore presents the results of the analysis of how behaviour is manifesting at two side roads with slightly different designs on Sauchiehall Street: Scott Street and Pitt Street (Figure 85), as compared to a similar location on Argyle Street (Figure 86).

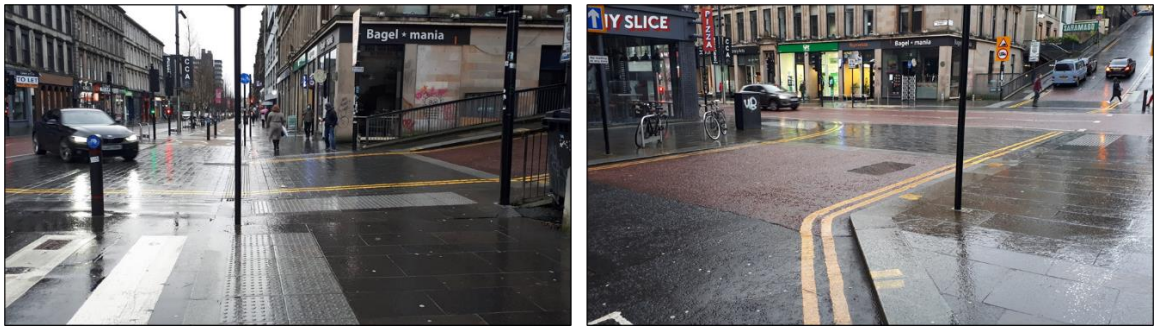


Figure 85: Scott Street side road looking westbound with a vehicle turning in (left) and Pitt Street side road looking northwest (right). Images © author.

Figure 86: Mitchell Street side road on Argyle Street looking northwest, used as a control. Image © Google Maps.

7.4.1 Measuring deviation behaviour

Chapter 5 details the methodology developed for analysing the side roads, which is based on a measure of how individual pedestrian and driver behaviour deviated from their established trajectory at the side roads. The intent in developing this measure was to capture movement in a manner which would allow for analysis of the public life being manifested through the movement. 'Full deviation' in terms of pedestrian movement therefore refers to individuals stopping entirely at a side road before crossing whereas 'no deviation' refers to continuous movement across the side road without hesitation. 'Significant deviation' and 'minimal deviation' refer to behaviour between these two extremes. The same approach was applied to driver behaviour with 'full deviation' meaning that a driver comes to a complete stop before turning into or out of the side road, and 'no deviation' referring to drivers who drive into or out of the side road without any regard for pedestrians crossing or without altering their speed (beyond that necessary to make the turn). Table 10 provides more detail as to how these categories were applied.

Table 10: Assessment criteria for each deviation category, applied to pedestrian and driver behaviour at side roads.

	No deviation	Minimal deviation	Significant deviation	Full deviation
Pedestrians	No glance up / no change in speed / "oblivious"	Glance up on approach / no change in speed	Slow down on approach / look around / break off conversation	Stop at side road / full look around / actively give driver priority
Drivers	No change to speed / force pedestrians to hurry or retreat / dangerous behaviour	Minimal slowing / force change to pedestrian behaviour / overrun yellow lines	Enter slowly / give way to people crossing	Stop regardless of whether pedestrians are waiting or crossing

Theoretically, if continuous side roads were performing perfectly, 100% of pedestrians would show 'no deviation' behaviour and 100% of drivers would show 'full deviation' behaviour. In reality, of course, there are other factors governing human behaviour, including individual propensity towards risk and factors such as eyesight, hearing and mobility. As with the assessment of locational compliance on Sauchiehall Street in Section 7.3, the measurement approach developed here does not specify a threshold for 'success' in terms of the relative proportions of deviation behaviour but this could be developed with further research.

7.4.2 How are people walking and people driving behaving at side roads?

7.4.2.1 Pedestrian behaviour

Figure 87 shows the distribution of pedestrian deviation behaviour on each street.

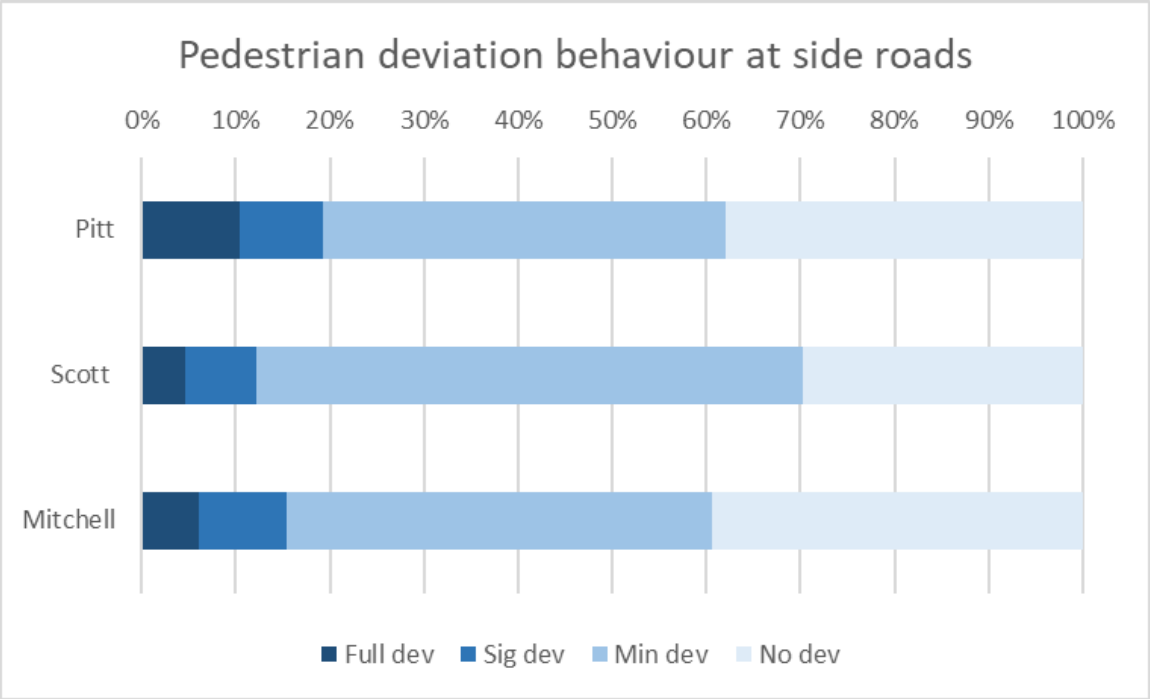


Figure 87: Pedestrian deviation behaviour at side roads as a proportion of total movements on each street. Count based on two 30-minute observations of each street, repeated two times in October and January. Pitt Street n = 182, Scott Street n = 305, Mitchell Street n = 466.

Pedestrians appear to be behaving similarly across all side roads with the majority of those observed demonstrating minimal or no deviation when crossing. This can perhaps be interpreted as a positive outcome for Pitt and Scott Streets, which are designed intentionally to elicit this behaviour. However, it raises questions as to why this is also the case on Mitchell Street, which is not specifically designed to give people walking priority yet has the highest rate of no deviation behaviour. Further analysis of the street suggests that it is behaving more like the continuous footway treatments on Sauchiehall Street, rather than a standard side road. This may be due to it being narrow, traffic flow exiting rather than entering, and also its location on Argyle Street, where other side roads are either signalised or pedestrianised. The footway is also flush with the carriageway at Mitchell Street, which even in the absence of continuous paving, may signal some level of pedestrian priority. Whilst perhaps therefore not

providing a good control in this case, Mitchell Street does provide an example of a different sort of design intervention, which appears to be eliciting similar behaviour to the designs on Sauchiehall Street. Further research at a more standard side road with kerbs and two-way running will be required, however, to ascertain whether Mitchell Street is indeed a suitable control.

Scott Street (Figure 85) has the cycle track running parallel to the footway. This provides a wider buffer between the carriageway and footway, as well as an additional visual cue for both drivers and pedestrians as to the priority of the active travel infrastructure. Pedestrians showed the lowest levels of full deviation behaviour on Scott Street, suggesting that the addition of the cycle track provided some extra encouragement to cross without fully stopping. That said, Scott Street pedestrians also showed slightly lower levels of no deviation behaviour here than Pitt or Mitchell Street. It may be that the cycle track is both providing extra reassurance in terms of a buffer from vehicles but also acting as a potential hazard that people walking are having to process. Further research into interaction events between people walking and cycling would help to elucidate this more clearly.

Pitt Street has the highest combined rate of full and significant deviation behaviour at just under 20% of people walking. The design of the street (Figure 85), which includes a relatively wide turning radius from Sauchiehall Street and carriageway flush with the crossing, means it is possible for drivers to turn in without slowing down much. The higher deviation rate perhaps reflects people instinctively behaving more cautiously here than Scott Street, where the cycle track provides an extra buffer.

This distribution of behaviour may also suggest that four categories of deviation is too many and three may capture behaviour more accurately. Indeed, it was sometimes difficult to make a judgement between minimal and significant deviation whereas the extremes were easier to categorise.

7.4.2.2 Driver behaviour

Figure 88 shows the driver deviation behaviour observed at the three side roads. It should be reiterated here that observations were recorded on a ‘pedestrian by

pedestrian' and 'driver by driver' basis, rather than one as the result of the other. The majority of driver behaviour on all streets fell within the significant and minimal deviation categories. A slightly greater proportion overall fell in the full or significant deviation categories on Scott Street, suggesting that drivers are behaving slightly more courteously here, possibly due to the additional visual cue provided by the cycle track. This was still less than half of all drivers though.

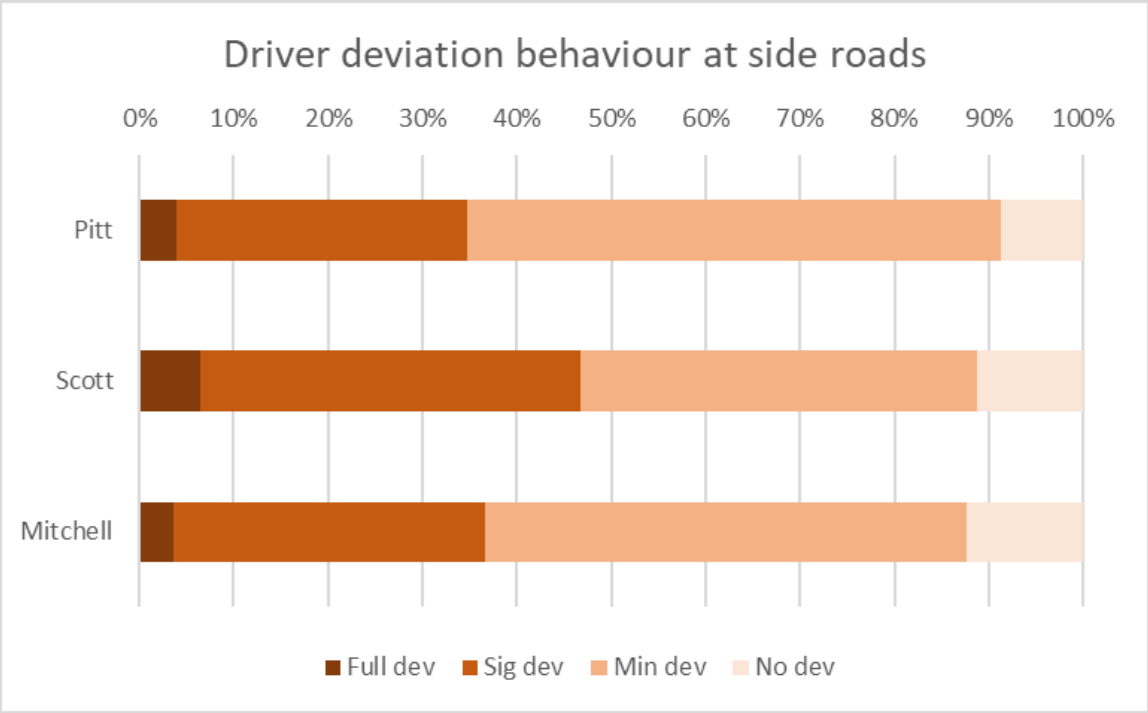


Figure 88: Driver deviation behaviour at side roads as a proportion of total driver movements per street. Count based on two 30-minute observations of each street, repeated two times in October and January. Pitt Street n = 150, Scott Street n = 62, Mitchell Street n = 126.

There is no corresponding reduction, however, in the proportion of no deviation behaviour on Scott Street, with rates comparable to Mitchell Street (where a higher rate may be expected due to vehicles turning out, rather than in). Indeed, Scott Street appears to be the street of extremes with drivers either showing higher rates of full deviation behaviour or higher rates of no deviation. This could be interpreted as drivers reacting to the new infrastructure by either driving more courteously, as shared space principles would imply (Hamilton-Baillie, 2008), or more dangerously. There could also be an effect of the significant incline up Scott Street (Figure 89). Drivers are perhaps turning in faster or more aggressively than usual because they are 'revving up' for the hill.

Figure 89: The "driver's eye" view turning into Scott Street side road, approaching the hill (left) and descending the hill on nearby Dalhousie Street with the continuous footway at the bottom (right). Images © author.

In terms of assessing how behaviour varied across what are effectively three different designs for side roads, Fisher's Exact tests were carried out for pedestrian and driver behaviour. The test returned a p-value of 0.0019 for pedestrians, suggesting that pedestrian behaviour is not independent of side road design (taking significance to be $p < 0.05$). This suggests that pedestrians are behaving significantly differently between Scott, Pitt and Mitchell Streets. This could be interpreted as people instinctively reading the designs of the streets and behaving accordingly, whether consciously or subconsciously. The same test, however, returned a p-value of 0.4745 for drivers, suggesting that driver behaviour and side road design are independent of each other. This suggests that drivers are behaving regardless of the design of the street and perhaps, therefore, that the designs are not communicating so clearly to drivers.

7.4.3 Walking with vs. walking against traffic flow

Sauchiehall and Argyle Street are both one-way for vehicles in an eastbound direction. Following pilot observations, it was noted that people walking eastbound, with the traffic flow, could not see vehicles approaching the side road in the way that people walking westbound could. Approaching vehicles could be *heard* on most occasions but it would be difficult to ascertain without looking round whether an approaching vehicle was turning into the side road or carrying on along the street. A further category was introduced therefore which was 'danger' or 'clear', i.e. could a vehicle be heard approaching (regardless of whether it was turning) or did the street sound clear. Whilst not universally applicable – some individuals were using headphones whilst walking and hearing

impairments would not be visible – this measure was applied to control for this effect as far as possible. Observations were also divided into westbound and eastbound.

7.4.3.1 Eastbound vs. westbound

It was hypothesised that individuals walking westbound would be more likely to show no or minimal deviation behaviour on Pitt and Scott Street due to being able to see oncoming traffic. Argyle Street is also one-way eastbound but vehicles are turning out so it was hypothesised that there should not be a difference between the directions at Mitchell Street. Figure 90 shows the results of this analysis.

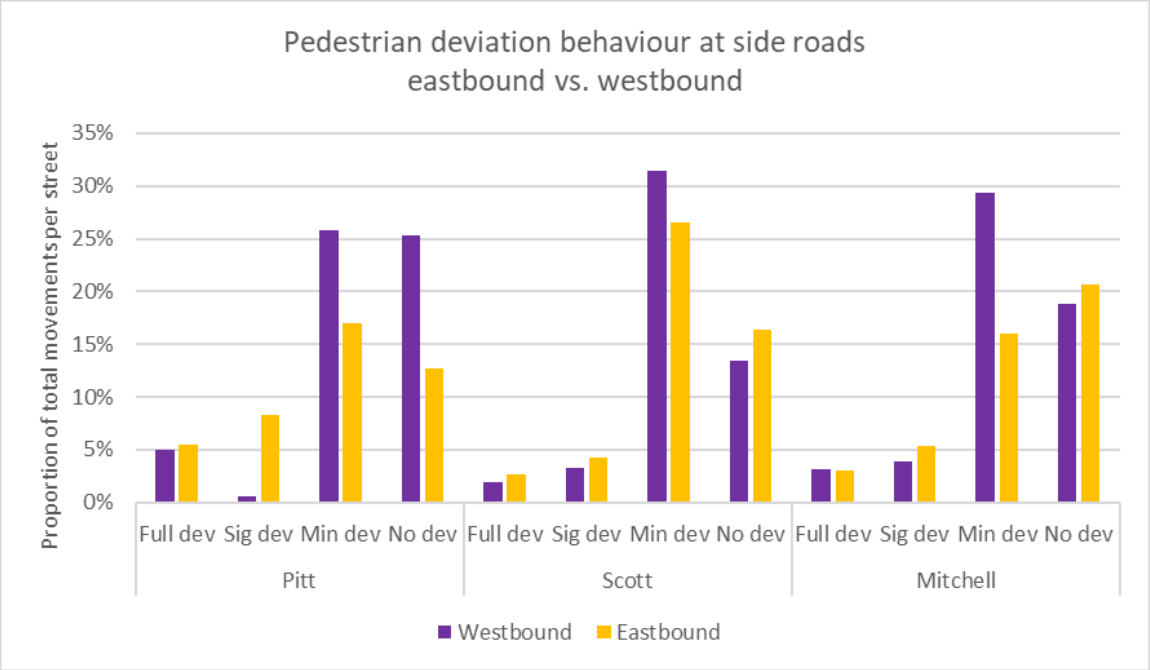


Figure 90: Pedestrian behaviour at side roads by eastbound (n = 440) and westbound (n = 512) movement as a proportion of total movements per street.

On Pitt Street, higher levels of minimal and no deviation behaviour were indeed observed for people walking westbound and lower levels of significant deviation, supporting the hypothesis. However, full deviation behaviour was comparable in both directions. It may be that those individuals who are deviating fully, i.e. stopping and even giving drivers priority, are exhibiting personal tendencies

towards risk and that the street design has not acted to override these tendencies. In socio-technical transitions terms, this is perhaps making visible the sort of regimes influencing people's instinctive behaviour at a point where they are interacting with vehicles. The design of the side road 'niche' has been sufficient to disrupt the regimes governing a proportion of people's behaviour but not all. Framing it in this way perhaps helps to identify how other aspects of the design, such as continuing the same footway paving through the side road crossing, could be modified to help protect the niche and exert more pressure on the regime.

On Scott Street, behaviour is more mixed with slightly more people showing minimal deviation behaviour westbound but more people showing no deviation behaviour eastbound. This supports the theory that this side road is more visually complex and therefore not communicating as clearly in either direction as Pitt Street. In socio-technical terms, the increased complexity of the design is perhaps diluting or dispersing the pressure that can be exerted on the regime. Argyle Street, as predicted, shows mixed results across each category, except for minimal deviation behaviour.

7.4.3.2 'Clear' vs. 'danger'

In terms of 'clear' and 'danger' behaviour, it was hypothesised that people walking would exhibit higher levels of no and minimal deviation behaviour when the street *sounds* clear and that this should occur on all three streets. Figure 91 indicates that this is indeed the case, with higher rates of no and minimal deviation corresponding to clear sounding streets and comparatively higher rates of full and significant deviation in the auditory presence of vehicles.

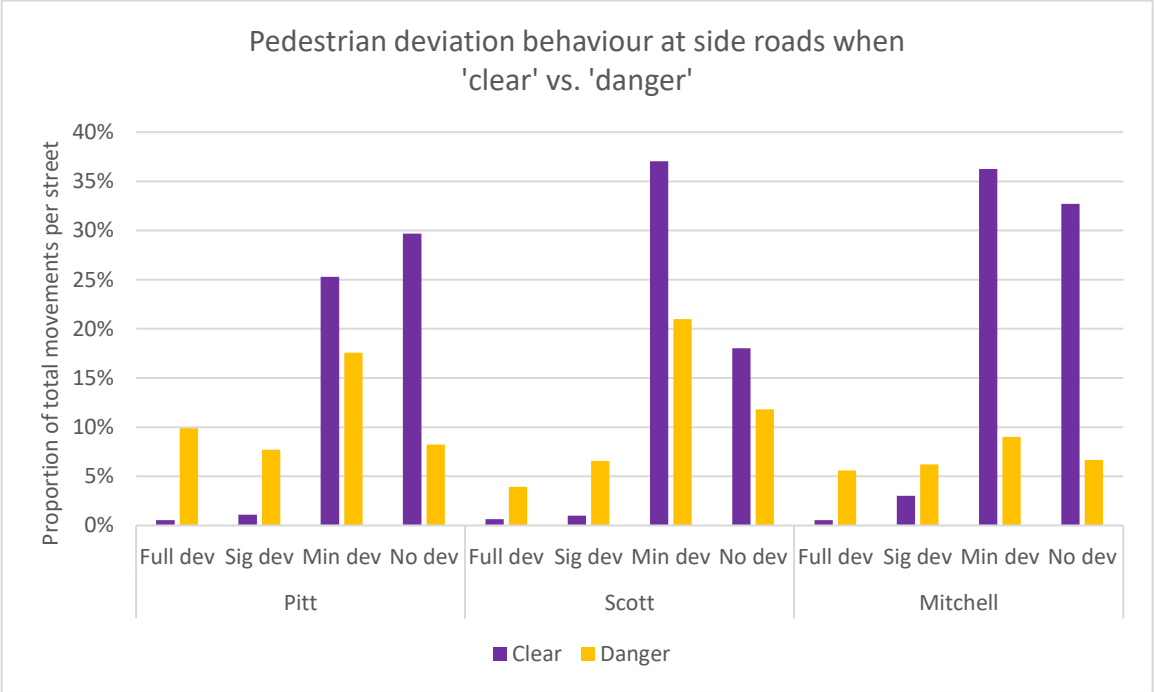


Figure 91: Pedestrian deviation behaviour at side roads when conditions were either 'clear' (no vehicle approaching, n = 614) or 'danger' (vehicle approaching, n = 339) as a proportion of total movements per street.

If the side roads were functioning perfectly, in theory, 100% of people would show no deviation behaviour even in the presence of vehicles approaching. That this is occurring slightly more on Scott Street suggests that it is having some visual communication effect in encouraging people to cross regardless of the presence of vehicles. This design, although imperfect, is a significant change to prevailing highways practice in the UK and will take a while to 'bed in', even with some level of continuous footway provision. To frame the idea of 'bedding in' in socio-technical transition terms, pressure is seemingly being exerted on the incumbent regimes, with some immediately observable impact on behaviour, but it will perhaps take a sustained period of pressure on the regimes to cement the change. So these initial results could be viewed as encouraging, if also a sign that the street is still not performing as well as it could do.

It is also notable that a small proportion of people walking are exhibiting full or significant deviation behaviour, even in the absence of vehicles. That these rates are low perhaps suggests that the street designs are suggesting priority for people walking, at least in the absence of vehicles. This would need to be researched further with a more suitable control, but it lends weight to the argument that both pedestrians and drivers need to alter their behaviour at side

roads for them to function successfully. If drivers approach in a manner that suggests they are not intending to stop, people will instinctively hold back but people encountering the side roads in the absence of vehicle cues appear to be more likely to continue walking without deviating significantly.

7.4.4 The public life of continuous footway

Qualitative observations were recorded alongside the quantitative data. As discussed above, this research did not intend to ascertain thresholds concerning safe driver deviation behaviour, nor what level of pedestrian deviation behaviour can be deemed successful in terms of the side roads functioning. A brief recounting of some of the incidents that were observed, however, might perhaps provide a visual contribution to this discussion. The following vignettes indicate small insights into what might be deemed to be the public life occurring at the side roads, including examples of roving sociability (Section 7.3.3) and lingering behaviour. However, they also detail several observed interactions that were aggressive, unpleasant or dangerous.

On Scott Street, pedestrians were occasionally observed crossing whilst using mobile phones in their hands, some without seeming even to glance up in the absence of an oncoming vehicle. It could be argued that this is the epitome of success in terms of infrastructure designed to afford pedestrian priority, especially because this behaviour indicated that roving sociability (Section 7.3.3) was occurring unhindered. Two sets of adults with young children were also observed crossing without deviation, neither stopping to take the children's hands, suggesting that they perceived the environment to be safe enough to exhibit this behaviour.

One evening in January, two men on cycles stopped for a full conversation in the middle of the junction (Figure 92). A driver approached slowly, at which point the men moved over slightly but only sufficiently to allow the vehicle to pass, at which point they waved in acknowledgement and carried on conversing for around five minutes. Whilst not a shared space design per se (Hamilton-Baillie, 2008), enshrined within this approach is the idea of encouraging connection between people in vehicles and those outwith, in order to create a safer environment for everyone. This is particularly noteworthy in that it suggests a

moment of fleeting sociability (Mehta, 2019) was made possible between a driver and someone not in a vehicle, perhaps demonstrating that public life can occasionally *include* vehicle drivers, rather than merely mitigating the presence of vehicles.

Figure 92: Two men were observed stopping for a chat in the middle of Scott Street side road. Image © author.

At the opposite end of the scale, drivers were frequently observed slowing when they saw a pedestrian waiting to cross but then continuing, sometimes waved through by the pedestrian. These low-level interactions were perhaps not even noticed by the individuals involved as they represent the existing norm (or regime). However, it is argued that this behaviour is merely perpetuating the regime, suggesting that the side road design, as a niche, has not been strong enough to break through yet. At worst, a van driver approached when a woman was midway through crossing but carried on regardless and drove very close to her before accelerating to screech the tyres just as she was clear of the crossing, leaving her shouting obscenities and visibly shaken. Many more incidents of micro-aggression were observed, mainly exhibited by drivers. Whilst much observational work was neutral, or even enjoyable, this incident, along with a few others at side roads, was very unpleasant to witness.

It is notable on Scott Street that the design of the side road means that the junction has a very wide splay of 12m or more. This is somewhat inadvertent but runs counter to best practice, which suggests that side roads should be narrowed as far as possible to promote slower turning speeds. Pitt Street (along with Mitchell Street) is narrower, but this did not stop many drivers cutting the corner, possibly due to the absence of a ramp up from the carriageway (Figure 93). One driver was even observed driving right across the footway *behind* waiting pedestrians.

Figure 93: Pitt Street side road is designed such that the footway is flush with the carriageway, providing no physical deterrent to drivers to stop them cutting the corner when turning in. Image © author.

There appeared to be a greater level of driver impatience on Pitt Street with several drivers sounding their horns at pedestrians who they deemed should not be stepping out into the crossing, and greater levels of visible muttering apparent. There were also more 'failed' attempts to cross where pedestrians moved substantially out into the side road, only to have a driver approach at speed and force them to retreat (classed as 'no deviation' on the part the driver and 'significant deviation' for the pedestrian). In addition, there were a couple of 'stand-offs', where pedestrians and drivers both attempted to assert priority. Some of these ended with pedestrians weaving their way between queueing vehicles. Others appeared to end with the driver stopping but looking either angry or confused. The absence of the additional buffer from the cycle track on Pitt Street meant that vehicles turning in were much closer to pedestrians

before the driver adapted their behaviour and this appeared to contribute to a level of micro-aggression where interactions occurred.

7.5 Summary

This chapter has presented the results of the observational phase of this research, enriched by additional narration of how the data were manifesting on the street. The chapter focussed on three 'niche' elements of the street: lingering behaviour, measured by bench occupancy, as well as people inhabiting and working on the street; walking and cycling behaviour at the footway-level cycle track when unobstructed and obstructed; and walking and driving behaviour at three differently designed side roads.

Key findings regarding lingering behaviour were as follows:

- Bench occupancy rates were generally much lower in the newly regenerated section of Sauchiehall Street compared to the older, pedestrianised section. It was hypothesised that the location of the benches in the middle of the street and exposed to the carriageway was making them less inviting. There is also a lack of informal or moveable seating on Sauchiehall Street.
- Commercial seating occupancy, where available, was generally low. In June, public bench occupancy rates were higher than commercial seating rates in the pedestrianised section, but this was not the case in the newly regenerated section. It is suggested that commercial seating has been allowed to occupy the prime (sheltered, protected) locations on the street at the expense of public benches.
- Various behaviours were observed taking place on benches, the most frequent of these being chatting, smoking, and interacting with a phone held in a hand. Given the ubiquitous presence of mobile phones in contemporary society, it is suggested that the concept of sociability behaviour be extended to include the notion of socialising with another person 'virtually'.
- Delivery cyclists were identified as a new category of street workers. These individuals were observed forming transient communities on

benches and sometimes using street infrastructure to undertake ‘cycle leaning’.

- Inhabiters and workers were also observed contributing to the public life of the street, often interacting with street infrastructure as a ‘punctuation point’, allowing a degree of agency over the immediate environment.

Overall, it was suggested that micro-level improvements to infrastructure in public life terms, such as moveable seating and enabling more comfortable sociability behaviour, may produce a spatial conglomeration effect that would help encourage people back to city centre streets, ultimately enabling longer-term regime change.

In terms of behaviour at the footway-level cycle track, it was found that:

- There was a high level of compliance with the ‘correct’ (intended) behaviour with 100% of people cycling doing so in the cycle track and around 90% people walking doing so in the footway. Whilst high, this means that 1 in 10 people were still walking in the cycle track.
- Obstructions in the street resulted in slightly higher levels of people walking into the cycle track but generally this rate was low, and the street appears to be operating in a systemically safe manner, despite some minor altercations.
- A new concept – roving sociability – was introduced to describe the behaviour of people using mobile phones in their hands or to speak into whilst walking or cycling. It is argued that a good contemporary street will be designed such that this behaviour can occur safely, recognising that it could be considered as a key component of passive sociability (Mehta, 2019) and increasingly important within contemporary public life.

The final section presented analysis of behaviour at the side roads. These are particularly important to consider because unlike the FLCT, where the incumbent behavioural regimes are compatible with systemically safe functioning, for the side roads to operate safely, established behavioural regimes, especially on the part of drivers, need to be changed. In general, it was noted that:

- Pedestrian behaviour fell primarily within the ‘minimal’ or ‘no deviation’ categories at each side road, which is an encouraging sign that the side road is functioning sufficiently well to bring about observable regime change on the part of people walking.
- However, whereas the majority of driver behaviour fell within the ‘significant’ and ‘minimal’ deviation categories, a notable proportion still fell within the ‘no deviation’ category. A Fisher’s Exact test confirmed that driver behaviour and side road design are independent of each other, suggesting that an insufficient level of pressure is being applied to these behavioural regimes.
- Instances where the design of the side road could be improved were identified, including recommendations to remove the raised table on Sauchiehall Street, install a steep ramp and narrow the junction width, thereby reducing the turning radii.

As per the discussion in section 5.4.3.1 of Chapter 5, the observation and analysis of the side roads considered the behaviour of people walking and driving independently of each other. This approach was used to capture instinctive behaviour at the side roads by people walking and driving. Interaction events were recorded via qualitative narration where these were deemed significant, i.e. notably dangerous or notably harmonious. The results presented here thus support conclusions relating to the instinctive interpretation of the side road infrastructure, as per the objective of this part of the research, rather than conclusions relating to the absolute safety (or not) of the side roads in terms of interaction events.

Overall, the analysis has approached the evaluation of physical infrastructure not only from a functional or safety perspective, but also considering the potential of the novel infrastructures on Sauchiehall Street to contribute to the wider public life of the street. Furthermore, their function is considered in terms of the potential for enacting wider socio-technical transitions. If these ‘niche’ infrastructures (in socio-technical terms) are to eventually exert sufficient pressure on the regimes to alter them, they will need to function as their design intends. Early indications of this functioning suggest that there is potential for changing the regimes governing user behaviour but that designs will

need to ‘bed in’ and perhaps be replicated elsewhere across the city for this pressure to produce sufficient influence over the regimes.

Chapter 8: Discussion and conclusion

8.1 Introduction

This concluding chapter reflects on the findings of this research, including their theoretical implications, and their contribution to policy and practice in the field of street design. Born of my passion for urban street design and sustainable urban travel, as well as my background as a design practitioner, the overall intent of this research was to investigate the process of regenerating a mixed-use street and the implications of its design for place, movement and public life. The research took the Avenues Programme, an ambitious street regeneration programme in Glasgow, Scotland, as a case study. The Programme's pilot project on Sauchiehall Street formed the core focus for the data collection.

The research utilised an adapted socio-technical transitions (STT) framework to identify how the Sauchiehall Street project was shaped by contextual 'landscape' factors, as well as the actions of a network of agents. Interviews with project agents, alongside a review of relevant design policy, identified novel infrastructure designs and the framework was used to frame these as socio-technical 'niches'. By using this framework, it was possible to identify cognitive 'regimes' acting to govern the behaviour of both agents and people using the street. Overall, the research investigated what occurred during the pilot project, but also how the completed street is shaping instinctive behaviour, with a view to informing future street regeneration projects elsewhere.

The following section, 8.2, reviews the novel contributions of this research, starting with the methodological contributions and progressing to discuss the process of adapting the STT framework as a novel contribution and the experience of using it in this research. The proceeding two sections discuss the findings from RQ1 (8.3) and RQ2 (8.4), also incorporating elements of RQ3. The chapter concludes with the presentation of an analytical framework that researchers and practitioners can use to design and implement progressive mixed-use street design in the future, addressing RQ3. The final section concludes the research project with a discussion of whether Sauchiehall Street is, indeed, showing the potential to bring about a sustainable urban transition.

8.2 Novel contributions in this research

This sub-section reviews the two main methodological contributions before moving to a discussion of the adaptation and use of the STT framework in this research.

8.2.1 Methodological contributions

This research introduced two methodological contributions. The first of these was the adaptation of existing mobile methods to enable 'virtual' walking interviews by using a series of photographs to recreate the experience of walking along the street. This provided a useful alternative to walking interviews during a period where it was not possible to carry out face to face research. However, due to constraints with the non-familiarity of Microsoft Teams, it was not possible to use the photographs consistently, nor invite all the interviewees to take control of the screen and direct the walk. The use of a consecutive series of photos, mimicking a walk along the street, did occasionally appear to elicit responses from participants that reflected the mobile aspect of this method, and some were able to use the software to take control of the interviewer's screen. This method could be developed further by using it as the core focus of interviews in future research to allow interviewees to fully master the use of the software. It was particularly interesting to adapt the method for use with a participant with a visual impairment, which required the researcher to audio transcribe the images. In this case, the approach appeared to work well and provided a tool that the participant had not experienced before. This could be expanded upon as a tool for use in public consultations with people with visual impairment, as well as providing a theoretical contribution to the mobile methods literature.

The second methodological contribution related to the use of the deviation measure for analysis of the side roads, which was adapted from existing methods. This appeared to offer a useful framing for analysis of the behaviour of people walking and driving, however it proved difficult to apply the behavioural categories consistently, especially when footfall was higher. This reflects a

general limitation of observational methods, where a single observer can become saturated. Future research here may usefully refine the approach, including reducing the number of behavioural categories from four to three for each mode. Following further testing by in situ observers, it may then be useful to digitise the approach for use with video footage from fixed cameras.

8.2.2 Reflections on adapting and using the STT framework

The application of the STT framework to a street regeneration project in this research is novel, revealing a new way to approach the analysis of street regeneration projects, such as the Avenues. Using STT, it was possible to frame the Sauchiehall Street pilot, with its novel infrastructural components, as an example of a 'niche' – a radical technological innovation (Schot, 1998). Within this framing, 'landscape' factors – long-term, stable trends – could be identified, as well as regimes – "the semi-coherent set of rules carried by different social groups" (Geels, 2002, p.1260). By making visible these conceptual entities surrounding the Avenues Programme, their impact on the project could be interrogated. This interrogation made it possible to assess how well the street is *currently* functioning as a 'niche', using indicators from existing research, which ultimately provides insight into the potential for the street to enable sustainable urban transitions in the longer-term.

One of the key adaptations made to the STT framework to make it applicable for the current research was to incorporate the idea of the place-shaping continuum (Carmona, 2014). This recognises distinct phases within the life of an urban design project, including 'design for use', which occurs during the conceptualisation and design phase, as well as 'space in use', recognising that streets continue to be shaped through use once they're constructed. Making this adaptation allowed for the identification of different regimes operating within the two phases, as well as different types of niches, captured in the updated framework diagram in Figure 94.

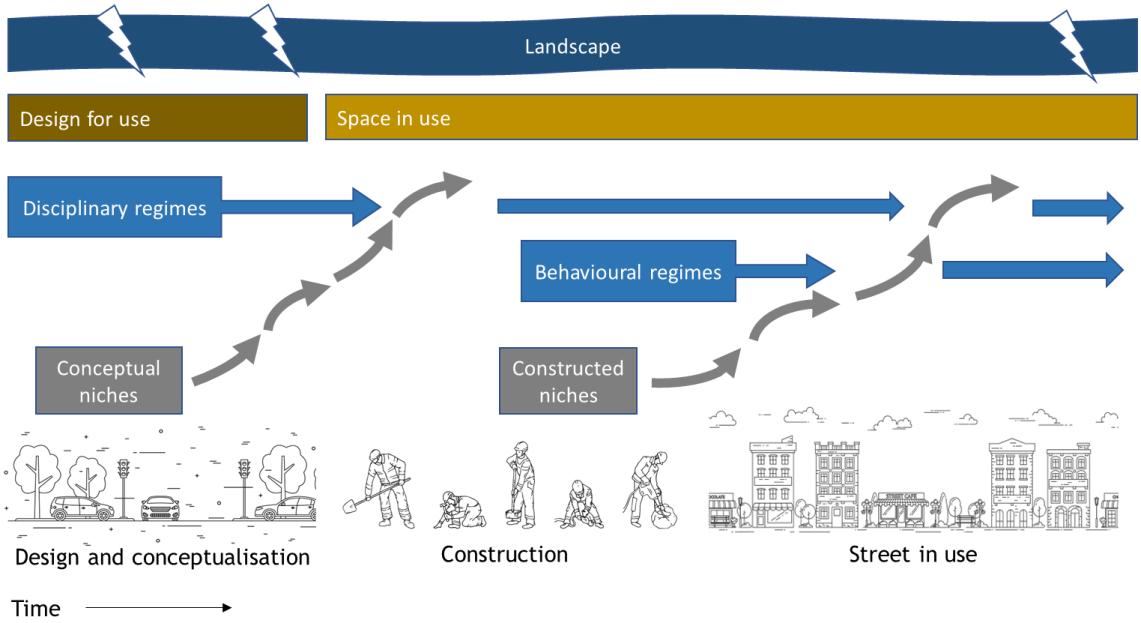


Figure 94: Adapting the STT framework to include the place-shaping continuum (Carmona, 2014) allows for identification of different regimes operating in the two phases. Conceptual niches, prior to construction, can be seen exerting pressure on disciplinary regimes, whilst constructed niches are exerting pressure on behavioural regimes.

The various regimes acting to constrain the design and conceptualisation process can be summarised as 'disciplinary regimes', i.e. those embedded within the praxis of each specific discipline, such as engineering. At this stage, the niches – the emerging infrastructure designs – are conceptual, but nevertheless already exerting some pressure on the existing regimes. This idea that a niche can already be exerting pressure on the regime before it is physically constructed forms a conceptual update to STT theory. Once constructed, the niches then continue to exert pressure on these disciplinary regimes, but they are also exerting pressure on what are termed 'behavioural regimes' here, i.e. the behaviours of the people using the street. It is argued that it is useful to consider the existence of different types of niches and regimes at different stages within the lifecycle of a street regeneration project.

The STT framework is particularly useful in this case for identifying regimes that were acting to constrain or enable the project. For instance, framing the actions of the highways engineers in the current research as regime-constrained means this can be addressed in future through more holistic (or regime-aware) training, rather than just treating this issue as a barrier relating to an individual, or a profession as a whole (Berry et al., 2013). This also provides an applied lens for identifying examples of theoretical behaviour, such as the conscious and

subconscious designer (Carmona, 2014). Perhaps most importantly, it becomes possible to analyse a street regeneration project in terms of the systems governing it and therefore provides a means for linking physical interventions on the street to wider behaviour change. This potentially has useful implications for both theory and practice, as detailed in Section 8.5.

Whilst useful as a tool for modelling the transitional potential of Sauchiehall Street, future research could apply the updated STT framework to a longitudinal case-study of the Avenues to ascertain the extent to which longer-term transitions have occurred. This could focus on Sauchiehall Street, repeating the data collection undertaken in this research to evaluate how people are behaving whilst using the various infrastructures of the street and re-interviewing the key agents identified as having influence in this research to identify any longer-term regime shifts. Given the longer-term nature of the construction, STT could also be used to frame analysis of the design of future Avenues streets as they are completed. This would allow for exploration of how infrastructure design is evolving in each street, whilst also offering insight into observable regime and landscape change in the field of urban street design.

The subsequent sections discuss findings and make conclusions relating to the three research questions:

1. How was the design of the Sauchiehall Street Avenues pilot project shaped by the conceptualisation, delivery and construction process? (Section 8.3)

2. Is the design of Sauchiehall Street enabling and encouraging the intended behaviour? (Section 8.4)

3. What learning does Glasgow's Sauchiehall Street Avenues pilot offer for designing the streets of the future? (Section 8.5)

Section 8.5 draws together the findings from each of the research questions into a novel design and analytical framework that can be applied to future street regeneration projects.

8.3 RQ1: How was the design of the Sauchiehall Street Avenues pilot project shaped by the conceptualisation, delivery and construction process?

The Sauchiehall Street pilot provides an insightful case study from which it is possible to draw conclusions that could, in turn, inform the development of future street design. The first two RQs, pertaining to the results presented in chapters 6 and 7, are discussed below.

8.3.1 Existing landscape factors

Analysis of the interview and documentary data using the adapted socio-technical framework revealed several types of forces that were acting to shape the eventual design of the street. Perhaps the most obvious were those at the 'landscape' level: the contextual factors, such as the city's topological, political and economic status. As a physical street regeneration programme, the Avenues needs to be cognisant of the network of existing forces which govern the built environment and also those that have shaped the individual street. The primary mechanism through which these contextual factors shaped the project was therefore policy, i.e. where objectives already enshrined in planning policy and economic strategy in turn informed the objectives for the Avenues Programme.

As discussed in Chapter 6, the Avenues is an example of a programme born of regional economic regeneration but brought about through localised physical infrastructure. When translated to the level of the Sauchiehall Street pilot, this manifested as a street regeneration project that featured a significant active travel infrastructure component, alongside the wider economic and social regeneration objectives, some of which were inherited from the previous regeneration project planned for the street. Whilst it is laudable that an economic regeneration programme has been translated into a means for securing physical active travel infrastructure in this way, this potentially has implications for quality if it is not managed properly. This therefore places an onus on project governance and those enacting it within an urban design project to ensure that the design of technically engineered infrastructure is understood by

urban design professionals, and that urban design objectives are understood by engineers.

8.3.2 Integrating urban design and engineering guidance

Unlike a standalone project to build e.g. one section of cycle track along a carriageway, where the design of the cycle track would form a core focus and engineering standards could be applied without impacting other modes, projects in a mixed-use street environment do not afford this level of sole focus on the design of movement infrastructure. Given the potential kaleidoscope of objectives and intentions across complex programmes such as the Avenues, it is useful to reflect on whether the detailed design of key pieces of infrastructure, such as the side roads and FLCT, can be held sufficiently consistent to enable them to function safely and effectively. This thesis argues that these infrastructure components are not only integral to safe movement along the street but can also contribute to the public life of the street, if designed correctly. It is further argued, therefore, that their design should be considered central to the planning and design of a mixed-use street (or network of streets), rather than being considered as merely one component that can be altered to fit in with other components.

The Avenues lacks any design guidance or policy specific to the Programme, which raises a question as to the extent to which the design detail of physical infrastructure will remain consistent in future stages of the Programme, given that these future streets will inevitably also be shaped by the wider policy context. There is a corresponding divergence more generally in design guidance that would usefully speak to the design of mixed-use streets. Currently, urban design guidance, such as *Designing Streets* (Scottish Government, 2010) defers to infrastructure-specific (engineering) guidance when it comes to integrating e.g. cycle-specific infrastructure into streets, whereas engineering guidance, such as *Cycling By Design* (Transport Scotland, 2021) defers to urban design guidance where it concerns how to appropriately apply active travel infrastructure in mixed-use streets. This also perhaps reflects the more philosophical contention between the place-making approach, which suggests that design should reflect local context (Carmona et al., 2010; Gehl, 2010; Ellin

2011; Adams and Tiesdell, 2013), and the principles enshrined in the engineering-led approach of systemic safety (Furth, 2017), where design consistency is considered key for ensuring safety.

As discussed in Chapter 2, it is also pertinent to consider an additional 'agent' shaping the design of streets, that of statutory building standards, which detail technical requirements applicable to building work to protect the public interest. Section 4 of the Building (Scotland) Regulations 2004 (Scottish Government, 2004), which details standards for access and egress to premises, may be of particular importance on Sauchiehall Street where access along the street now requires people to cross the cycle track, as well as the footway. Alterations to access could potentially entail physically re-engineering these pieces of street infrastructure. This legislation also governs the placement of street furniture, which is pertinent on the street where 'café style' seating is being encouraged outside commercial premises. Whereas these standards do not appear to have required any alteration to the street since it was completed, it is plausible that they could do in the future if further upgrades are made to premises. As such, they should be considered as a potential design agent in their own right.

The framework presented in Section 8.5 of this research therefore recommends incorporating urban design and engineering guidance properly within one document, i.e. demonstrating mixed-use streets and the types of infrastructure that will enable thriving public life in these settings. Likewise, it should be expected that those tasked with project governance – 'regeneration professionals' (Ward, 2011), perhaps – will be cognisant of the details of both urban design and engineering. Specifying engineering detail from the outset and designing this into the street holistically so that each piece of infrastructure contributes to the public life should allow for greater consistency of infrastructure design, as per systemic safety principles, whilst allowing for a more context-led design for other elements of the street.

8.3.3 Project governance: networks of agency, subconscious knowledge, and the role of the champion

Other physical aspects of the street, including a large gas main, constrained the design to an extent. However, analysis revealed that the more significant impacts (in terms of the novel infrastructures) occurred as a result of conceptual, or philosophical, constraints amongst the project team. Through the interviews, it was possible to identify a core network of agents shaping the project. Many of these individuals demonstrated characteristics identified within Strategic Niche Management theory as being important for enabling a niche to thrive (Kemp et al., 1998; Kemp et al., 2001). Chief amongst these agents was the Principal Officer, who exhibited several examples of acting as a 'champion' for the project (Kemp et al., 1998). He was the visionary, but also able to act strategically to use what was ostensibly an infrastructure project to bring about wider economic and environmental aims.

The Principal Officer was an example of several 'knowing' (or self-conscious) designers within the project. He was not necessarily knowing in the sense of having a design background, but he was knowing in terms of the wider context of sustainability and how a street could contribute to those aims. As such, he was able to strategically amass design knowledge via an urban design consultancy that he effectively hand-picked for their demonstrable experience of pushing the boundaries of design in the UK. He also leveraged access to a wider network of learning through this consultancy. In turn, he was sufficiently introspective to recognise the skills he lacked and was able to strategically curate his own internal team, bringing in relatively junior officers who could offer the 'missing pieces' in terms of his own skills, whilst being amenable to broadening their thinking to ultimately help bring about transitional change. That the Principal Officer was willing to nurture these internal communities of practice (McDermott and O'Connor, 2002) ensured that these individuals 'went on the journey', rather than merely participated in a design project. Indeed, the presence of a project manager who came from a disciplinary background not specifically related to street design appeared to enable the wider transitional dimension of the project, over and above the regeneration of a single street. However, it also appears that some of the attention to design detail was lost, perhaps as a result of this 'bigger picture' focus.

Analysis also revealed deeper insight into the nature and influence of knowing designers. With specific reference to the side road design on Sauchiehall Street, it was apparent that the Senior Highways Engineer at GCC had been instrumental in changes being made to the conceptual design, resulting in a physical manifestation on the street that differed from the original design intent. Rather than his actions resulting from a *lack* of knowledge, however, it was apparent that his actions were based in a powerful, philosophical belief that the intended design was not safe and that he therefore could not countenance it. It is suggested that this is a direct demonstration of regime-constrained thinking where the status quo within the engineering profession, which relies heavily upon research-based standards, exerted sufficient pressure to alter the design of the side road. The eventual design, it is argued, is therefore the product of a *network of knowledges*, rather than a lack of knowledge, as might appear to be the case. Within this, the Senior Highways Engineer at GCC was perhaps exhibiting *subconscious knowledge* based on decades of experience (a regime), which ultimately overcame the protection around the 'niche' design.

8.3.4 The Design Continuity Gap

Framing the events of the design process, including the actions of the highways engineers, in STT terms offers new insight into how similar projects might be managed in the future. This research identified the existence of several 'gaps' inherent in a project of this kind where the concept is developed in-house by a local authority, passed to an external design team who draw up initial designs before passing the designs back to the local authority who can then make further changes, or indeed invite further external input. This potentially produces what has been termed in this thesis a *design continuity gap* (Figure 95), within which there is a *conceptual design gap* where project officers, such as highways engineers, may not be on board with the philosophical intent behind a design (e.g. to change the established priority of people driving and walking at side roads). There is also potentially a *temporal design gap* whereby the urban design consultants relinquish agency over a project when it's taken back 'in-house'. In this case, the *design continuity gap* appeared to have been worsened by a *regulatory design gap*, whereby the design standards that might have provided the Senior Highways Engineer at GCC with a secure basis for accepting the

proposed design were not published until after the project had taken place. Despite these being knowingly 'in the pipeline', this was not sufficient for a profession heavily bound by standards and risk mitigation.

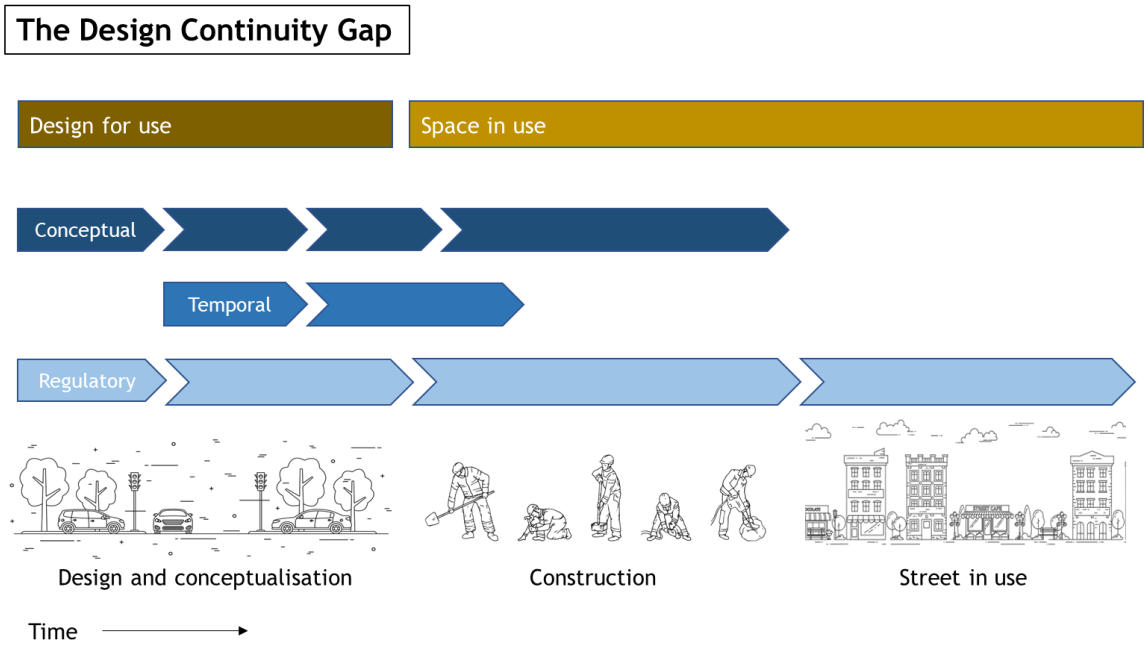


Figure 95: The Design Continuity Gap, comprising a conceptual design gap, temporal design gap and regulatory design gap. Images licensed by author.

8.3.5 Closing the gaps: regime-aware officer training

Each of the gaps identified above effectively acts to produce spaces where the niche is less protected, lessening pressure on the incumbent regimes and allowing established practice to dominate. The framework presented in Section 8.5 recommends initially just anticipating and noticing these gaps, acting to mitigate them where possible, but accepting that they may occur regardless. Building a community of practice among design professionals, as discussed in Section 6.4.2, may reduce the potential impact of the *temporal design gap*, if knowledge can be retained beyond the involvement of specific design professionals. Likewise, the existence of comprehensive design guidance, as discussed above, may lessen the opportunity for the *regulatory design gap* to occur.

A final recommendation, however, concerns the nature of training offered to local authority officers undertaking street design projects. This recommendation

is based on the researcher's experience of providing training to local authority and design officers through the Local Cycling and Walking Infrastructure Plan programme in England between 2017 and 2021, but similar design training exists outwith that setting. This research has uncovered the influence of highways engineers, in particular, over the design of key pieces of infrastructure. When framed through the lens of socio-technical transitions, this issue can be considered as occurring due to the existence of incompatible regimes, i.e. different types of knowledge, rather than a lack of knowledge. Current design training, often offered by NGOs, tends to try to *provide* knowledge, presuming it is lacking or incorrect, but it is argued that training might be re-conceptualised to explicitly note these wider regime forces and offer more of a mediation type approach between officers from different disciplines. This perhaps better respects the various knowledges and encourages, and accompanies, participants on a learning journey, rather than requiring an abrupt change to established thinking. This may also help encourage a more holistic view of street regeneration projects as conduits for sustainable change, as well as canvases to be altered.

8.4 RQ2: is the design of Sauchiehall Street enabling and encouraging the intended behaviour?

Observation of instinctive behaviour at three key pieces of infrastructure along the street – the benches, footway-level cycle track and side roads – revealed insights into what might traditionally be considered place and movement behaviours, as well as the wider public life of the street. Analysis of these behaviours painted a mixed picture in terms of the overall functioning of the street according to the design intention. The footway-level cycle track appears to be functioning relatively well with people largely cycling and walking in the intended sections of the street. Behaviour at the side roads is more mixed, with some evidence that people walking are instinctively asserting priority to cross the side roads regardless of the presence of vehicles, but corresponding evidence that drivers are, largely, continuing to treat the side roads as if they have priority.

8.4.1 The public life of benches and other street furniture

Analysis of benches and other infrastructure along the street indicated that there is observable public life taking place on Sauchiehall Street in the form of people occupying public benches, albeit less so in the newer regenerated section of the street compared to the older pedestrianised section. Further evidence of public life was observed through analysis of people lingering on the street. Mainly comprising people working, including delivery cyclists, and people inhabiting the street during the day, these individuals were observed interacting variously with street furniture, supporting existing public life theory (Whyte, 1980; Gehl, 2010; Gehl and Svarre, 2013). New theoretical insights were gleaned, including the implications of what has been termed 'roving sociability' in this research, where mobile phone use necessitates a new category of contemporary sociability behaviour (Mehta, 2019).

The bench occupancy data revealed notably lower occupancy rates in the newer, regenerated section of Sauchiehall Street compared to the older pedestrianised section, suggesting that the new street may not be entirely fulfilling its intended public life function. This may, in part, reflect the nature and placement of the benches, which are sited in the median strip between the cycle track and carriageway, requiring people to sit with their back to the road. Previous public life studies suggest that seating should be sited such that it offers protection and enclosure behind (Gehl, 2010), whilst ideally affording people the option to move it around (Whyte, 1980). This raises questions for a mixed-use street such as Sauchiehall Street, where the area along the building line is occupied by commercial premises who are being encouraged to have their own 'café style' seating on the street. Comparison with commercial seating occupancy indicated that these commercial seats were relatively more occupied in the winter months, and it was noted that their more sheltered placement perhaps makes them more pleasant to sit on than the public benches, especially in a city with a notably wet and windy microclimate.

Given that people must pay to use the commercial premises, this raises an additional question as to whether private seating has been allowed to occupy the prime spots on the street at the expense of cost-free public seating. It might perhaps be prudent to safeguard some of the more sheltered space along the building line for public seating, or indeed to consider designing public seating

that at least provides shelter from the wind and rain. Whilst this might be more space intensive, it would provide a more hospitable space for the types of sociability behaviour identified as being key to enabling public life to thrive. Enclosed outdoor space may also offer the opportunity for more moveable seating. Whilst not providing a direct income, encouraging people to spend longer periods of time in public space tends to increase the overall economic viability of an area. Affording the same quality of experience for everyone, regardless of whether they can afford to pay for private seating, would provide a more equitable public life on the street.

8.4.1.1 Transient community: delivery cyclists

Fleeting sociability (Mehta, 2019), where people interact relatively briefly in urban space, was observed occurring where delivery cyclists were congregating on groups of public benches between commissions. These transient communities, examples of people contributing to the public life of the street by working there, were also observed making use of street furniture such as trees and railings as leaning posts. These infrastructures allowed them to wait without having to dismount their cycle, whilst benches oriented to face each other provided enclosed space for gathering. This observation contributes to the literature on urban design for cycling: these 'punctuation points', such as pillars and trees, should be considered beyond their primary infrastructure function as elements that can also add to the ease of using the street on a cycle. People inhabiting the street during the day were also observed leaning against pillars, often whilst sitting. Again, this points to consideration of street furniture as a tool for enabling more comfortable public life.

8.4.2 The public life of active travel infrastructure

Two types of infrastructure on Sauchiehall Street, the footway-level cycle track (FLCT) and side roads, were also analysed to ascertain how they were naturally functioning. These novel infrastructures, identified as such by interviewees, were discussed in Chapter 7 in terms of their movement function, but this was expanded upon to reflect on their potential to contribute to the public life of

the street. Recognising (and measuring) the blurring of traditional place and movement functions in these new infrastructures provides a novel contribution to both the road safety literature concerning shared-use infrastructure and urban design literature.

It appeared that the FLCT was functioning largely as intended in terms of where people were walking and cycling, including occasions where the street was obstructed, forcing people to alter their behaviour. However, micro-aggressions were observed occurring between path users, raising questions as to whether these should be deemed significant enough to suggest that the design is not providing a safe and comfortable experience for all users. Road safety research has tended to focus on interactions between people and motorised vehicles, not the relatively 'low-level' interactions occurring where people walking and cycling must share space in a complex urban environment. This research did not intend to ascertain a threshold that might indicate a sufficiently safe level of behavioural compliance for shared-use infrastructure. However, it is argued that the functioning of FLCT-type infrastructure should be evaluated not just in terms of *actual* interactions, but also in terms of *perceptual* experience, which may to a large extent be shaped by 'near misses', often not recorded (Aldred and Crosweller, 2015). Observational methods allow for these micro-aggressions to be captured and intercept interviews would provide a richer insight into the experience of those using the infrastructure.

A further methodological contribution relates to the analysis of behaviour at side roads on Sauchiehall Street using a measure of 'deviation' behaviour. The deviation behaviour of people walking at side roads appeared to be influenced by the design of the side road, with significant differences in walking behaviour observed between each design. Driver behaviour, however, did not appear to differ significantly between designs, suggesting that the intended pedestrian priority was not being communicated clearly enough by the design of the street. Other factors were identified as affecting behaviour, including the direction of pedestrian travel and whether people walking could hear vehicles approaching or not.

Despite no significant alteration to driver behaviour, there were encouraging signs that a proportion of people walking were reacting to the side road design as intended. Indeed, despite some suggestion that the compromised design

amounted to the infrastructural equivalent of 'placelessness' (Carmona, 2016, Planning Consultant, interview, 2021), a few instances of sociability behaviour were observed occurring actually in the side road, including between people walking and driving. In keeping with the notion of roving sociability, proposed above, it is argued that providing people with the opportunity to walk along the street unhindered, i.e. without having to concentrate on ensuring their safety from motorised vehicles and therefore able to continue conversations, is an important enabler of contemporary public life.

8.4.3 Supporting vs. challenging regimes

This finding that drivers were not reacting as intended to the side road design is particularly noteworthy given the discussion in Chapter 6 concerning the compromised design of the side roads, which occurred in part due to the apparent influence of regimes over the behaviour of highways engineers in the project team. Whilst it was not possible to ascertain the direct influence of the designs on behaviour, it is theorised that many people driving (and some people walking) are exhibiting regime-constrained behaviour. In this case, drivers were often observed continuing to assert priority over people walking, a plausible indication of a long-established regime within UK driving culture that drivers have priority over people walking. This illuminates an important point for consideration when installing new infrastructure on a street, which is whether that infrastructure is intended to support and continue existing regimes (such as the FLCT) or required to challenge and change existing regimes (such as continuous footway is designed to do). The framework in Section 8.5 suggests that this should be ascertained when designing infrastructure because this will affect whether, and how strongly, the design must assert pressure on the incumbent regime. It is suggested, for instance, that evaluation of the design and function of side roads is considered in terms of the ability of the design to exert a strong enough pressure on people driving, as well as walking, to overcome existing behavioural tendencies.

Continuous footway is also an example of a design intent that attempts to bring about behavioural change through suggestion, rather than regulation. Whilst this is perhaps preferable in terms of sustainable behaviour change, it may be that

one or two niche designs on their own are not sufficiently protected to exert the requisite amount of pressure on the regime. Having a consistent design for side roads across the city – providing 'strength in numbers' – as well as alterations to the design, such as a steeper ramp from the carriageway, may improve the protection offered to each individual niche and increase the overall chances of altering the associated behavioural regimes.

8.4.4 A spatial conglomeration of niches

It appears generally that the newly regenerated section of Sauchiehall Street is not functioning particularly successfully in terms of more traditional measures of public life, such as bench occupancy. However, analysis of movement infrastructure suggests that people are largely walking and cycling as intended along the FLCT. Behaviour at side roads demonstrates some initial signs of intended behaviour and the potential for these infrastructures to contribute to the public life of the street, however improving their design may help to bring about the type of transitional change that Sauchiehall Street is required to produce in order to meet wider sustainability objectives.

This points to the potential for considering a mixed-use street as a canvas comprising a series of spatially dispersed infrastructures – which may be niches – each of which can contribute to the public life of the street. Treating each of these infrastructures as a conduit for potential transition towards a more sustainable street (and city) could allow for a spatial conglomeration effect, akin to that described by Ieromonachou et al. (2004), whereby the combined pressure applied to the various regimes may be more than the sum of the individual parts. Overall, it is therefore suggested that making a series of micro-level changes to street infrastructure could help bring about this effect, enhancing the public life potential of streets by making the experience of using them more comfortable and enjoyable for a range of users. This should include making some benches into seating that can be made more socially comfortable by those using it, and making sure infrastructure supports e.g. cycle leaning, virtual sociability, and comfortable inhabitation. Further details emerging from this research are outlined below:

1. Bench location and siting: benches may provide a more comfortable experience if sited such that the back of the bench is protected, i.e. along the building line. Moveable seating may be more attractive for people where it affords personal agency to shape a space into something more socially comfortable. This may raise security concerns, however these should be weighed up against the greater potential for creating more attractive public space. Siting some benches in groups may enable more 'in-person' sociability behaviour, whereas maintaining some private space may enable easier 'virtual' sociability, through the use of mobile phones, and passive sociability.

2. Rain and windproof infrastructure: providing public seating that offers shelter from wind and rain would enable more people to linger on the street for longer. This may also allow for more flexibility with seating if an area is relatively contained.

3. Street furniture for enabling public life: 'punctuation points', such as pillars and trees, not only provide psychological benefits (Gehl, 2010) but also improve the comfort of the street for people working as delivery cyclists and those inhabiting the street. Each piece of infrastructure on the street should be considered for its potential to contribute to the public life and micro-adjustments made where necessary.

4. Turning radius and ramp gradient at side roads: it appeared from observations that the wide turning radii and absence of steep ramps from the carriageway were leading to people being able to drive at relatively high speeds into the side roads. These two design details run counter to established best practice. Whereas more empirical research would be required to support this observation, it is recommended to reduce turning radii as far as possible and remove the raised table to allow for installation of a short, steep ramp.

8.5 RQ3: What learning does Glasgow's Sauchiehall Street Avenues pilot offer for designing the streets of the future?

This penultimate section draws together the findings from Chapters 6 and 7, as well as discussions from this chapter, to create a novel framework for designing and analysing streets of the future, especially mixed-use streets, such as Sauchiehall Street. The framework comprises two parts: the first (Figure 96) outlines governance considerations that should be addressed from the outset of a street regeneration project seeking to bring about socio-technical change. The second part (Figure 97) demonstrates examples of design details that might be incorporated to enable public life to thrive in a mixed-use street, as well as prompts to enable analysis of how well infrastructural components of the street are contributing to this public life.

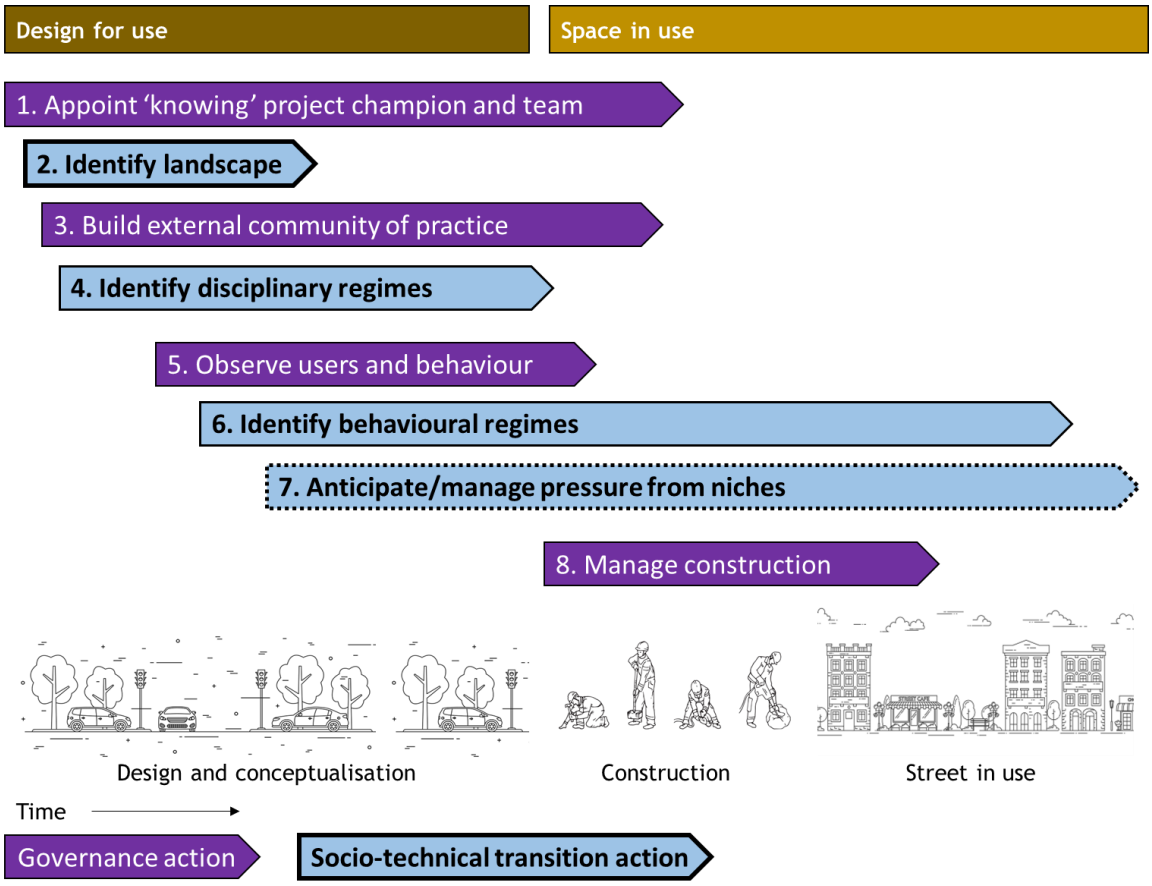
This is a conceptual framework demonstrating indicative design details and giving examples of prompt questions that might be used to frame objective setting and subsequent evaluation of a mixed-use street. The overarching question sitting behind the framework could be summarised as 'how can the design and construction of this street best enable its potential for bringing about future sustainable urban transitions?' At the level of more detailed design and analysis, the question asked might be 'how can each piece of infrastructure on this street be designed to avoid placelessness and fully enable the public life of the street?' These two questions should be considered from the outset and addressed more specifically at relevant points during the design, conceptualisation and construction process.

8.5.1 A novel framework for designing and measuring the streets of the future

Figure 96 and Figure 97 detail the suggested urban design governance framework for approaching a street regeneration project within the context of enabling socio-technical change. Recommendations relating to project governance are shown interwoven with consideration of relevant socio-technical transition theory (Geels, 2002) throughout the life span of a project (design and conceptualisation, construction and street in use). The framework also incorporates the idea of the place-shaping continuum (Carmona, 2014),

identifying distinct considerations that should be made during the planning phase (design for use) and post-construction phase (space in use). The identification of a knowing project champion should predate the actual project inception to allow for a suitable project team to be appointed.

Part 1: Urban design governance considerations.



1. ***Appoint 'knowing project champion and team:*** Champion should recognise their strengths and identify where they can appoint team members to mitigate for missing knowledge. Champion should be knowing in terms of how street regeneration can bring about socio-technical change.

2. Identify landscape: Project team should identify landscape factors that have shaped the history of the street and those likely to shape the future. These should contextualise the design.

3. Build external community of practice: Champion should leverage professional networks to build conceptual and design knowledge, including design consultants appointed to the project.

4. ***Identify disciplinary regimes:*** Project team should undertake reflexive exercises using real-life design examples to identify regimes shaping different disciplinary backgrounds. Open discussion should be encouraged. Regime-aware training may be useful at this stage to support project officers.

5. ***Observe users and behaviours***: On-street observation should be undertaken to ascertain who is there, who is not there, how people are currently behaving and how they would ideally behave in a thriving public life scenario.

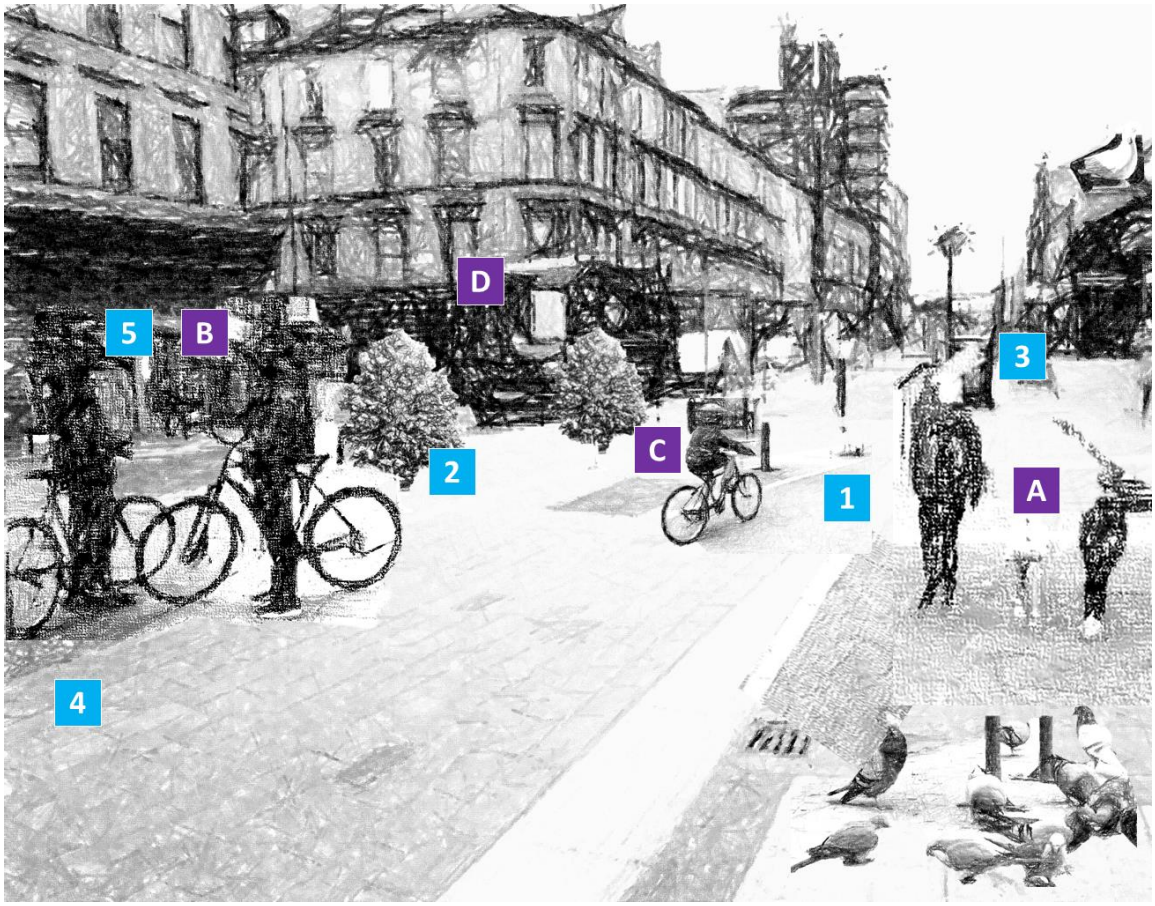
6. ***Identify behavioural regimes:*** As far as possible, street user behaviour should be analysed to identify regimes shaping current behaviour, especially where there is intent to introduce novel infrastructures. It can then be ascertained whether new infrastructure is required to support or overcome these regimes.

7. ***Anticipate/manage pressure from niches:*** Champion should anticipate pressure from conceptual niches (in design) on disciplinary regimes and manage the impact on the project team. Likewise, the impact of constructed niches on behavioural (and disciplinary) regimes should also be anticipated and managed.

8. ***Manage construction:*** Champion and project team should treat construction phase as the start of the 'street in use' and manage relationships and impact on existing street users, e.g. businesses.

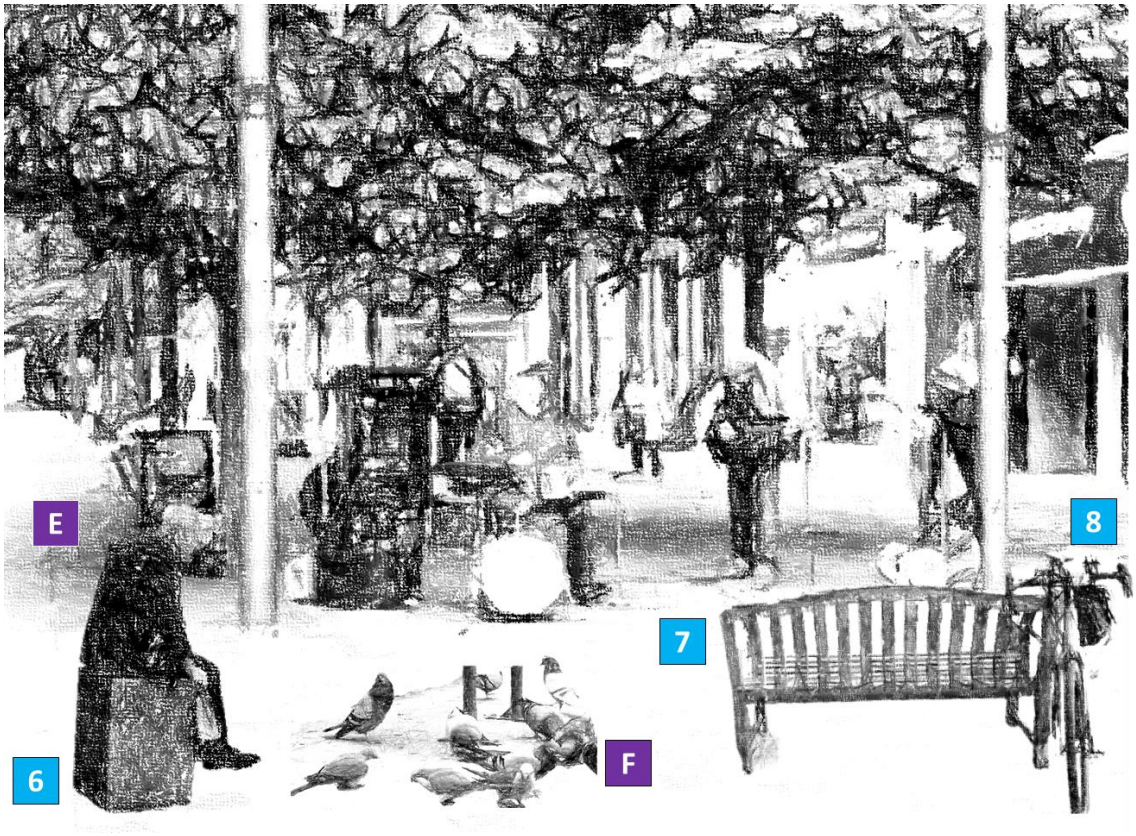
Figure 96: A novel framework for designing and measuring the streets of the future – Part 1: Governance considerations. Images licensed by author.

Part 2: Designing and analysing a mixed-use street.



Design considerations

1. Infrastructure should enable the place and movement functions of the street to operate together, without one undermining the other.
2. Use street furniture to lessen vehicle impact, such as by narrowing side road entry points.
3. Site seating along the building line or in other sheltered locations. Ensure at least some is water and windproof.
4. Reduce carriageway width to provide sufficient space for people not in vehicles, allowing for street cafe tables.
5. Consider how street infrastructure can also form a punctuation point to encourage fleeting sociability and provide agency.
6. Install street furniture that doubles up as informal seating.
7. Consider how fixed seating relates to existing natural and built features of the street. Are there natural ‘stages’ or gathering places?
8. Make small adaptations to tree guards, benches, railings etc to enable easy cycle leaning.



Questions for analysis

A. Are people instinctively continuing without deviation at side roads, regardless of the presence of vehicles? Are children present and enabled to behave independently, especially where vehicles are present?

B. Are punctuation points encouraging fleeting sociability?

C. Are people cycling representative of the full range of potential users and ability levels? Is there evidence of micro-aggressions taking place?

D. Are vehicle drivers required to behave courteously, giving way to people not in vehicles?

E. Are all types of sociability occurring safely and comfortably: passive, fleeting, enduring, roving?

F. Is nature also thriving?

Figure 97: A novel framework for designing and analysing the streets of the future – Part 2: Design considerations and questions for analysis. Images created by author from various photos taken during fieldwork, using PowerPoint Artistic Effects. Images and photos © author.

8.6 Is Sauchiehall Street demonstrating evidence of enabling longer-term transitions?

By integrating the more applied theory of Strategic Niche Management (Kemp et al., 1998; Caniëls and Romijn, 2006) into the updated STT framework, it is possible to discuss whether there are indications that the Sauchiehall Street pilot may bring about longer-term change. However, before delving too much into details, it is perhaps appropriate to step right back to the bigger picture and consider the ambition of Sauchiehall Street relative to its context, i.e. the current political and cultural reality of Glasgow. Performing this benchmarking exercise should help to interpret the relative magnitude of the 'achievement' of the Sauchiehall Street pilot and inform the applicability of the lessons learned for other locations.

8.6.1 Understanding Glasgow

A visitor to Glasgow, familiar with other post-industrial UK cities, may conclude (initially at least) that Glasgow shares many of the attributes commonly seen in these cities. Indeed, the city centre presents a view of a city that has invested heavily in regeneration, whilst respecting its built heritage. Whilst it would not take a visitor long to encounter the M8 motorway, a walk along the extensive pedestrianised "Golden Z" (Figure 48) may suggest a city that has acknowledged the negative impact of its past decisions concerning transport infrastructure and has already started reparative work. Likewise, this visitor would be likely also to encounter a population of academically and politically engaged young people, as well as employees of international firms and local business owners. All of which may, potentially, leave this visitor standing on Sauchiehall Street and wondering *"is this it?"*, given the extent of the fanfare when the street finally opened. Indeed, none of these initial impressions of Glasgow as a progressive, modern European city would be inaccurate or entirely unfair. But they mask some of the deeper realities in Glasgow and may potentially belie the true achievement of Sauchiehall Street.

Whereas all urban centres have their 'rise and fall' story, Glasgow's own story of industrialisation and post-industrial decline has been noted for producing economic and environmental problems that were more acute than anywhere else in the UK or Europe (Lever and Moore, 1986). Unemployment rose steadily through the second half of the 20th century, coupled with a 40% reduction in population, leaving a city that was characterised as squalid and violent by the 1980s (Kintrea and Madgin, 2019). Glasgow's decision makers, however, were anything but muted in their response. The M8 motorway rips through local communities still today, including below Sauchiehall Street at Charing Cross where it forms an imposing legacy of a (largely) unchecked belief that extensive civil engineering, coupled with the ensuing relocation of thousands of people to peripheral suburbs as part of an accompanying large-scale social engineering project, could cure Glasgow's post-industrial ills. The reality today is a city that contains nearly half of the 20% most deprived data zones in Scotland (Glasgow Community Planning Partnership, 2023). Glasgow also exhibits wide socio-economic inequalities when it comes to health: it has the highest mortality rates, and the lowest and most slowly improving life expectancy in Western Europe, but these indicators are highly concentrated in 'healthy' and 'unhealthy' areas (Baruffati et al., 2019). Vehicle ownership data provide insight into further inequalities. In 2018, Glasgow had the highest number of households with no access to a private vehicle in Scotland, at 46% (Understanding Glasgow, 2023).

The data above present a different picture, one of a city that has perhaps suffered from particularly unfortunate circumstances, but has undoubtedly also sowed the seeds of its own decline through successive public policy decisions since the mid-20th century, often exacerbated by the effects of central government policy. Set against this context, Glasgow's ability to present a relatively polished front (in the city centre, at least, but also other areas) might seem remarkable. Regeneration work on a street like Sauchiehall Street also needs to be understood within this context. It is notable that other UK cities that are undergoing similar transformative, infrastructure-led programmes (e.g. London, Manchester, Leicester, Birmingham, Sheffield) have (relatively new) mayoral systems and, often, associated 'commissioners' for active travel. These individuals, including Chris Boardman in Manchester and Dame Sarah Storey in

Sheffield, have strong public profiles and are able to leverage public support and increased investment by raising awareness of the wider benefits of active travel schemes (Gore et al., 2021). Scotland has not adopted the mayoral system and despite Lee Craigie holding the position of 'Active Nation Commissioner' between 2018 and 2022, this role was not reproduced at the city-region level, as it has been in England. Despite a commitment by the Scottish Government to increased active travel funding, neither has the role been replaced in Scotland.

Placed within the holistic picture of Glasgow, despite its flaws, the Avenues Programme should perhaps be understood to be much more revolutionary than the physical infrastructure might suggest. Securing funding for this sort of work against a backdrop of significant need in so many other areas is perhaps in and of itself a significant achievement, especially given that the understanding of the links between active travel and public health were not so advanced a decade ago (Docherty, 2019). That the project team were willing to push additional boundaries in the Sauchiehall Street pilot – namely, the introduction of continuous footway and the footway-level cycle track prior to the publication of the updated Highway Code – is laudable. But this sort of decision making is also notably in keeping with the spirit of Glasgow's decision makers in the past, those who were not afraid to whole-heartedly embrace the newest trends of the time, including urban motorways. The advantage of the Avenues Programme is perhaps its long-term nature. Sauchiehall Street, as a pilot project, affords the project team the opportunity to embrace change, make mistakes and adjust these in future Avenues streets. The ability to critically reflect through this iterative learning should arguably become the main remit of any future 'champion', as this may ultimately define the 'success' or otherwise of the Avenues Programme. But it would certainly seem apt for future project teams to embrace an awareness not just of the recent past, but also the more deeply embedded 'Glasgow' landscape – encompassing the physical, political and socioeconomic context - within which they are working. A sustainable transition to a different reality in the future will require not only making peace with some of the more 'destructive' decisions of the past, but also understanding them enough to both work holistically within them and also avoid inadvertently repeating them.

With this broader context in mind, the next sub-section reviews the details of how the new infrastructure is functioning and what this might suggest about the potential for a sustainable urban transition.

8.6.2 Is there evidence of socio-technical change?

Firstly, the niche pieces of infrastructure, including the footway-level cycle track and side roads, appear to be functioning relatively well, but not perfectly. At a basic level, this raises questions such as how well infrastructure needs to function to be perceived as safe and comfortable enough to enable behaviour change. At a more nuanced level, however, there were indications that behavioural norms were starting to transition, with evidence of public life behaviour taking place within these formerly movement-based infrastructures. This suggests that introducing these sorts of designs into mixed-use streets has the potential to change behaviour, if designed well.

Returning to the STT framing, it is perhaps useful to ask whether the Avenues Programme has provided sufficient protection around the infrastructure niches to enable them to thrive. That they are still present in the street in 2023 with only minor alterations suggests that the niches in the pilot project have been sufficiently protected. However, this point can perhaps only fully be addressed by ascertaining whether similar concepts, such as continuous footway, will be included into the next block of the Avenues. Further research may usefully ask how the protection around these niche infrastructures could be strengthened in similar projects, for example by ensuring that senior managers are clear at the outset of the project that infrastructural interventions can be a means for eventually changing the landscape – a role for the project champion. The researcher has experienced examples of this, for instance, where design training is offered to elected Members to broaden their understanding of street regeneration projects. This research supports this concept, and it is further suggested that a transitions lens is introduced to frame such training.

Lastly, the evidence of disciplinary regime shifts occurring within the project team is perhaps an indicator of the potential for longer-term transitional change to occur through these individuals. Despite not specifically being framed as a

socio-technical transition project, agents within the project demonstrated several of the traits identified as being key for agents of change. As discussed in Section 8.3.3, the Principal Officer, acting as a 'knowing' project champion, curated a team of officers who he mentored through the project and these officers describe having gone on a journey in terms of their thinking. They, in turn, have the potential to become equivalent 'champions' for similar projects in the future. It is this sort of regime change, if it can be replicated in similar projects in different locations, that will theoretically exert sufficient pressure on the landscape to bring about eventual transition. Likewise, iterative changes to existing and newly designed street infrastructure have the potential to enact behavioural regime change through a process of spatial conglomeration. Overall, it is suggested that being able to identify disciplinary and behavioural regimes, and manage them strategically, could contribute to this longer-term process.

8.6.3 The proverbial bench

The Avenues Programme is undoubtedly a bold, ambitious programme, reflecting Glasgow City Council's appetite for transforming the city. An oft-repeated rhetoric from several participants during the interviews was that Sauchiehall Street is "so much better than it was" and indeed, this sentiment would hold true for all but the most obscure metrics. That the Programme has occurred at all is to be celebrated and the not insubstantial transformative work of the project team should rightly be recognised.

As the pilot street, Sauchiehall Street is perhaps best considered as a first draft: an indication of sentiment and potential but requiring a humility and commitment on the part of the future Avenues project teams to 'review and re-draft' for the future streets. This will inevitably be complicated by the decision to appoint different external consultancies for each stage of the Programme, particularly in the absence of a central governance mechanism to ensure design consistency in the future streets. But transformative work, such as the Avenues is trying to achieve, is a long game and there must be a balance between pushing too hard and not pushing hard enough. A niche must be radical to enact change but if it is too radical, it will simply fail. A regime may appear to shift in the short-term, such as nominal acceptance of continuous footway at side roads,

but it is easy to imagine that the resulting backlash from those who are not happy may temper the design of side roads in the next block of Avenues. Either way, the Sauchiehall Street pilot has perhaps laid the groundwork for change and the skilled leadership of a future champion may enable ambitious design to thrive in subsequent Avenues.

In concluding this thesis, however, the real-world context of this work cannot be ignored. Even as this conclusion is written, nearly four years after Sauchiehall Street was completed and with inflation pushing the cost of construction materials to an all-time high, the Avenues webpage paints a sorry looking picture with the construction start date of every future Avenue listed as “TBC” (Get Ready Glasgow, 2023) and no further completions. It is, of course, possible that these streets will be completed in due course. But there is an inherent risk that such a large programme, one that appears to be as vulnerable to the elements as the proverbial Sauchiehall Street bench weathering the Glaswegian storms, may simply never be completed. Transforming a city through its streets is a big and complex task. However, it would appear paramount to do everything possible to maximise the potential of the Avenues Programme to not just simply make it a bit easier to walk and cycle on certain streets, but to really bring about transformational change in the public life of the city, recognising that this is inextricably linked to its socio-environmental health.

Post-script: The decarbonised city of the future

This research has demonstrated evidence of an emerging transformation taking place on Sauchiehall Street following the regeneration work carried out through the pilot project of the Avenues Programme. There were early indications, for example, of 'public life' behaviour starting to take place within what would formerly have been considered purely 'movement' spaces, such as side roads. Likewise, it appeared that there could be potential for change to occur through the actions of agents involved in the project, who might use their experience to influence similar projects in the future. However, the research also noted potential barriers to longer-term change due to, for instance, compromises within the design process that took place, which impacted the final design of the street.

These initial findings suggest the potential for transformative change at the level of the individual street. But for a city such as Glasgow to achieve the significant decarbonisation that will be required of all cities in order to avert the impending climate crisis, programmes such as the Avenues will need to be supported by far wider, structural change across multiple domains, especially transport. This post-script depicts a radical scenario in which Glasgow takes these major steps towards transport decarbonisation, exploring some of the changes that could occur.

Moving around the decarbonised city

How might a decarbonised Glasgow of the future look? At the most practical level, the physical fabric of the city will need to continue to transform to better enable people to make more sustainable choices around travel behaviour. Physically, it is difficult to imagine decarbonisation having occurred in Glasgow in the sustained presence of the multi-laned orbital motorway that currently severs the west and north of the city from the centre. Whilst it would be naïve to suggest that there will be no place for private vehicle ownership in a decarbonised future, the proportion of journeys made by private vehicles will need to be drastically lower than it is currently. Decommissioning the M8 and

reclaiming the space for the creation of new residential communities would create a city centre that is re-integrated into surrounding areas and therefore more instinctively accessible by active travel modes.

As important as fully segregated active travel infrastructure is in the current urban picture, a decarbonised city of the future will perhaps ideally not be one with an abundance of highly technical, bespoke infrastructure for walking and cycling. Instead, it will be one where the distances people are required to travel are greatly reduced through the provision of facilities local to where people are living. But it will also be one where streets that were formerly dominated by motorised vehicles – often the shortest, easiest routes between places – will become inherently safer and more accessible in the absence of vehicle danger. Likewise, whereas continuous footways at side roads are an important interim measure for helping to rebalance current streets in favour of those not using motorised vehicles, they could fast become redundant as drivers adopt the practice of giving way to people walking and wheeling at side roads as a behavioural norm. In the future, however, the concept may continue to be useful in a context where it is low-powered modes, such as e-bikes and e-scooters, turning in and out of side roads and needing to give way to people walking and wheeling.

This reality will require greater availability of low-powered micromobility modes, such as e-scooters and e-bikes, as well as greater provision of public transport. This, in turn, will require a level of legislative and design intervention to ensure that all street users can co-exist safely. However, reclaiming much of the space currently given over to motorised vehicles will offer an inherently safer experience for other street users, purely based on each person having more ‘room for manoeuvre’. There may, in addition, be a greater role for community vehicle ownership and it would seem likely that autonomous vehicles will play a greater role in cities of the future. A systemically safe city of the future could arrange transport spatially according to the propensity of each vehicle type to cause harm, rather than based on the supposed inherent vulnerability of people not in vehicles. This would entail providing dedicated road space for any remaining motorised modes, thus protecting more local streets for modes with less potential to cause harm.

Perhaps more challenging to imagine, given the current trajectory, is the decoupling of the concept of sustainability with that of e-vehicles. Whilst undoubtedly less pollutive in terms of tailpipe emissions, e-vehicles emit a range of other pollutants, including tyre dust and those involved in the not insignificant manufacturing process. They also require the perpetuation of the vast amounts of urban space dedicated to roads and pose the same safety risks as fossil-fuelled vehicles. More importantly, therefore, an e-vehicle is still a vehicle and still perpetuates the damaging idea that mass private vehicle ownership is compatible with a decarbonised future. Meaningful transformation will require a reversal of the current government incentivisation of e-vehicles, and for their future use to occur on a 'needs must' basis, only in situations where motorised vehicles are still required.

A final, key piece of the decarbonised city will be the provision of public transport. Train travel will continue to play an essential role in decarbonising longer distance journeys for passengers and freight, and more local journeys for passengers (where a heavy rail network exists). But given the expense and complexity of building new rail-based networks – even trams – it is buses that are likely to play a more important role in the more immediate future. Fully subsidising bus travel and making it free for everyone could utterly transform public transport use in urban and rural areas, for a fraction of the cost of trying to provide new heavy rail networks. This would likely need to be accompanied by the re-nationalisation of bus companies, expanded route service and a more comprehensive provision of dedicated bus lanes in the short term. However, this measure alone could act as the catalyst for the start of a virtuous circle whereby public transport is considered reliable and easy, and more people therefore choose not to drive, ultimately reducing the vehicles on the road and improving public transport reliability (even if people still owned private cars for the time being). In the longer-term, the existing heavy rail network could be fully electrified and expanded at a more local level.

In this decarbonised city, it is easy to see how people could be living healthier lives, through an increase in everyday physical activity but also as a result of a reduction in the pollutants that can cause asthma, cancers and other life-limiting diseases. Of equal importance is the idea that everyone, regardless of

age, physical ability or financial status, could be empowered to move around the city easily and independently. The gains in mental health, increased social confidence and community cohesion that could ensue demonstrate the importance of considering transport as much as a social issue as a physical one.

Political and economic governance: transcending political cycles

A radical measure to bring about transformative change could be the publication of legally binding environmental and public health targets by the UK Government. Whilst it might perhaps generally be considered more sustainable to achieve change through voluntary participation, using the 'shock tactic' of legal mechanisms to mandate action could help draw attention to the seriousness of the need for change. It could also draw attention to the importance of addressing carbon dependency as a route for unlocking wider social and environmental gains, as discussed above. This might also pave the way for greater funding that is ring-fenced for specific outcomes, such as subsidising public transport, as well as encouraging more 'joined up' thinking across different domains.

Another key advantage of legal mechanisms is that they are more likely to transcend political cycles and specific party policies. Transport policy tends to be quite vulnerable to becoming a political 'hot potato', as well as becoming heavily politicised in the media (for instance, low traffic neighbourhoods). It could be that in the decarbonised city of the future, with legal backing, the commitment to climate and health targets becomes 'non-negotiable', even to the extent that political parties no longer need to campaign on these grounds.

Turning to Scottish politics more generally, it would seem plausible that Scotland could benefit from increased devolution and the transfer of power from the UK Government in the future, regardless of its independence status. This could have particular implications for transport, as an already devolved matter. Greater devolved power could enable significant investment in jobs relating to renewable energy generation, alongside the expansion of modern manufacturing in Scotland. This could position Scotland as a European, or even world leader, in terms of national decarbonisation. But it would require significant

decarbonisation of the heavy rail network, as well as improved rural transport provision, in order for this to be achieved equitably. Having an emerging national identity as a small, decarbonised country could provide the incentive to really prioritise these works. Another key factor could be the introduction of a Scottish Mayoral System and increased regional governance, which would further strengthen local decision making.

Regeneration professionals: A generation of champions

A key recommendation from this research is that a mediation-orientated approach is taken towards projects such as the Avenues in order to overcome interdisciplinary differences between professionals from different fields. However, in the decarbonised city, it could be that the traditional roles of urban designer and highways engineer have evolved into a more cohesive profession, perhaps termed 'urban engineering'. Operating in a post-roads context, urban engineers would no longer need to expend resources trying to manage the integration of place and movement spaces, as there would no longer be a requirement to manage the risk of motorised vehicles in urban streets. But these urban engineers could, in effect, embody the idea of the regeneration professional: interdisciplinary specialists, possessing a range of experience relating to the built environment. Whereas the 'championing' role may no longer be required when the merits of street regeneration projects are more widely understood, the role of the 'quality controller' could remain key to ensuring consistency across all work being delivered. This could be strengthened through the publication of urban engineering standards for infrastructure, which have the enabling of public life as their core objective.

Indeed, it could be that urban engineering is routinely taught at reputable UK universities, as well as colleges (and even schools). This could help ensure a steady supply of well-qualified, creative design engineers who can transcend what were traditionally boundaries between the more 'creative' urban designers and the more 'standards-focussed' highways engineers, incorporating the essential contributions of both these disciplines. Moreover, these training courses could contain an environmental psychology component, ensuring that all

built environment work is developed with an understanding of how people are likely to experience the resulting street designs.

Piloting Change: Sauchiehall Street

But what of Sauchiehall Street and its place in the decarbonised city? It is comforting to imagine that Sauchiehall Street in the future might still indisputably be Sauchiehall Street: the aspirational, yet ultimately challenging street at the heart of Glasgow's shopping and nightlife. No longer so dirty perhaps, but neither squeaky clean. This has to do with identity and the idea that a decarbonised city, especially one with relatively standardised infrastructure, should not inadvertently lead to a homogenisation of city centres and their streets. Central to this vision is the continued removal of private vehicles from the majority of streets in the city centre, therefore enabling these streets to develop free from the constraints imposed by vehicle dominance.

The greatest metric of 'success' for the future iteration of Sauchiehall Street could perhaps therefore be that the Garage Nightclub, a longstanding cultural icon in Glasgow, is still thriving, and that it is still possible to spend a sticky night there before frequenting a "fast food" outlet on the way home. The difference might perhaps be that revellers arrive on foot from nearby residences, via public transport, or using one of many shared micromobility modes that can be hired on a one-way basis for a small fee. As for the "fast food", chips may remain the staple, but the potatoes could be grown 400m away in one of the urban farms and be air-fried using power from local wind micro-generation. Due to its investment in an emerging "green entertainment" industry, Garage Nightclub may have been able to apply for grants to help cement it as a leading green business in Glasgow. Perhaps it will be at the forefront of change in the entertainment sector, offering competitive rates for employees and paid apprenticeships in lighting and sound tech for people entering the industry.

Indeed, this may be just one of many similar case studies of success from businesses on Sauchiehall Street in the future, all stemming from the street being more pleasant to spend time on in the absence of vehicle dominance. But

this would require continuing to address the concern amongst business owners that customers will stop frequenting high street premises unless they can arrive by private car. Key here may be the power of experiential learning in the short-medium term. Future Avenues projects could be developed with the aim of enabling public life to thrive, including encompassing design recommendations from this research. If enough of the Avenues streets can be completed well, alongside some of the radical changes to public transport detailed above, this could engender enough confidence in city authorities to alleviate the fears of business owners.

People Make Glasgow

It is perhaps naïve to think that a city that has experienced the level of systemic deprivation that Glasgow has will simply 'bounce back' and readily achieve this sort of transformative change. Indeed, it may be that certain issues, such as those exacerbated through continued promotion of the electric car as the panacea for all transport ills, get worse still before they get better. It would also appear pertinent for Glasgow's decision makers to embark on a more deliberate reckoning with the city's past and to seek to acknowledge, perhaps to reconcile, the violences that have been inflicted on Glasgow in its recent history. It is perhaps only this level of humility and reflection on the part of those tasked with safeguarding the city's tomorrow that would lessen the risk of inadvertently (or deliberately) inflicting new violences in the future.

Trust between a city's decision makers and its people, whether business owners or everyday citizens, is perhaps one of the most important aspects to try and develop. But alongside trust must come hope. One of the less anticipated success factors within the Avenues Programme may turn out to be the behavioural change made possible simply by ordinary people believing that an alternative future is possible. As was the case during the first COVID-19 lockdown, when people experienced firsthand what car-free, tranquil streets could really feel like, Sauchiehall Street (imperfect though it is) provides a tiny glimpse of an alternative future. Unfortunately, the context surrounding the COVID-19 lockdown made it a wholly unsuitable setting for engendering a more

permanent transition towards that alternative reality, despite widespread acknowledgement at the time that it was pleasant to experience. But nevertheless, the power of providing hope through demonstrating that projects can be delivered successfully, and meaningful behavioural change enabled, must not be underestimated. In addition, the more that projects are successfully delivered, the more that ordinary citizens come to accept radical transformation as the norm and become more willing to embrace change in their personal lives.

The decarbonised Glasgow of the future could therefore be one that has reconciled its past and undergone an equitable, just transition to achieve a radically transformed future. It could be home to an empowered, yet community-minded population that has been, and continues to be, shaped by the experience of living and working in a city that supports independence through equitable movement. Whilst complex to achieve, this could be brought about through a combination of practical measures: legally binding environmental and public health targets, increased regional governance (including additional devolved power in Scotland), increased subsidy of bus travel and comprehensive reduction of private vehicle usage. Alongside these practical measures, however, there must also be the investment in reconciliation, the building of trust and the demonstration of hope, which will ultimately let Glasgow, and its citizens, flourish.

Appendix 1: The impact of the COVID-19 pandemic

The national lockdown and ensuing restrictions from March 2020 necessitated changing the original research strategy. This would have comprised an initial quantitative phase, undertaking naturalistic observations of Sauchiehall Street and conducting intercept interviews, followed by a qualitative phase, featuring in-person walking interviews. This unforeseen disruption required a sudden rethink of the entire research strategy as social distancing restrictions made it impossible to carry out the observations and interviews as planned. As such, an altered qualitative phase using online interviews was pursued and the quantitative data collection was delayed until the restrictions had eased sufficiently. Though difficult to accommodate at the time, this led to the adoption of a different focus for the qualitative data phase and to the creative exploration of an online alternative to established walking interview methods.

Aside from the impact on the research strategy, the impact of COVID-19 on the interview participants must be considered. Whereas each of these participants was still working in their professional role, albeit from home, they were potentially affected physically and emotionally by the pandemic in several ways, such as not being able to meet colleagues on site, juggling childcare responsibilities etc. It is impossible to quantify the effect of this on the validity of the data, however it should be noted that there is a possibility that interview answers given pre-COVID-19 may have differed.

COVID-19 also impacted the quantitative (observational) data collection. Whereas restrictions had eased significantly by October 2021, when the first data collection took place, the following issues remained:

- The requirement to practice social distancing (which required people to maintain 2m distance in public spaces) had only recently been lifted. It is possible that people were continuing to alter their behaviour, consciously or subconsciously, even in the absence of a law requiring it.
- There was a notable uptick in active travel during the pandemic due to the public transport restrictions. Any data pertaining to numbers of people walking or cycling will potentially be confounded by this.

- Loss of opportunity to experience Sauchiehall Street: the redeveloped street had only been reopened to people for a matter of months before the first lockdown in March 2020. As such, people had perhaps not got used to how the infrastructure should function as quickly as they may otherwise have done.

Lastly, the extended lockdowns through 2020 and 2021 negatively impacted the researcher's mental health and ability to engage fully with the research project. The impact of this, along with the researcher needing to take over a month of sick leave following contraction of COVID-19 in 2022, is likewise unquantifiable. However, this is undoubtedly a 'COVID PhD', shaped during and by what might be termed the meta-isolation of doing an already isolating project during a period of mandated isolation.

Appendix 2: Documents sourced for qualitative document analysis

Document / webpage	Date	Author / owner	Category	Synopsis
Project documentation				
"The Glasgow City Region Deal" https://www.glasgow.gov.uk/article/20014/The-Glasgow-City-Region-City-Deal	Accessed 18 May 2020	GCC	Project documentation	Details the overarching City Region Deal within which the Avenues sits.
"Infrastructure" https://www.glasgow.gov.uk/article/22753/Infrastructure	Accessed 18 May 2020	GCC	Project documentation	Glasgow City Region City Deal page detailing the 'infrastructure' arm of the funding, under which the Avenues sits.
"City Deal Glasgow" https://www.glasgow.gov.uk/article/20015/City-Deal-Glasgow	Accessed 18 May 2020	GCC	Project documentation	Details the City Region Deal funding being used specifically in Glasgow.
"Avenues" https://www.glasgow.gov.uk/avenues	Accessed 16 May 2020	GCC	Project documentation	Main landing page for the Avenues Programme.
"Past Avenues Consultations" https://www.glasgow.gov.uk/article/25730/Past-Avenues-Consultations	Accessed 16 May 2020	GCC	Project documentation	Links to previous Avenues consultations, including Sauchiehall Street.
Report presenting the Strategic Business Case for the City Centre Enabling Infrastructure Public Realm Programme http://www.glasgow.gov.uk/councillorsandcommittees/viewDoc.asp?c=P62AFQDNDN0GT1Z3NT	18 Aug 2015	Clyde Valley Cabinet	Project documentation	EEIPR Strategic Business Case presented to Glasgow and Clyde Valley Cabinet for approval.

Minutes of the Clyde Valley Cabinet meeting https://www.glasgow.gov.uk/councillorsandcommittees/viewPack.asp?c=P62AFQ2UZ381ZL0GB253YXYXQAJ5I77DJ52AFQDNDXDNDXZ3	18 Aug 2015	Clyde Valley Cabinet	Project documentation	Minutes approving the EEIPR programme for development to Outline Business Case.
Sauchiehall Avenue Stage 2 Streetscape + Public Realm (draft)	Sep 2015	Urban Movement (not in public domain)	Project documentation	Draft Stage 2 design report from the Sauchiehall Street design team outlining the context, proposal and visualisations.
"A new name and a new economic strategy for the Glasgow City Region" https://www.glasgow.gov.uk/index.aspx?articleid=19100	16 Feb 2016	GCC	Project documentation	Article announcing the decision to change the name of the "Glasgow and the Clyde Valley City Deal" to "Glasgow City Region City Deal".
Report presenting the Outline Business Case for the City Centre Enabling Infrastructure Public Realm Programme https://www.glasgow.gov.uk/councillorsandcommittees/viewDoc.asp?c=P62AFQDNDN0GT1Z3NT	12 Dec 2016	Glasgow City Region – City Deal Cabinet	Project documentation	EEIPR Outline Business Case presented to the renamed Glasgow City Region – City Deal Cabinet for approval.
Minutes of the Glasgow City Region – City Deal Cabinet meeting https://www.glasgow.gov.uk/councillorsandcommittees/viewDoc.asp?c=P62AFQDNDN0G2U812U	12 Dec 2016	Glasgow City Region – City Deal Cabinet	Project documentation	Minutes approving the EEIPR programme for development to Full Business Case.
Report presenting the Full Business Case for the City Centre Enabling Infrastructure Public Realm Programme https://www.glasgow.gov.uk/councillorsandcommittees/viewDoc.asp?c=P62AFQDNDNZLNTNTDX	13 Jun 2017	Glasgow City Region – City Deal Cabinet	Project documentation	EEIPR Full Business Case presented to the renamed Glasgow City Region – City Deal Cabinet for approval.
Minutes of the Glasgow City Region – City Deal Cabinet meeting (June 2017)	13 Jun 2017	Glasgow City Region – City Deal Cabinet	Project documentation	Minutes approving the EEIPR programme for development to delivery monitoring and evaluation.

https://www.glasgow.gov.uk/councillorsandcommittees/viewDoc.asp?c=P62AFQDNDNZ3ZLZLZ3				
Sauchiehall Street Planning application. Ref: 17/00240/DC	Submitted 3 Feb 2017, approved 27 Oct 2017	Ciaran Buchanan on behalf of GCC	Project documentation	Full planning application. Granted subject to conditions.
GCC budget monitoring: investment programme statement https://www.glasgow.gov.uk/councillorsandcommittees/viewSelectedDocument.asp?c=P62AFQDN2UT1T10GZ3	22 Nov 2017	GCC Finance and Audit Scrutiny Committee	Project documentation	Statement confirming novation of tree contract from Land Engineering to Idverde, award of construction works to Rainton Construction Ltd and Block A design team contract to Civic Engineers.
Programme Status Report https://www.glasgow.gov.uk/CouncillorsandCommittees/viewDoc.asp?c=P62AFQDN2UT1Z3Z381	Dec 2017	Glasgow City Region – City Deal Cabinet	Project documentation	Glasgow City Region – City Deal Cabinet report indicating 'amber' status of Sauchiehall Street project due to delays.
GCC budget monitoring: investment programme statement	14 Feb 2018	GCC Finance and Audit Scrutiny Committee	Project documentation	Programme update including anticipated start date of 8 January 2018 for Sauchiehall Street and progress with Block A workshops.
"Enabling Infrastructure Integrated Public Realm - Avenues programme" https://www.glasgow.gov.uk/CHttpHandler.ashx?id=44418&p=0	No date, accessed 18 May 2020	Derek Dunsire, Principal Officer, GCC	Project documentation	Presentation by Principal Officer at GCC for City Centre Regeneration / City Deal outlining EEIPR project.
"City Deal – City Centre Enabling Infrastructure Integrated Public Realm"	3 May 2017	Derek Dunsire, Principal Officer, GCC	Project documentation	Undated presentation by Principal Officer at GCC for DRS City Centre Regeneration / City Deal (possibly to

https://www.glasgowchamberofcommerce.com/media/1372/city-deal-public-realm-investment.pdf				the Retail Association) outlining EEIPR project. Updated from previous undated presentation to include risks and economic context.
Sauchiehall Street 'Avenue' Lessons Learned: Input to Consultation Report	16 April 2019	Nick Wright (not in public domain)	Project documentation	Report noting the results from various consultation methods undertaken by Nick Wright Planning for GCC to review the delivery of the Sauchiehall Street pilot.
City Centre Avenues: Note of Community Council Update Meetings. Sauchiehall Precinct, Cambridge Street and the 'Underline'.	9 June 2021	Nick Wright on behalf of GCC	Project documentation	Note of online meeting with Blythswood and Broomielaw, and Garnethill Community Councils (Woodlands and Park, and Woodside sent apologies), GCC and Civic Engineers. Updating local residents on the next stages of the Avenues.
National policy / guidance				
Design Manual for Roads and Bridges (DMRB)	1992	Highways Agency	National policy / guidance	Statutory standards dictating design and assessment standards for the trunk and major road network in the UK.
Manual for Streets (MfS)	2007	Department for the Environment, Transport and the Regions	National policy / guidance (England)	Non-statutory guidance for (primarily new residential) street design in England.

Manual for Streets 2: Wider Application of the Principles	2010	Chartered Institute of Highways and Transportation	National policy / guidance (England)	Non-statutory companion document to MfS providing greater technical clarity on aspects of street design.
Designing Streets https://www.gov.scot/publications/designing-streets-policy-statement-scotland/pages/3/	2010	Scottish Government	National policy / guidance	Statutory guidance for street design in Scotland, forming companion document to Creating Places.
Green Infrastructure: Design and Placemaking https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2011/11/green-infrastructure-design-placemaking/documents/0122541-pdf/0122541-pdf/govscot%3Adocument/0122541.pdf	2011	Scottish Government	National policy / guidance	Companion to Designing Streets and Designing Places. Guidance providing an overview of green infrastructure (GI) as well as setting out some key design issues and techniques to help incorporate GI into placemaking at all scales.
Creating Places https://www.gov.scot/publications/creating-places-policy-statement-architecture-place-scotland/pages/3/	2013	Scottish Government	National policy / guidance	Statutory document setting out the overarching framework for architecture and built environment in Scotland.
Local Transport Note 1/20: Cycle Infrastructure Design	2020	Department for Transport	National policy / guidance (England)	Guidance providing detailed design advice for cycling infrastructure. Technically applies to England only but principles applied more widely.
Cycling By Design	2021	Transport Scotland	National policy / guidance	Non-statutory companion guidance to Designing Streets in Scotland providing detail on integrating cycling infrastructure into streets.
Glasgow City Council (GCC) / local policy and guidance				

Glasgow City Plan 2 (parts 1 – 4)	2009	GCC	GCC / local policy and guidance	Statutory Development Strategy for Glasgow including spatial priorities.
Glasgow Proposed City Centre Development Plan https://www.glasgow.gov.uk/CHttpHandler.ashx?id=19258&p=0	2013	GCC	GCC / local policy and guidance	Draft statutory Local Development Plan for Glasgow setting out 10-year planning framework.
City Centre Strategy and Action Plan 2014-19 https://www.glasgowcitycentrestrategy.com/project/city-centre-avenues (now redirecting to https://www.glasgow.gov.uk/en/Business/CityCentre)	2014 – 2019 (Accessed May 2020 – Feb 2022)	GCC	GCC / local policy and guidance	Non-statutory strategy outlining GCC's vision for the creation of a Districts Strategy with 9 districts and associated regeneration frameworks. Also introducing the concept of "enabling infrastructure" to regenerate the city centre.
Glasgow City Centre Transport Strategy	2014 – 2024 (published Feb 2015)	GCC	GCC / local policy and guidance	Non-statutory 10-year strategic plan for transport, part of City Centre Strategy.
Glasgow's Strategic Plan for Cycling (draft for consultation)	2015 - 2025	GCC with Sustrans	GCC / local policy and guidance	Non-statutory strategic plan for developing cycling throughout Glasgow.
Made in Sauchiehall and Garnethill: Regeneration Framework for Sauchiehall and Garnethill District. Research findings for public consultation.	Sep 2015	GCC Development and Regeneration Services	GCC / local policy and guidance	Report detailing the findings from the 'pilot' regeneration framework for Sauchiehall and Garnethill District.
City Development Plan	2017	GCC	GCC / local policy and guidance	Finalised statutory 10-year planning framework for Glasgow taking in NPF3.

Lane Strategy for Glasgow City Centre https://www.glasgowconsult.co.uk/UploadedFiles/DRAFT%20LANE%20STRATEGY%20FOR%20PUBLIC%20CONSULTATION.pdf	Dec 2016	Willie Miller Urban Design for GCC	GCC / local policy and guidance	Draft non-statutory strategy detailing regeneration of the network of lanes running parallel to the main streets in Glasgow City Centre.
Economic Strategy for Glasgow https://www.glasgow.gov.uk/CHttpHandler.ashx?id=36137&p=0#:~:text=The%20new%20Glasgow%20Economic%20Strategy,wellbeing%20for%20all%20its%20citizens.	2016 - 2023	GCC with Glasgow Chamber of Commerce	GCC / local policy and guidance	Non-statutory document outlining the economic strategy for Glasgow, intending to make it the most productive city economy in the UK.
Glasgow Public Realm Design and Maintenance Guide	2020	GCC	GCC / local policy and guidance	Non-statutory guidance focusing specifically on public realm design, for use in assessing planning applications.
Organisational article				
"Urban greening at Sauchiehall Street" https://www.idverde.co.uk/projects/urban-greening-at-sauchiehall-street	Accessed 19 May 2020	Idverde	Organisational article	Idverde landscaping consultants detailing tree contract, claiming novel construction method.
"Glasgow's Sauchiehall Street gets greener" https://www.greenspacescotland.org.uk/news/street-trees-on-sauchiehall-street-avenue	Accessed 26 May 2020	Greenspace Scotland	Organisational article	Greenspace Scotland report introducing Sauchiehall Street project.
"Project of the month" https://us10.campaign-archive.com/?u=4ca480c2cfc0285b27e56761d&id=f00e63dad6	Accessed 26 May 2020	Greenspace Scotland e-bulletin	Organisational article	Greenspace Scotland e-bulletin announcing Sauchiehall Street as project of the month. Claims Avenues Programme has roots in 'Five Streets' project.
The Five Streets: Town Centres and Climate Change Programme	Sep 2013. Accessed	Greenspace Scotland, GCC and SEPA	Organisational article	Details partnership project between

https://drive.google.com/file/d/15VGjouXNKyjI_tDQ_gJ056_N0yDd2R7V/view	26 May 2020			Greenspace Scotland and Glasgow City Council Development and Regeneration Services with support from SEPA, including modular green infrastructure system design.
Glasgow 'Avenues' Design http://www.urbanmovement.co.uk/glasgowavenues.html	Accessed 20 May 2020	Urban Movement	Organisational article	Urban Movement webpage detailing their overall involvement with the Avenues Programme, including visualisations of future streets.
Sauchiehall Street Avenue http://www.urbanmovement.co.uk/sauchiehallstreet.html	First accessed 20 May 2020	Urban Movement	Organisational article	Urban Movement webpage detailing their design concept for Sauchiehall Street.
"Glasgow Avenues: Walk This Way" https://www.urbanrealm.com/features/612/Glasgow_Avenues%3A_Walk_This_Way.html	17 Apr 2018	Urban Realm	Organisational article	Interview with Derek Dunsire (GCC) and Stephen O'Malley (Civic Engineers).
Consultation on Glasgow Low Emission Zone: report to committee	8 June 2021	Environment, Sustainability & Carbon Reduction City Policy Committee	Organisational article	Report updating the Environment, Sustainability & Carbon Reduction City Policy Committee on the LEZ and advising of the intention to progress to statutory consultation.
News article / other				
"Landscaping firm collapse costs 135 jobs" https://www.bbc.co.uk/news/uk-scotland-scotland-business-40119852	Jun 2017	BBC News	News article / other	Article detailing the collapse of the Land Engineering (Scotland) firm contracted to deliver the landscaping elements of Sauchiehall Street and takeover by Idverde.

Glasgow Live interview with Derek Dunsire https://www.facebook.com/glasgowlive/videos/733057533563320	11 Jan 2018	Glasgow Live	Newspaper article	Glasgow Live interview delivered via Facebook.
"Avenues project will free up city from heavy traffic"	15 June 2018	Glasgow Evening Times	Newspaper article	Article announcing public consultation on Block A.
“Residents displaced by school of art fire stage protest”	22 Jul 2018	BBC News	News article	Article detailing displacement of local residents following 2018 Art School fire.
"Outlaw illegal parking on city street, says taxi boss"	29 Sep 2018	Glasgow Evening Times	Newspaper article	Article reporting chairman of Glasgow Taxis calling for ban on private vehicles along Sauchiehall Street whilst works are in progress.
“Art school admits 'poor communications' after Mack fire”	15 Nov 2018	BBC News	News article	Article detailing Art School’s regret at how it communicated with the local community after the second fire.
“Funding approved for Sauchiehall Street development”	17 May 2019	Glasgow Evening Times	Newspaper article	Article detailing the use of funds from development on council-owned land for the northern footway on Sauchiehall Street allowing redistribution of City Deal cash.
"Go For It: Time for bold new vision for Glasgow"	3 July 2019	Glasgow Evening Times	Newspaper article	Article announcing consultation on George Square (Block B). Glasgow Evening Times declares unequivocal support for car-free George Square proposal.
"Glasgow looks to Barcelona for cleaner, healthier streets model"	10 Oct 2019	Glasgow Evening Times	Newspaper article	Article reporting that representatives from Barcelona are attending the International Healthy Streets Summit in Glasgow. Introducing the

				‘superblock’ concept and suggesting it is being used for inspiration in Glasgow.
"BID TO IMPROVE Sauchiehall Street HAS BEEN A SUCCESS"	26 Sep 2020	Glasgow Evening Times	Newspaper article	Article reporting the Sauchiehall Street Business Improvement District (BID)’s views that the regeneration has been successful.
“New street layout in Glasgow is dangerous, say blind people”	19 Feb 2022	BBC News	News article	Article reporting concerns with Sauchiehall Street from people with a visual impairment suggesting GCC are not considering disabled people’s concerns.
“Glasgow School of Art: A timeline of two fires”	25 Jan 2022	BBC News	News article	Article reporting the findings from an investigation into the Art School fires.

Appendix 3: Interview participants

Interview no.	Participant identifier	Organisation	Date	Mode
1	Delivery Manager	GCC	02 Feb 2021	Teams
2	Senior Urban Designer	Urban Movement	12 Feb 2021	Teams
3	Rehabilitation Officer	GCC	12 Feb 2021	Teams
4	Lead Designer	Urban Movement	18 Feb 2021	Teams
5	Senior Engineer	Civic Engineers	23 Feb 2021	Teams
6	Former Chair	BID	23 Feb 2021	Teams
7	Operational Director	Nightclub	25 Feb 2021	Teams
8	Senior Highways Engineer	GCC	26 Feb 2021	Teams
9	Business Support Officer	GCC	10 Mar 2021	Teams
10	Politician	GCC / SNP	24 Mar 2021	Teams
11	Technical Lead	Multiplex	28 Mar 2021	Phone
12	Development Management Planner	GCC	20 Apr 2021	Email
13	Professor of Urban Design	Glasgow School of Art	5 May 2021	Teams
14	Professor of Urban Design	Glasgow School of Art	8 Jun 2021	Teams
15	Planning Consultant	NW Planning	20 Jul 2021	Teams
16	Project Manager	GCC	05 Aug 2021	Phone
17	Group Manager	GCC	17 Mar 2022	Teams

Appendix 4: Interview protocol

Preparation

Phone ready to record audio.

Remove headphones.

Notebook ready for random observations.

Open:

- Protocol
- PowerPoint of full E-W
- Folder of other PowerPoint
- Google maps

Introduction

Hello. My name is Becki and I am a PhD researcher at the University of Glasgow. Thank you for offering your time to take part in this interview today.

The purpose of the research that you are being invited to participate in is to analyse the processes that shaped the design and implementation of the Avenues programme and especially the project pilot on Sauchiehall Street. Specifically, the research will seek insight from the various individuals and organisations responsible for the design and implementation of the public realm improvements.

Recording

I'm going to start recording the interview now. The recording will save to the Teams cloud (Microsoft) and I will move it to a secure location, password protected and encrypted. Please remember that you can ask to stop the interview and recording at any point.

Record.

Administration

Make sure they've read:

- Participant info sheet
- Privacy notice

Make sure they've filled out:

- Consent form [get verbal consent as well]

Explanation of interview

The interview will have 4 sections:

1. Personal information and virtual walk
2. Where did the original design of Sauchiehall Street come from?
3. What changed throughout the project from the original design, and why?
4. How well do you feel the street is performing now?

The questions are semi-structured so I will use them to guide the interview but feel free to comment on anything else that you feel is relevant.

I had hoped to do these interviews in person and to go for a walk along the actual street. Instead, I am going to attempt to recreate the walk through a series of photos of Sauchiehall Street. We will start the interview by walking virtually along the street and you will then be free to refer back to any of the photos as we're talking later in the interview. Think of it as you taking me to different parts of the street, as we would in real life.

The specific photos used are intended to give a general feel for the different parts of Sauchiehall Street. There are also some showing the specific design elements that pertain to place or movement function. We will also look at the transitional areas between the different parts of the street and how the Avenues joins to neighbouring existing infrastructure.

Please stop me at any point if you feel uncomfortable and would like to stop the interview.

Do you have any other questions before we start?

Personal information:

Name:

For the recording: please answer the following based on the time when you were involved with the Avenues programme.

Organisation:

Job title:

Job status (manager/head of department/project lead etc):

How would you describe your professional discipline (e.g. engineer, urban designer, planner):

Years of professional experience in this field:

If you have lived outside the UK, the country where you gained most relevant experience for this project:

Describe your specific role in the Avenues programme and specifically, the Sauchiehall Street pilot:

Virtual walk

I'm now going to share my screen and we'll have a virtual walk along Sauchiehall Street via a series of photos. This is to familiarise ourselves with the street so I'm going to ask you not to make general comments at this point. But please feel free to refer back to any of the photos during the next set of questions if that's useful. We will revisit some of them more deliberately towards the end of the interview.

Whilst we're walking, please have a think about which part of the street you feel is most successful and which elements you feel could be improved.

SHARE SCREEN

[Complete tour, with verbal prompts about location.]

STOP SHARING

Where the design started. How deliberate were the place and movement aspects?

Thinking back to the original concept of the Avenues and design of Sauchiehall Street:

- What do you think was the main intent behind the Avenues programme?
- [If they don't mention active travel: how deliberate was the inclusion of active travel infrastructure in the programme?]
- Which policy and/or design documents are you aware of (locally, nationally, internationally) that shaped the original Avenues programme?
- Where did the original design of Sauchiehall Street come from? (Would you say this was an urban design project?)
- Where did you look to for inspiration for the concept/design? Where or who does this well? Did you visit anywhere else in person to gain inspiration or knowledge?
- Which guidance was used for the engineering detail?
- Were other tools used in the conceptualisation or detail of the design (such as LOS, Place Standard, Healthy Streets)?
- Were other consultee groups involved at the original concept/design stage?

SHARE SCREEN – instruct participant to select "take control" and tell me if they want to relinquish control – I may also take back control (don't select "stop presenting").

What changed throughout the project and why? Is the final design as intended?

- Looking back, as far as you're able, to the beginning of the Sauchiehall Street pilot, what has changed from the original design to the one we see here? Please comment on both deliberate change (such as change following consultee input) and unintended change (such as constraints, hold ups etc). You can also move us back to any specific parts of the street you would like to comment on.
    - Who or what shaped the change at various points? Were there controversies, hiccups or compromises with stakeholder groups?
    - What were the key power balances and relationships?
    - Was change externally or internally driven?
- Did you (and/or your organisation) feel able to influence the overall design as you wished?
- In terms of some of the more specific elements (continuous footway etc), did the design of these change?
- What were the main constraints and main enablers?
- How did stakeholders feel about the newer type designs (side road crossings etc)?

How is Sauchiehall Street performing now?

At this stage, I'm going to ask you to take control of my screen and ask you to visit certain parts of the street using the photos.

- Which aspects of the street are you most proud of? Please take me to that location. Why are we here?
- Which aspects of the street would you change if you could? What didn't work? Again, please use the photos to take us there. Why are we here?
- Were there any parts of the design that were particularly commented on by stakeholders? (Either SS or upcoming designs for the future Avenues.)

[Take back control of screen. Switch to design detail powerpoint.]

I'm going to walk us back via a few specific design elements of the street now. Firstly, the design of the footway level track [show photos and ask question below]. Then the continuous footway [show photos and ask question below]. And lastly, the transition section at Charing Cross [show photos and ask question below].

- In general, how well do you feel this active travel infrastructure is functioning? Were these the original designs? How well does Sauchiehall Street work as a street for movement?

Here is an overview of one section of the street [show overview photos].

- How successful is the urban design element of Sauchiehall Street? How well does Sauchiehall Street work as a place?
- Would you say that the movement (engineering) and place (urban design) functions are interacting successfully?

Monitoring:

- Have you undertaken any monitoring or evaluation of the street? Can you share any data or evidence for things that are working or not working?
- What lessons are you taking forward into the next phase of the Avenues?
- Has there been any lesson sharing as a result of the Avenues programme?

Appendix 5: Quantitative data proformas

FOOTWAY LEVEL CYCLE TRACK: SAUCHIEHALL STREET NON-OBSTRUCTED/PINCH-POINT					
Day/Date	Time	Sheet no.	Location:	Eastbound / Westbound	Weather
	Walking totals		Cycling totals		Other totals
Female adult					
Male adult					
Child					
	Footway movements		Cycle track movements		Median movements
Pedestrian (1)					
Pedestrian (2+)					
Cyclist (1)					
Cyclist (2+)					
Delivery cyclist					
Ped_phone_ear					
Cyclist_phone_ear					
Ped_phone_hand					
Cyclist_phone_hand					
Behaviour log:					

Figure 98: Proforma developed to record footway-level cycle track data (method 2).

FOOTWAY LEVEL CYCLE TRACK CONTROL: ARGYLE STREET NON-OBSTRUCTED/PINCH POINT					
Day/Date	Time	Sheet no.	Location:	Eastbound / Westbound	Weather
	Walking totals		Cycling totals		Other totals
Female adult					
Male adult					
Child					
	Footway movements		Carriageway (W-E) movements		Cycle lane (contraflow E-W) mvt
Pedestrian (1)					
Pedestrian (2+)					
Cyclist (1)					
Cyclist (2+)					
Delivery cyclist					
Ped_phone_ear					
Cyclist_phone_ear					
Ped_phone_hand					
Cyclist_phone_hand					
Behaviour log					

Figure 99: Proforma developed to record control data on Argyle Street for footway-level cycle track metric (method 2).

SIDE ROAD: SAUCHIEHALL/ARGYLE STREET PITT/SCOTT/MITCHELL				
Day/Date	Time	Weather	Sheet no.	Eastbound / Westbound
Pedestrian behaviour	**Full deviation:** Stop, full look around, actively give driver priority	**Significant deviation:** Slow, look around, break off conversation	**Minimal deviation:** Glance, no change in speed	**No deviation:** No glance, no change in speed
CLEAR: **Can't** see (w/bound) or hear (e/bound) vehicles approaching	Walking (1): Walking (2+): Cycling:	Walking (1): Walking (2+): Cycling:	Walking (1): Walking (2+): Cycling:	Walking (1): Walking (2+): Cycling:
DANGER: **Can** see (w/bound) or hear (e/bound) vehicles approaching	Walking (1): Walking (2+): Cycling:	Walking (1): Walking (2+): Cycling:	Walking (1): Walking (2+): Cycling:	Walking (1): Walking (2+): Cycling:
Driver behaviour	**Full deviation:** Stop regardless of whether people crossing	**Significant deviation:** Enter slowly, give way to people crossing	**Minimal deviation:** Force change to ped behaviour, don't stop, overrun yellow lines	**No deviation:** Force people to hurry/stop suddenly, dangerous
	Vehicle: Cyclist:	Vehicle: Cyclist:	Vehicle: Cyclist:	Vehicle: Cyclist:

Figure 100: Proforma developed to record side road data for all side roads (method 3).

Appendix 6: The mechanics of quantitative data collection

1. Lingering behaviour

Prior to commencing the main data collection, the characteristics of each public bench along Sauchiehall Street and Argyle Street were recorded, including location, side of street, direction faced, number of seating places, presence of arms and backs, construction material, and whether they were grouped together. On Argyle Street, the small stone posts were also included in the data collection, as the pilot data collection session revealed that people were using these as additional seating (Figure 101).

Figure 101: Example of the stone posts on Argyle Street, which were being used as informal seating. Some have been retrofitted with wooden slats on the top, presumably to make them more comfortable to sit on, although these slats were sometimes missing in part or entirely. Images © author.

The process was repeated to note the commercial premises with seating available outside on each street. The total number of possible seats was calculated by recording the number of tables multiplied by the number of seats at each table. This varied greatly between seasons and sometimes even between days, so it was necessary to take a baseline for each premise and then modify as necessary during the actual data collection sessions.

Bench occupancy data were collected by walking the length of Sauchiehall Street (between Buchanan Galleries and Charing Cross) and Argyle Street

(between James Watt Street and the start of Trongate) recording the occupancy status of every public bench at the point where the researcher passed it. This ensured that the subject of the research, the new section of Sauchiehall Street, was observed directly before or after the pedestrianised control section. Occupancy was recorded as 'vacant' or, if a bench was occupied, the number of occupants was recorded along with high-level sociodemographic data (presenting sex, approximate age within a 10-year band and ethnicity). Basic behaviours were recorded (posture, use of mobile phone, interaction between occupants, eating, drinking and smoking). It was also noted where a bench was in direct sunlight and where occupants were within hearing distance of a busker.

A similar process was carried out for people occupying private seating outside commercial premises on the street. In this case though, it was only considered appropriate to record the occupancy levels relative to the total seats available in each premise and basic socio-demographic data (presenting sex and approximate age). There were often large numbers of people present, especially in summer, which made it difficult to capture anything other than very basic detail without having to stand for lengthy periods of time and attract attention to the researcher.

Concurrently, individuals exhibiting 'other' stationary behaviours were recorded. These included people busking, people working on the street as e.g. charity collectors, and people inhabiting the street as their residence during the day[5]. The same socio-demographic and behavioural data were collected for these individuals, but an additional category was added to record where an individual was interacting with street furniture other than benches (e.g. leaning on a tree or sitting on a step).

Observations were carried out twice per street per season, once at peak and once at off-peak. The direction of the collection was reversed the second time to maintain the validity of the approach. Qualitative comments pertaining to the

[5] This terminology is used specifically to refer to individuals who were observed sitting or standing on the street, often asking for money and sometimes with belongings. Sometimes these individuals were observed sleeping in makeshift bedding. However, the term 'homeless' is avoided because it is not possible to form a judgement pertaining to homelessness based purely on observation.

context of observations, and any particularly noteworthy occurrences, were recorded in a separate journal.

2. Footway-level cycle track

To collect the non-obstructed data, the researcher sat at a fixed location on each street (a specific bench on Sauchiehall Street and two specific doorways on Argyle Street) to remain as unobtrusive as possible whilst also maintaining a vantage point over the street. Data collection was carried out for 15 minutes recording people moving in one direction followed directly by 15 minutes in the other direction. The order of these was reversed in the second collection session.

100% of the individuals passing were recorded, other than two occasions on Argyle Street where the volume of people saturated the researcher's ability to record manually.

Sauchiehall Street

Figure 102 indicates the three 'zones' that comprise the new footway-level cycle track on Sauchiehall Street. Legally, people cycling must not use the footway (unless it is designated as an unsegregated shared-use path, which Sauchiehall Street is not)[6]. People walking, however, can legally use any part of the street. Despite this, it is intended for people walking to use the footway and people cycling to use the cycle track (DfT, 2020). The median strip is designed to provide space for street furniture that would otherwise obstruct the footway and cycle track, such as trees, benches and cycle storage. It is not designated for cycling and perhaps not necessarily intended for walking, however the latter is permitted legally.

[6] This is also potentially complicated further by the existence of 'Core Paths' in Scotland, which designate certain routes for use by all non-motorised users (Land Reform (Scotland) Act 2003). The pedestrianised section of Sauchiehall Street, east of Rose Street, is designated as a Core Path meaning that people cycling have a legal right to use it, despite there being no specific cycle infrastructure. The section west of Rose Street is not designated as a core path, however signage suggests it is designated as a segregated shared-use path, where people cycling must use the intended side. They can also choose to ride in the carriageway.

‘Non-obstructed’ observations were carried out in the location shown in Figure 102, including recording people walking or cycling in the median strip.

Figure 102: The three areas comprising footway-level cycle track on Sauchiehall Street, indicating intended direction of use. Note that the two closer individuals in the photo are walking in the cycle track, rather than using the footway, as intended. Image © author.

The same observational approach was applied to the ‘pinch point’ locations. These observations proved problematic on Sauchiehall Street, in that it was designed to allow for non-obstructed movement. Obstructions were therefore temporary and absent entirely on one occasion. The pinch points observed on Sauchiehall Street were:

- a temporary barrier placed outside a bar to allow people to queue for entry, which obstructed approximately 75% of the footway
- a large metal delivery crate outside a convenience store obstructing approximately 50% of the main footway (although the entrance to the convenience store provided an easy diversion, Figure 103)
- A group of people waiting outside a nightclub during a 19:30 data collection session, many of whom appeared to be under the influence of

alcohol, standing such that they were obstructing most of the cycle track and footway.

Figure 103: Example of one of the 'pinch point' locations observed on Sauchiehall Street. The metal crate is obstructing roughly 50% of the main footway. Image © author, taken June 2022.

Figure 104: Example of one of the 'pinch point' locations observed on Sauchiehall Street. A large group of people attending a nightclub had assembled on the street such that they obstructed much of the footway and cycle track. Image © author, taken October 2021.

Argyle Street

On Argyle Street, the infrastructure was not an exact copy of Sauchiehall Street, so it was necessary to adapt the approach slightly. The site selected for the unobstructed observation comprised a bi-directional footway of similar width to Sauchiehall Street, two lanes of eastbound carriageway and a westbound contra-flow cycle lane (Figure 105). This site was felt to provide as close a comparison as possible to Sauchiehall Street, given the wide footway, cycle-specific infrastructure, and carriageway. However, it is acknowledged that the streets are not identical, and data were analysed to control for this as far as possible by calculating behaviour as a proportion of total *anticipated* behaviour occurring in each area, according to the street design. People were categorised according to mode and their location in either the carriageway, contra-flow cycle lane (westbound) or footway.

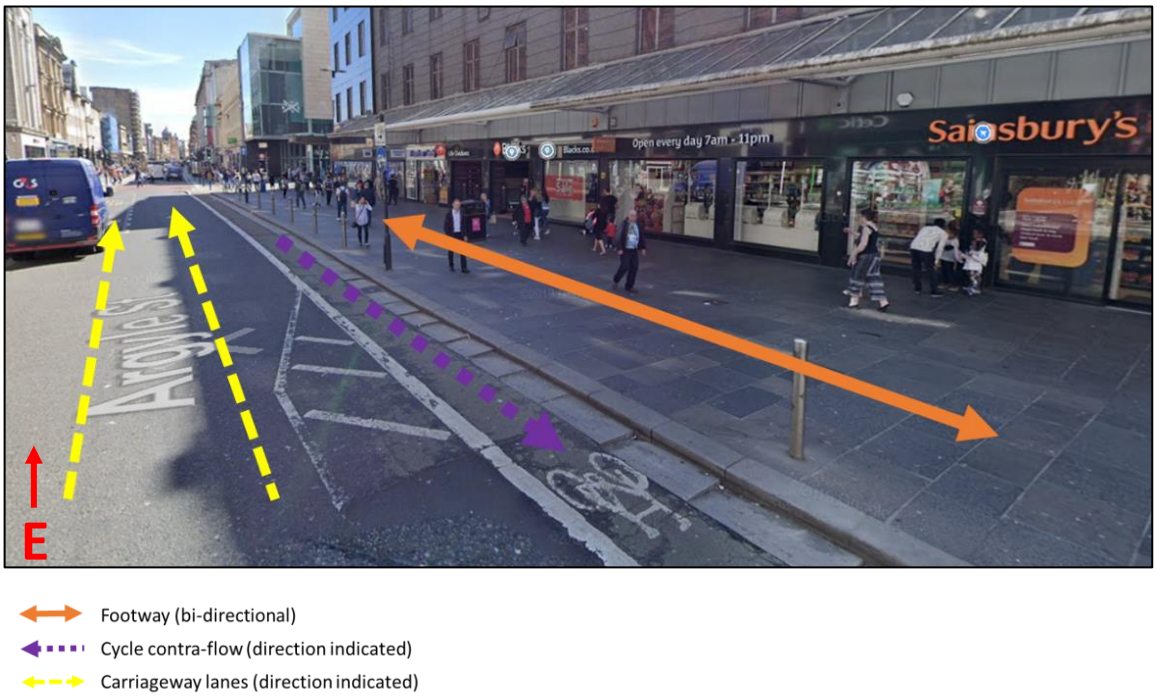


Figure 105: 'Unobstructed' observation site on Argyle Street showing footway, contra-flow cycle lane and carriageway. Image © Google Maps 2018.

Two 'pinch point' sites were observed on Argyle Street. The first was a fixed bus shelter on the north side of the street, which effectively divided the footway in two (Figure 106). A second site was made possible for the June 2022 data

collection when temporary construction works obstructed the footway that had been observed in the 'non-obstructed' observations (Figure 107).

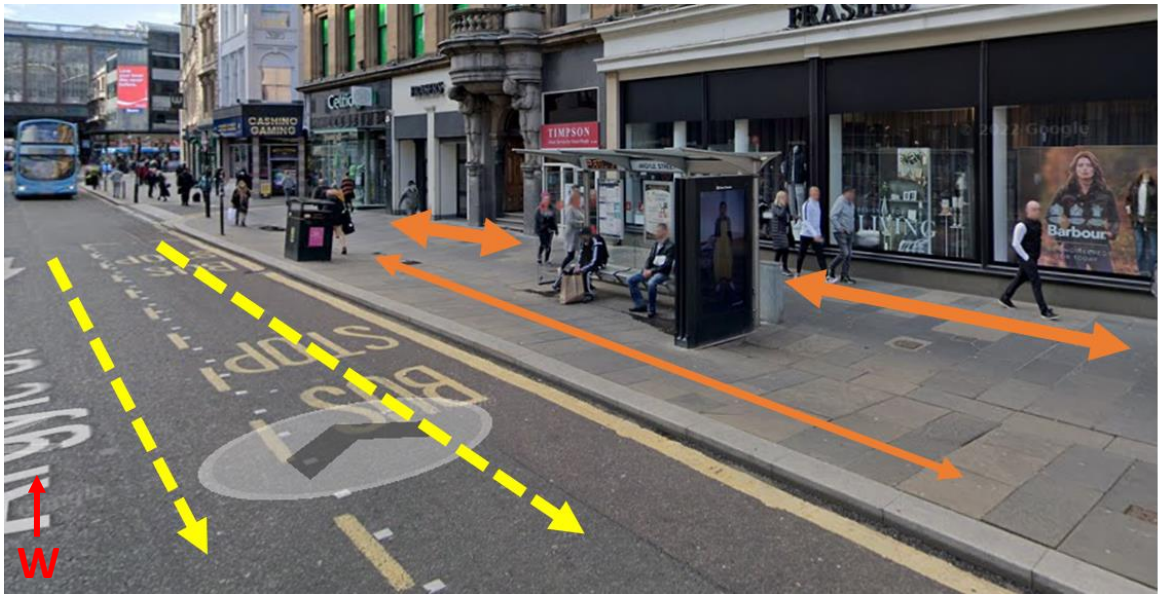


Figure 106: First 'pinch point' site on Argyle Street featuring fixed bus shelter. People were forced to decide whether to walk behind the bus shelter on the wider section of footway or pass in front in the narrower section by the carriageway. There is no specific cycle infrastructure: people are expected to cycle eastbound with the traffic in the carriageway or cross to access the westbound contra-flow. Image © Google Maps 2018.

Figure 107: Second 'pinch point' site on Argyle Street featuring temporary construction works obstructing the footway. People could choose to continue on the footway through the pinch point or step into the cycle lane or carraigeway. Image © author, taken June 2022.

3. Side roads

To collect the side road data, the researcher stood at a fixed location next to the side road on each street to remain as unobtrusive as possible whilst also maintaining a vantage point. Data collection was carried out for 15 minutes recording people walking in one direction followed directly by 15 minutes in the other direction. The order of these was reversed in the second collection session. Vehicle drivers were recorded every time they entered or exited the side roads, regardless of the direction of pedestrian flow being observed.

100% of the people approaching the side road were recorded by making a tally in the relative cell of the proforma in Appendix 5. Non-drivers were categorised as ‘single’, ‘2+’ (where people were in groups of 2 or more) and ‘cyclist’. It was not possible to collect any additional socio-demographic data manually due to the cognitive complexity of the observation.

Data collection sites

Three side road sites were observed: two on Sauchiehall Street at Scott Street and Pitt Street, and one control on Argyle Street at Mitchell Street. Both sites on Sauchiehall Street were designed with the intention of creating pedestrian priority at the side road. Scott Street, on the north side of Sauchiehall Street, also featured the continuous cycle track across the junction whereas Pitt Street on the south side had no specific cycling provision (Figure 109).

Both streets were one-way for vehicles: northbound on Scott Street and southbound on Pitt Street, so vehicles were turning left and right off the carriageway respectively to enter the side roads. However, Scott Street has been designed to provide a wider splay for vehicles entering the side road and the presence of the cycle track meant that vehicles were required to turn across two separate pieces of infrastructure (footway and cycle track). Thus, the two designs differed and it was decided to observe both to assess whether behaviour also differed at the two sites.

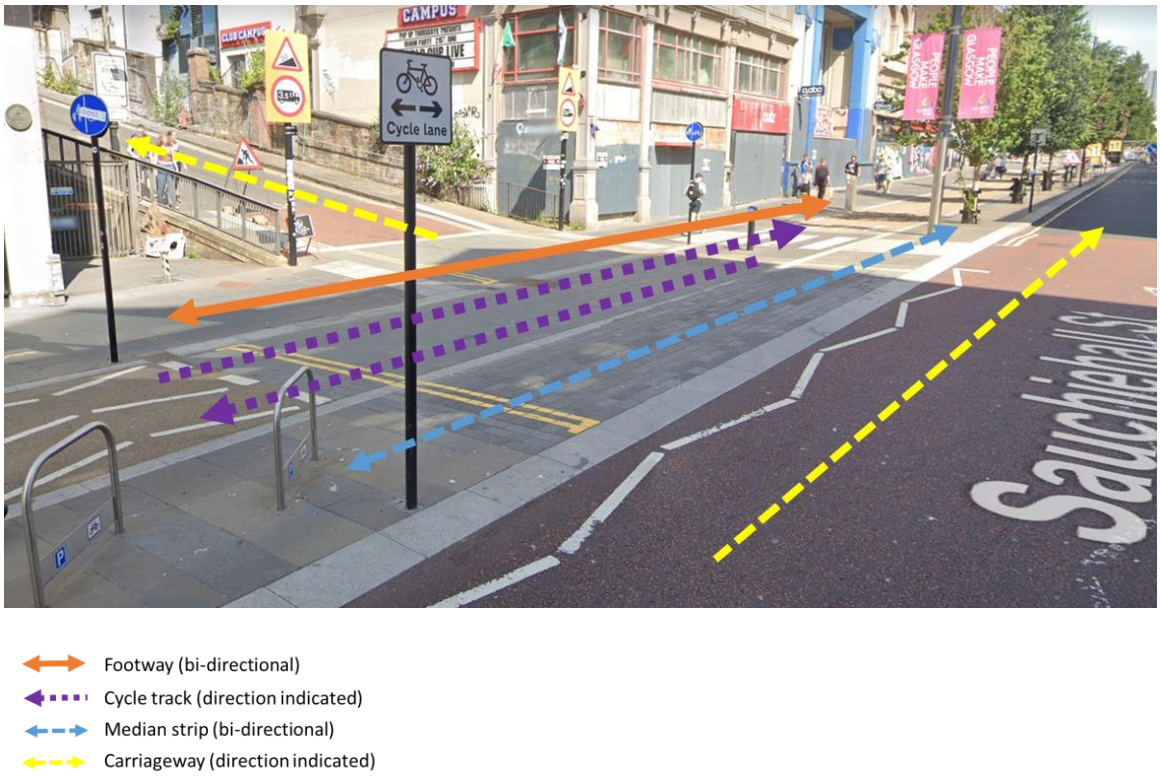


Figure 108: Scott Street side road on the north side of Sauchiehall Street showing footway, cycle track and median strip continuing through the side road. Vehicles enter the side road by turning left off Sauchiehall Street. Note that it is possible to start turning in from the double yellow lines. Image © Google Maps 2021.

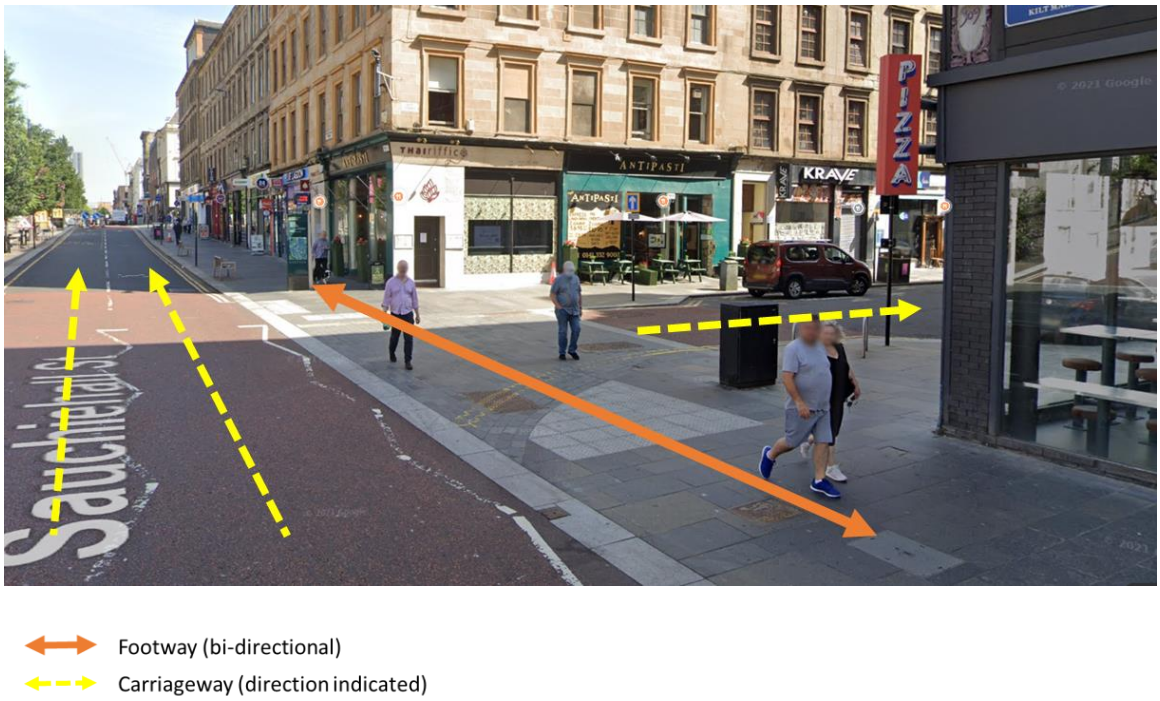


Figure 109: Pitt Street side road on the south side of Sauchiehall Street. Vehicles enter the side road by turning right off Sauchiehall Street but there is no corresponding cycle track to cross. Theoretically it is only possible to start turning where the yellow lines demarcate the carriageway, however there is visual evidence of people driving across the nearside footway, effectively cutting the corner to turn in. Image © Google Maps 2021.

Mitchell Street was selected as a control site on Argyle Street as it is the only side road along the study section of Argyle Street that does not have signal controls (Figure 110). It is a single lane side road with vehicles travelling one-way towards Argyle Street, i.e. turning out of the junction. The side road presents visually as a traditional crossing with a clear distinction between the granite footway and black tarmac carriageway, although there are no kerbs, so the whole surface is flush.

Figure 110: Mitchell Street side road on Argyle Street. Vehicles exit the side road and must turn left on Argyle Street. Image © Google Maps, 2018.

Appendix 7: Metadata for all observations, including type and seasonal data

*FLCT refers to footway-level cycle track.

**'Feels like' temperature taken from Meteorological Office app, referring to the effective temperature accounting for e.g. wind chill.

Date	Day	Time	Location	Data type*	Direction	Temp.	'Feels like'**	Sun	Rain	Wind	Light
11/10	Mon	08:30	SS	Lingering	Eastbound	10	9	No	Light	Slight	Full
11/10	Mon	10:00	SS_Scott	Side road	Eastbound	11	10	No	None	Slight	Full
11/10	Mon	10:15	SS_Scott	Side road	Westbound	11	10	No	None	Slight	Full
11/10	Mon	10:30	SS_normal	FLCT	Westbound	11	10	No	None	Slight	Full
11/10	Mon	10:45	SS_normal	FLCT	Eastbound	11	10	No	None	Slight	Full
12/10	Tue	08:30	AS	Lingering	Westbound	13	12	No	None	None	Full
12/10	Tue	10:00	AS_normal	FLCT	Eastbound	13	12	No	None	Slight	Full
12/10	Tue	10:15	AS_normal	FLCT	Westbound	13	12	No	None	Slight	Full
12/10	Tue	10:30	AS_Mitch	Side road	Eastbound	14	12	No	None	Slight	Full
12/10	Tue	10:45	AS_Mitch	Side road	Westbound	14	12	No	None	Slight	Full
12/10	Tue	17:00	SS_Scott	Side road	Westbound	14	14	No	None	Slight	Full
12/10	Tue	17:15	SS_Scott	Side road	Eastbound	14	14	No	None	Slight	Full
12/10	Tue	17:30	SS_normal	FLCT	Eastbound	14	14	No	None	Slight	Full
12/10	Tue	17:45	SS_normal	FLCT	Westbound	14	14	No	None	Slight	Full
13/10	Wed	08:30	SS_pinch	FLCT	Eastbound	13	11	No	None	Slight	Partial
13/10	Wed	08:45	SS_pinch	FLCT	Westbound	13	11	No	None	Slight	Partial
13/10	Wed	09:00	SS_Pitt	Side road	Eastbound	13	11	No	Light	Slight	Full
13/10	Wed	09:15	SS_Pitt	Side road	Westbound	13	11	No	Light	Slight	Full
13/10	Wed	10:00	SS	Lingering	Westbound	13	12	No	None	Slight	Full
13/10	Wed	19:30	AS_pinch	FLCT	Westbound	13	10	No	None	Strong	None
13/10	Wed	19:45	AS_pinch	FLCT	Eastbound	13	10	No	None	Strong	None
13/10	Wed	20:00	AS_Mitch	Side road	Westbound	12	10	No	None	Slight	None
13/10	Wed	20:15	AS_Mitch	Side road	Eastbound	12	10	No	None	Slight	None
15/10	Fri	08:30	AS_Mitch	Side road	Westbound	3	2	Full	None	Slight	Full
15/10	Fri	08:45	AS_Mitch	Side road	Eastbound	3	2	Full	None	Slight	Full
15/10	Fri	09:00	AS_pinch	FLCT	Westbound	4	3	Full	None	Slight	Full
15/10	Fri	09:15	AS_pinch	FLCT	Eastbound	4	3	Full	None	Slight	Full
20/10	Wed	10:00	AS	Lingering	Eastbound	10	8	Slight	None	Slight	Full
23/10	Sat	17:00	AS_Mitch	Side road	Westbound	14	11	No	None	Slight	Full
23/10	Sat	17:15	AS_Mitch	Side road	Eastbound	14	11	No	None	Slight	Full
23/10	Sat	17:30	AS_normal	FLCT	Westbound	13	10	No	None	Slight	Partial
23/10	Sat	17:45	AS_normal	FLCT	Eastbound	13	10	No	None	Slight	Partial

23/10	Sat	19:30	SS_Pitt	Side road	Westbound	13	10	No	Light	Slight	None
23/10	Sat	19:45	SS_Pitt	Side road	Eastbound	13	10	No	Light	Slight	None
23/10	Sat	20:00	SS_pinch	FLCT	Westbound	13	10	No	Light	Slight	None
23/10	Sat	20:15	SS_pinch	FLCT	Eastbound	13	10	No	Heavy	Slight	None
10/01	Mon	08:30	SS	Lingering	Westbound	6	4	No	None	Slight	None
10/01	Mon	17:00	SS_normal	FLCT	Westbound	10	7	No	Light	None	None
10/01	Mon	17:15	SS_normal	FLCT	Eastbound	10	7	No	Heavy	None	None
10/01	Mon	17:30	SS_Scott	Side road	Eastbound	11	8	No	Heavy	Slight	None
10/01	Mon	17:45	SS_Scott	Side road	Westbound	11	8	No	Heavy	Slight	None
11/01	Tue	10:00	AS_normal	FLCT	Eastbound	4	3	Slight	None	Slight	Full
11/01	Tue	10:15	AS_normal	FLCT	Westbound	4	3	Slight	None	Slight	Full
11/01	Tue	10:30	AS_Mitch	Side road	Eastbound	5	4	No	None	Slight	Full
11/01	Tue	10:45	AS_Mitch	Side road	Westbound	5	4	No	None	Slight	Full
12/01	Wed	08:30	AS	Lingering	Eastbound	9	6	No	None	Slight	None
12/01	Wed	17:00	AS_Mitch	Side road	Westbound	9	6	No	None	Slight	None
12/01	Wed	17:15	AS_Mitch	Side road	Eastbound	9	6	No	None	Slight	None
12/01	Wed	17:30	AS_normal	FLCT	Westbound	9	6	No	None	Strong	None
12/01	Wed	17:45	AS_normal	FLCT	Eastbound	9	6	No	None	Strong	None
13/01	Thu	10:00	SS_Scott	Side road	Eastbound	8	5	No	None	Slight	Full
13/01	Thu	10:15	SS_Scott	Side road	Westbound	8	5	No	None	Slight	Full
13/01	Thu	10:30	SS_normal	FLCT	Eastbound	9	5	No	None	Slight	Full
13/01	Thu	10:45	SS_normal	FLCT	Westbound	9	5	No	None	Slight	Full
13/01	Thu	19:30	AS_Mitch	Side road	Westbound	8	5	No	None	Slight	None
13/01	Thu	19:45	AS_Mitch	Side road	Eastbound	8	5	No	None	Slight	None
13/01	Thu	20:00	AS_pinch	FLCT	Eastbound	8	5	No	None	Slight	None
13/01	Thu	20:15	AS_pinch	FLCT	Westbound	8	5	No	None	Slight	None
17/01	Mon	08:30	SS_Pitt	Side road	Westbound	6	3	Slight	None	Slight	Partial
17/01	Mon	08:45	SS_Pitt	Side road	Eastbound	6	3	Slight	None	Slight	Partial
17/01	Mon	09:00	SS_pinch	FLCT		Missing					
17/01	Mon	09:15	SS_pinch	FLCT		Missing					
17/01	Mon	10:00	SS	Lingering	Eastbound	7	4	No	None	Slight	Full
18/01	Tue	08:30	AS_pinch	FLCT	Westbound	5	3	Slight	None	None	Partial
18/01	Tue	08:45	AS_pinch	FLCT	Eastbound	5	3	Slight	None	None	Partial
18/01	Tue	09:00	AS_Mitch	Side road	Westbound	6	4	No	None	None	Full
18/01	Tue	09:15	AS_Mitch	Side road	Eastbound	6	4	No	None	None	Full
18/01	Tue	10:00	AS	Lingering	Westbound	6	4	No	None	Slight	Full
25/01	Tue	19:30	SS_Pitt	Side road	Eastbound	7	4	No	Light	Slight	None
25/01	Tue	19:45	SS_Pitt	Side road	Westbound	7	4	No	Light	Slight	None
25/01	Tue	20:00	SS_pinch	FLCT	Westbound	6	3	No	None	Slight	None
25/01	Tue	20:15	SS_pinch	FLCT	Eastbound	6	3	No	None	Slight	None
06/06	Mon	17:00	AS	Lingering	Westbound	18	16	Full	None	Slight	Full

07/06	Tue	17:00	SS	Lingering	Westbound	18	14	Slight	None	Strong	Full
07/06	Tue	19:30	SS_normal	FLCT	Eastbound	16	14	Full	None	Slight	Full
07/06	Tue	19:45	SS_normal	FLCT	Westbound	16	14	Full	None	Slight	Full
07/06	Tue	20:00	SS_pinch	FLCT	Eastbound	15	12	Slight	None	Strong	Full
07/06	Tue	20:15	SS_pinch	FLCT	Westbound	15	12	Slight	None	Strong	Full
08/06	Wed	08:30	AS_pinch	FLCT	Westbound	11	8	Slight	None	Slight	Full
08/06	Wed	08:45	AS_pinch	FLCT	Eastbound	11	8	No	Light	Slight	Full
08/06	Wed	09:00	AS_normal	FLCT	Eastbound	11	8	No	Light	Slight	Full
08/06	Wed	10:30	AS	Lingering	Eastbound	11	9	No	Light	Slight	Full
08/06	Wed	09:15	AS_normal	FLCT	Westbound	11	9	Slight	Light	None	Full
09/06	Thu	08:30	SS_pinch	FLCT	Eastbound	13	11	No	Light	Slight	Full
09/06	Thu	08:45	SS_pinch	FLCT	Westbound	13	11	No	Light	Slight	Full
09/06	Thu	09:00	SS_normal	FLCT	Westbound	13	11	No	None	Slight	Full
09/06	Thu	09:15	SS_normal	FLCT	Eastbound	13	11	No	None	Slight	Full
09/06	Thu	10:00	AS_pinch	FLCT	Eastbound	14	12	No	None	Slight	Full
09/06	Thu	10:15	AS_pinch	FLCT	Westbound	14	12	Slight	None	Slight	Full
09/06	Thu	10:30	AS_normal	FLCT	Westbound	14	12	Slight	None	Slight	Full
09/06	Thu	10:45	AS_normal	FLCT	Eastbound	14	12	Slight	None	Slight	Full
10/06	Fri	10:00	SS	Lingering	Eastbound	16	13	Full	None	Strong	Full

Appendix 8: Reflexive Journal

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