

Commuting with new transport infrastructure:
Change, cost and comfort
on the Sofia metro extension

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by

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I, ANNA EVGENIEVA PLYUSHTEVA confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

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Abstract

New transport infrastructure reshapes existing everyday mobility arrangements, and is shaped by them in return. This study examines commuting practices as on-going economic, temporal, spatial and affective reconfigurations, following the launch of the second line of the Sofia metro in 2012. The study explores the ways in which qualitative research on everyday mobility practices can help address some of the challenges of appraising the usefulness of transport infrastructure.

Data were collected using repeated ride-along interviews with respondents who became metro commuters following the expansion of the Sofia metro network; ride-along interviews with other commuters; ethnography and auto-ethnography; and archival research. These methods highlight the role of longitudinal qualitative data in understanding the embodied experiences of routine public transport use.

The analysis considers the frequent metro users' perspectives on the economic and temporal costs of travel as subjective and embodied practices, arguing qualitative data can augment, rather than replace, quantitative appraisals of transport infrastructure. The collected data also point to the distributed nature of commuters' comfort and stress, by tracing comfort and stress through the collective, habitual, socio-material affordances of the rush hour. This view complicates the solitary figure of the mobile subject which forms the basis of much of existing transport research. Finally, a framework for thinking about habit and change in everyday mobility is presented. In this study, habit and change are not compartmentalised phases in travel behaviours and biographies, but mutually constitutive arrangements. By exploring modal and non-modal variabilities and shifts, an argument for travel behaviour research beyond mode and lifestyle categories is presented.

Through an in-depth engagement with the costs, durations, multimodality, variability, and the comfort/stress of commuting, the thesis contributes to efforts to develop new and different approaches to conceptualising the role in public transport infrastructure in the social and environmental sustainability of cities.

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Chapter 1. Introduction

When I started this research project in 2011, the launch of Line 2 of the Sofia metro was about a year away. The metro, conceived in the 1960s and first opened in 1998, had long been prominent in local politics and everyday conversation. Yet, up until the 2010s, it had been part of the daily mobilities of only a minority of Sofians. With the expanded network, this was about to change. The launch of the new metro line in 2012 was a big event for Sofia, as well as for the rest of Bulgaria. In a country which has mainly been covered in international news because of corruption, nepotism, and mismanagement of European Union (EU) funds, the fact that the metro expansion project made it onto the EU-WWF 'Well Spent' list was widely publicised (European Commission 2013). In embarking on this study, I have sought to unpack the meaning of the 'money well spent' trope in the context of urban transport. I was especially keen to find out what the impact of the second metro line would be on the daily lives of the inhabitants of the city, and this interest shaped my motivation to pursue the doctoral research project presented here.

This study focuses in particular on the effects of the new infrastructure on commuting in Sofia. Commuting habits and infrastructure projects are familiar topics both in the daily lives of cities worldwide, as well as in human geography scholarship. However, they are rarely brought into conversation as objects of enquiry. This is the gap the present study seeks to fill, and in doing so, to connect the Sofia metro case study to wider theoretical and practical preoccupations of urban transport research. The study first engages the topic of commuting. The journey to work, this humble and mundane trip that could be framed as the definitive urban routine (Binnie et al. 2007), continues to attract a lot of contention: for private individuals, especially those spending many uncomfortable and expensive hours per week on the move; and in urban politics, as the commute is often deeply implicated in processes of environmental and public health degradation, as well as social and economic exclusion (Coleman 2000; Bissell 2014). Conceptually, the seemingly routine and stable nature of commuting appeared to be a particularly suitable device for tracing the 'big' change anticipated with an overnight doubling of a city's underground rail network. The main research questions which guide this study can thus be thought of as the two sides of the same question: How do the practices of those who come to use a new transport infrastructure frame its value and usefulness? How can a new transport infrastructure inform the theorisation of change in the practices of routine everyday mobility?

While the commuting practices currently prevalent in the global North, such as driving to work, or spending a growing number of hours on the move, have been linked empirically to problems of societal, environmental and individual well-being, there are few indications as to whether, and how, commuting could be done differently on a large enough scale (Banister 2007). A new infrastructure for urban travel such as Sofia's new metro line is an opportunity to closely observe the dynamics of commuting behaviour change as they unfold. At the same time, enthusiasm for the transformative potential of infrastructure is pitched here against an all-important dose of scepticism. It can be expected that a new public transport line changes some aspects of the existing socio-material makeup of the commute while reaffirming others, although the exact dynamics of change and sameness might be quite different to those which various groups of stakeholders might have planned, or feared, at the project's inception.

Large transport infrastructure projects such as road expansion schemes, BRT networks, train station redevelopments, flyovers, or new tram lines, are a critical feature of many urban environments. At the same time, they can often be seen as controversial by politicians, citizens and scholars (Flyvbjerg 1998; Harris 2013). Since building new transport infrastructure is typically an expensive and complex undertaking, the process of convincingly demonstrating what is or is not worth building, is often as complex as the engineering of large structures itself (Adams 1981; Mouter, Annema, and Wee 2013). While cost-benefit analysis methods have become increasingly sophisticated with the advancement of modelling techniques and computational power, their overreliance on inflexible, quantitative and utilitarian understandings of costs and benefits, have been widely criticised (Self 1970; Richmond 2005; Shapiro and Schroeder 2008). According to research which critiques the processes of planning and quantifying the benefits of new transport infrastructure, methodological limitations and political motivations mean that, firstly, it is not always the most beneficial projects that get built, and secondly and more fundamentally, there is little agreement around possible definitions of 'beneficial' or 'worthwhile' (Bristow and Nellthorp 2000). The present study speaks to this body of work, but does not simply add another voice to the calls to do away with current cost-benefit analysis practices. Such calls, while persistent and substantiated, have not as yet brought about fundamental change in the domain of infrastructure appraisal. Instead, this work seeks to speak to the need for translation work between qualitative studies of mobility habits, and quantitative studies of transport infrastructure projects. By taking the challenges of analysing costs and benefits seriously, the study explores the potential of minute qualitative data for enriching some of these on-going debates.

The resulting thesis is first and foremost a qualitative transport geography of the second line of the Sofia metro. It is based mainly on the ride-along interview method: looking closely at what commuters do and at the ways in which they interact with each other and with everyday objects, and having detailed discussions with them about the usually taken-for-granted aspects of commuting routines. Many of these undertakings are staples of mobilities research (Cairns et al. 2014). At the same time, this is a narrative which uses micro-level empirical data in order to interrogate, and theorise, the difference that new public transport schemes can make to urban life. Thus, while focusing on the domain of the mundane, I have aimed to work across the distinctions between historical change and everyday practices. In doing so, I suggest that the dynamics between the two can shed light on the role public transport infrastructures play in the social and environmental sustainability of contemporary cities. By adopting this approach, I suggest that qualitative data on everyday mobilities do not invalidate currently prevalent transport project appraisal methods. Instead, qualitative geographies of transport can engage with, and contribute to, understandings of the ways in which urban infrastructure projects come to be valued in practice.

Mobilities scholars have developed a wealth of theoretical and methodological tools for grasping at the elusive micro-practices of mundane journeys. To deploy this theoretical tradition for the purpose of addressing questions of planning and evaluating infrastructure usefully, this thesis extends a mobilities-based approach to incorporate concepts and theories from transport geography, science and technology studies, the anthropology of infrastructure, and cognitive science insights on behaviour change and embodied cognition. This interdisciplinary approach allows for both the individual and collective aspects of commuting with new transport infrastructure to be explored. My aim in choosing this strategy is not to compare positive and negative outcomes for pre-defined groups along linear scales, but to trace a variety of socio-technical interactions in which new infrastructure becomes implicated. This aim is similarly reflected in a research design which focuses on repeatedly interviewing the same participants, during accompanied commutes in Sofia, across a range of contexts within and beyond the second metro line itself. The longitudinal research design has allowed me to follow the experience of individuals over time, as well as to be immersed in singular moments of commuter co-presence on the metro. This has, hopefully, allowed for a more nuanced view of newness, sameness, and change, to emerge in the resulting analysis, than would have been possible with snapshot views of a 'before' and an 'after.' Furthermore, the long-term engagement with the case study has informed an inductive approach to identifying topics of interest, suspending prior assumptions of causal links, as both the metro extension and commuting practices were observed to be changing continuously in non-linear ways. The resulting

research foci, as informed by the directions in which the empirical findings themselves took the study, have also informed the organisation of the rest of the thesis.

Chapter 2 introduces the history of the Sofia metro case study, tracing its construction from its inception in the 1960s, to the present day. The different forces which shaped the metro project emerge through the narrative, and complicate the impulse to attribute specific aspects of the metro project solely to political will, or to technological path dependencies. Political, social, economic, and technological aspects are all visible, and inter-related, in the way the metro's planners have conceptualised its role as an infrastructure, and in particular its possible impacts on commuting in Sofia. Finally, the chapter highlights the ambiguous approach of the city's authorities to appraising the metro project, and the significant shifts in public opinions of it. This ambiguity serves as the background for discussing the usefulness of the metro network after its first two lines, of a planned total of three, were finally completed in 2012.

Chapter 3 lays out the theoretical framework of the study, situating it in relevant literatures from across geography, planning, anthropology, and science and technology studies. It begins by considering recent theoretical and technological innovations in urban mobility, and more specifically, the role of public transport in its changing landscape. In the review, attention is drawn to the mobility services, and wider socio-cultural purposes, associated with public transport modes, which might not be afforded by other forms of getting around cities. These include infrastructure conducive to affordability, accessibility, and co-presence and mixing. In light of the likely need to continue building and expanding public transport infrastructure in various global contexts, the chapter provides an overview of how the costs and benefits of such projects are currently appraised. Attention is drawn, in particular, to the role of quantified and monetised time savings in gauging the worth of new transport infrastructure. This sets the scene for the alternative view of value of travel time adopted in this study, which takes into account both qualitative and quantitative aspects of time. The review identifies a gap between current social science research critical of large infrastructure planning and appraisal, and the need for a qualitative, socio-technical engagement aimed at innovating *with* the challenges of transport planning and appraisal. Finally, the domain of urban transport infrastructure research and practice is linked back to the rich interdisciplinary body of mobilities research. An overview of mobilities scholarship perspectives on commuting and commuting habits, which proposes directions for drawing on science and technology studies, and anthropological and cognitive science ideas, in order to enrich mobilities' conceptualisations on commuting habits and change. By linking research on large infrastructure appraisal and a range of perspectives on mobilities practices, the place of

qualitative, longitudinal engagements with the question of infrastructural change and utility, is mapped out.

Chapter 4 details the research questions, and the methodological approach I have adopted in bringing together the specific question of the effect of the Sofia metro extension on commuting with the theoretical directions identified in Chapter 3. The key approach explicated in the methodological chapter is centred on a qualitative longitudinal research design of repeatedly interviewing a group of commuters while accompanying them on their everyday journeys. The roles of additional interviews, archival research, ethnography, and autoethnography, are also detailed.

The findings of the study are presented in four chapters, each relating the empirical data collected, back to the research questions which frame this project. Chapter 5 engages with a core concept in the planning of transport infrastructure, namely travel time savings and their value. The chapter presents data on the different ways in which commuting time acquires value, across quantitative and qualitative aspects of travel time-making practices. Clock duration and embodied interactions are highlighted as being implicated in travel time together, instead of placing them in opposition, as belonging to contrasting and mutually exclusive paradigms. Chapter 6 applies a similar logic to the practices of paying for everyday travel, examining both the cost of using the metro infrastructure, and the situated and embodied practices which complicate a purely numerical approach to understanding price and paying. The dynamics of switching between different types of travel passes, both before and after the launch of Line 2, are explored, along with the place of fare evasion in mundane mobilities such as commuting. The chapter draws attention to ways in which the insights on paying as a situated practice can inform adaptations in the metro infrastructure which would make it more valuable to commuters. Chapter 7 shifts the focus away from the solitary mobile subject of transport research (Manderscheid 2013), to conceptualise collective habits of making comfort and stress during the peak times of metro commuting. The rush hour is discussed not as a pre-defined temporal segment, but as an entanglement of co-presences, and orientations between human and non-human bodies which seek out situated comfort in mindful and embodied ways. Linking these findings to the nexus of well-being and mobility, the chapter argues for considering the minute socio-technical dynamics of making a commute comfortable or stressful during peak times. The main theoretical contribution of these three chapters is one of translation: between quantitative measures of time savings, and lived infrastructural arrangements for valuing and making time; between price, and ticketing as a lived practice; between passenger satisfaction, and shared well-being. The final empirical chapter, Chapter 8, proposes an analytical framework for thinking about change.

Change here refers to the ways in which minute everyday mobility practices transform large new infrastructures, and vice versa. Data are presented which trace the fluid relationships between variability and shift, and modal and non-modal change, in everyday travel behaviours. The implications of this approach for thinking about urban sustainable mobility transitions are also discussed.

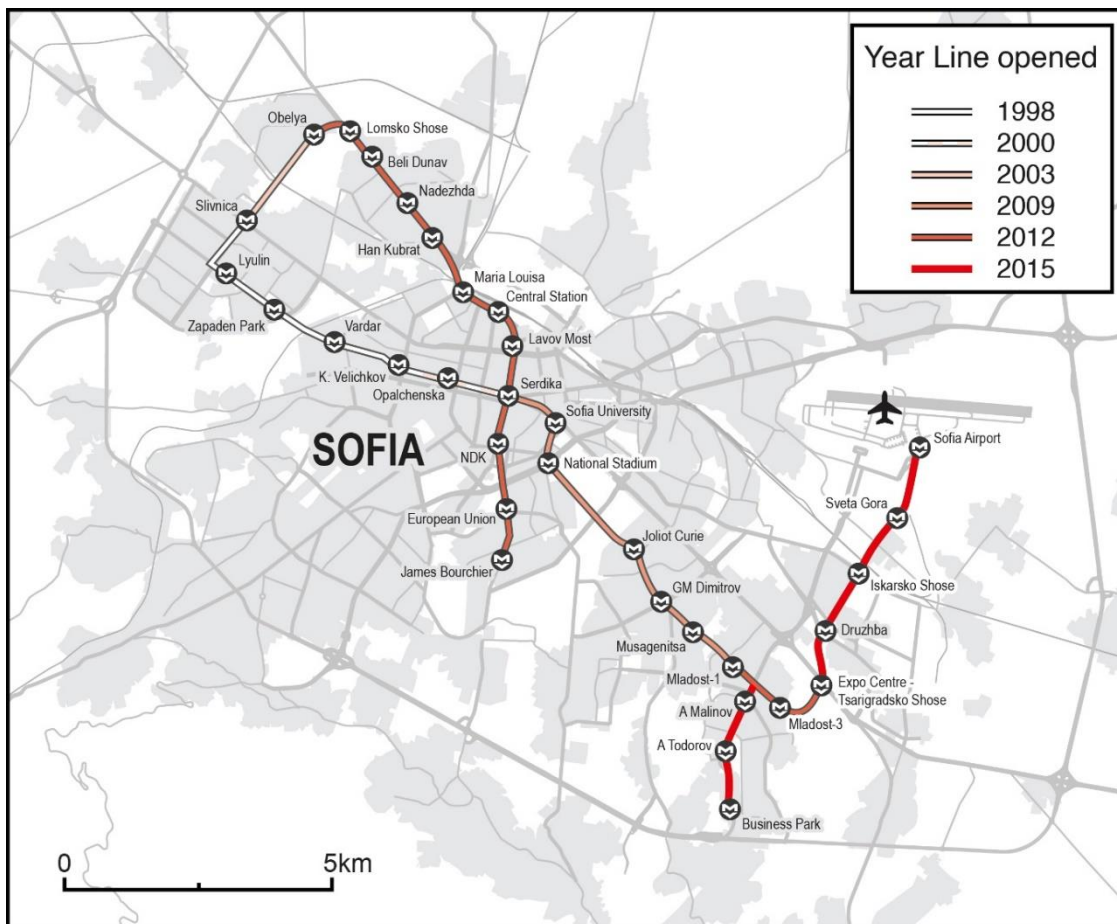
The concluding Chapter 9 summarises the findings presented in the four empirical chapters. It relates them back to the research questions which centre on infrastructural change and value, transformations in habitual mobility, and the implications of these for urban social and environmental sustainability, and well-being. The thesis structure inevitably involves a degree of compromise, particularly with shaping into a linear text the kind of inductive and interdisciplinary research this study has aspired to embody. Chapter 9 aims to make this compromise explicit and then move beyond it, focusing on themes which exceed the organisation of the empirical material into four chapters. The key themes of the study are discussed in relation to the Sofia metro extension case study, and the wider theoretical and practical implications of the empirical findings are also considered. The chapter concludes with some reflections on the limitations of this study, and identifies directions for future research.

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Introduction

The idea to build an underground rail system in Sofia dates back to the 1960s. The earliest relatively complete plans were approved in 1974. Ground was broken in March 1978, and construction started and stopped several times in the 1980s and 1990s, with the 1989 change of political regime one of several big challenges faced by the project. The first small section of Line 1 was launched in 1998, and a North-South link started running through the city centre in 2009 –almost 40 years after the intention to build a metro was first publicised by officials. The second line of the metro was launched in 2012 (Figure 2-1).



Map data © OpenStreetMap contributors, CC-BY-SA, opendatacommons.org

Figure 2-1. Phases of metro construction. Map by Miles Irving, UCL Geography Drawing office.

Historical accounts often present underground rail projects as metonyms for the broader political and cultural histories of their societies. Metro projects are thus frequently understood, first and foremost, as political and ideological projects – physical manifestations of the agendas pursued by powerful groups in urban societies. An overview of metro histories from different global contexts demonstrates that these metro-spawning ideologies are surprisingly consistent. Metros as an expression of urban modernity is one such frequently encountered theme (Tomic, Trumper, and Dattwyler 2006). Others include the often-studied linkages between metros and notions such as ‘global city,’ or ‘socialist city’ (Richmond 2005; Butcher 2011; Gibas 2013).

In making the case for a metro in the 1960s and 1970s, the local and national governments frequently resorted to ideologically loaded rhetoric, such as the metro as an initiative which will seal the eternal friendship between Sofia and Soviet Moscow. This type of rhetoric was familiar from similar projects across the socialist cities of the region, as discussed by Gibas (2013) in his work on the Prague metro development.

Because the political functions of metro networks are so often at the forefront of how their histories are written, other aspects of these large, complex and inevitably controversial

projects can become lost from view. These subtler aspects of metro histories encompass, on one hand, the seemingly mundane construction stages of delivering metro transport infrastructure; and on the other hand, its quotidian use by passengers, imagined by planners, and later performed by the city's inhabitants in practice. Metros, like any large urban project, are not only the physical manifestations of the agendas of local, national and international elites. Histories of large urban projects also need to be sensitive to the micro-level processes which make them part of the local everyday. In pursuit of this objective, this chapter draws on archival and media data and demonstrates the ways in which the everyday uses of the Sofia metro, and commuting in particular, have been imagined and incorporated into the project throughout its history, before moving in the next chapters to examine the ways in which they have been actualised in contemporary Sofia. By adding the micro-stories to the macro-narratives, such scalar distinctions can become complicated and enriched. Thus, the contemporary mundane interactions of underground trains and their users, can act as a lens through which to gain a different type of understanding of the metro's history, and in turn, studying its complex development trajectory can serve to illuminate the everyday mobilities of the Sofia metro of the early 21st century.

This chapter tells the story of the Sofia metro as an infrastructural project which has spanned several decades and two contrasting political regimes. To this day, the Sofia metro is a project which continues to evolve. As a result, its place in the everyday city of 2012-2015 reflects to an extent the technological and human histories which are embedded in the metro's current form. While this study aims to engage with a number of theoretical preoccupations from urban and transport geography and beyond, its findings are closely linked to the historical, spatial, political and economic specificities of the case study. In this chapter, the key connections between the metro project and the on-going dynamics of life in Sofia, are laid out.

2.1. What kind of city: Envisioning a metro for Sofia

Sofia became the seat of Bulgaria's government in 1879, and by the 1930s had come to stand in sharp contrast to the rest of the country, which was rural, relatively poor, and bound up in traditional ways of life (Gigova 2011). The city experienced largely uninterrupted growth throughout the late 19th and the 20th centuries. Contemporary Greater Sofia was formed in 1938, when a new law announced the addition of several adjacent villages to the metropolitan area (Dikov 2010:138).

The first two tram lines in Sofia began operation in 1901 (Dikov 2010). For a few decades, the trams represented urbanity, elegance and progress, and were much loved by the

residents of the city. But after its initial boom, public transport in the capital began to experience a steady decline. This was a trajectory familiar to a number of cities across Europe and North America (Costa and Fernandes 2012). By the 1960s, official voices were framing the Sofia tram as a nuisance rather than an iconic urban feature (see Figure 2-2). By 1976, the annual subsidy required to run Sofia's public transport had grown to BGL 11,102,000¹ (Ministerial Council 1977). It is in this period between the late 1960s and early 1970s that the first plans for a different kind of transport system emerged, one which would have greater speed, capacity, and contribution to a vision of progress, compared to the now old-fashioned trams.



Figure 2-2: Tram in central Sofia, circa 1960. Source: StaraSofia.com

The metro plans of 1972 were the first occasion, although by no means the last, when the metro was presented as “the future backbone of the city’s transportation system” (Sofia Municipality 2009). Importantly, what the local authorities meant by “transportation system” at different times of using the phrase during the 20th and early 21st centuries warrants a closer examination, given that commuting is always, in different ways, central to it. In the 1960s and 1970s, the vision for Sofia was one of a modern city built for growing automobility. Planners envisaged removing tram lines to make more space in the city’s streets for cars; pedestrianising the central part of the city to facilitate cultural and recreational activities; and building three metro lines for rapid journeys across the city –

¹ This is equivalent to approx. US\$115,646 in 1976 US dollars, or US\$466,000 in 2012 values (US\$1=BGL96.6 in 1976; purchasing power calculator at measuringworth.com). The ISO code for the Bulgarian lev was changed from BGL to BGN in 1999 to reflect the currency’s devaluation. Further currency conversions are given in 2012 US dollars.

and in particular, for Sofians' increasingly long commutes. The following two contributions from transport planners summarise the priorities set out for the city at the time:

"With the construction of the metro, the difficulties which have set upon the public transport will be removed. Convenient, fast and reliable connections of the main centre with the entire urban organism will be provided. With the introduction of the metro will begin the gradual removal of the tram transport, which has proven complex and burdensome to the street network." (Sofia People's City Council 1974a).

"Motorization of the Bulgarian People's Republic is developing rapidly. This is especially evident in the capital, where at present there are 114 motorised vehicles per 1,000 inhabitants. It is expected that by the year 2000, the number will have risen to 250 per 1,000. *[This estimate proved to be conservative, as there were 379 cars per 1,000 inhabitants in Sofia in 2005, according to Eurostat (2013)].* This rapid development necessitates the quick introduction of parking solutions. [...] Automobility is part of the national wealth and therefore, measures should be put in place which make the best of it, and preserve it." (Sofia People's City Council 1974b; see Figure 2-3.)



Figure 2-3: Street in central Sofia in the late 1960s. Source: *LostBulgaria.com*

However, focusing solely on the role of automobility in the planning of the metro would present only a partial picture of how the city and transport infrastructure were actually envisioned. The idea for a pedestrian city centre is a notable illustration of how much importance was assigned to walkability in terms of quality of life and urban environment as early as the 1970s. Similarly, the 1972 Decree which made the metro plans official, explicitly stressed that at all multi-level intersections of the metro with other modes of transport, pedestrian traffic must be given priority (Ministerial Council 1972a).

Among other things, the metro has always been seen by its planners as an infrastructure specifically geared for commuting. Along with the need to free up street space for cars, the

goal of shortening commuting times was a key objective for the metro's planners. Government experts cited studies carried out in the USSR which found that a 10-minute increase in journey time decreased worker productivity by 2.5-3.0%, while commutes which are longer than 30 minutes lead to productivity declines of over 10% (Ministerial Council 1977:27). The studies, carried out in Moscow, found that workers commuting by metro as opposed to other modes of transport were more likely to remain in a job for longer, and to deliver higher quality production. These long-standing concerns about duration, comfort and stress in commuter journeys are echoed in the chapters which follow.

At these early stages, the limited reach which is characteristic of all metro systems was not a major concern for public officials. The new high-rise residential areas on Sofia's outskirts had very high densities, as did many work destinations such as Sofia's major factories, and the public administration buildings in the city centre (Hirt 2007).

In this sense, the claims made in the 1970s by metro advocates, that it would make an effective infrastructure for commuting, appear to have been well-founded. There was very limited discussion of integration across transport modes at the time: the metro would replace ground-level public transport, not complement it. It was not until the 1990s that this rationale for the metro, along with the city's spatial structure, underwent significant changes; it was not until the 2000s that the question of taking a bicycle onto a metro train was ever raised.

Before eventually settling on a heavy rail² underground system, the local and national authorities discussed a range of different technology options. Coordination between agencies was poor, particularly since competition for Party goodwill, rather than collaboration, was often the priority. As a result, the first demolition of buildings began in the late 1960s (Dikov 2010:123), years before a clear plan of what was to be built in their place could be agreed upon.

2.2. What kind of transport: The 1972 metro plan

The technological options for the metro which had been given consideration included a heavy rail system almost entirely confined to underground tunnels; and light rail whose tracks would be at street level (except in the most built up central area, where the train

² Heavy rail systems can handle large volumes of passenger traffic, rely on an electricity supply from a third rail laid on the track, and always move along an exclusive right-of-way. Light rail systems are usually targeted to routes with lower passenger traffic and may move on tracks at grade level, not separated from other street traffic (Pucher 2004:199).

would descend into shallow tunnels). Despite several consecutive recommendations against the more expensive heavy rail option, which many experts considered excessive for Sofia's modest traffic volumes and population size at the time, government ambitions had to prevail (Guenchev 2009). The project was to serve major internal and external political purposes. First, it was to affirm the ability of the Government to bring modernity and prosperity to the small Eastern European country. Second, it was to serve as a state-of-the-art tribute to Bulgaria's endless loyalty to the USSR. In explicitly emulating Moscow's metro system (despite the fact that the population of the Soviet capital in 1970 was over 7 million, compared to Sofia's 800,000), Bulgaria was to demonstrate to its own citizenry and the world the ever-growing gains from the 'friendship' with the USSR (Guenchev 2009).

However, these broader political motives for a large infrastructural project did not negate the planning and managerial objectives pursued by local government. Instead, these two sets of priorities were continuously intertwined in the metro documentation throughout its history. Some of the benefits most frequently cited in relation to the metro project in the early 1970s included a better urban environment with lower air pollution and noise levels; greater equality, since residents of peripheral areas would gain greater access to the city centre; reduction in the number of accidents between pedestrians and trams; and the metro's additional function as an underground shelter in the case of emergencies. These policy objectives were connected to broader ideologies on one hand, but also to the day-to-day running of the project, the decisions made, the technologies chosen, as well as the technologies 'ended up with.'

In 1972, an early full version of the metro plans was approved and published by the national government. These included a track gauge of 1435mm, which would be equivalent to the national rail system. The equivalence was based on being able to use existing manufacturing and maintenance setups at the country's rail yards, rather than a desire to integrate the two networks (which would have made a significant difference to the suburban commuters transferring to the metro at Central Station, as will be seen in Chapter 8). A total network length of 21.2km was envisaged, with 25 metro stations; maximum capacity of 50,000 passengers/hour in every direction; and a total construction budget of BGL 400 million (US\$17.6 million in 2012) (Ministerial Council 1972b). How approximate these costings were is evident from a Ministry of Architecture report from the same year, which uses the same parameters, but estimates the overall cost at BGL 1 billion (Stoilov and Panev 1972). It is important to note that, as critiques of cost-benefit analysis of transport projects have repeatedly demonstrated, the dubious reliability of appraisal figures should not be attributed solely to the ideologically-driven Socialist

bureaucracy, nor to the lack of technical skills among local transport planners. While both of these factors played a role in defining the expectations placed on the Sofia metro, the repeated upward revisions of these figures also reflect the limitations inherent in the quantitative appraisal of large transport projects anywhere (Flyvbjerg, Bruzelius, and Rothengatter 2003; Eliasson and Fosgerau 2013). Several decades on, developing meaningful ways of setting expectations, and evaluating outcomes in relation to large transport projects, remains a significant challenge for decision-makers worldwide. Taking inspiration from the early metro planners in Sofia, the discussion in the chapters that follow takes as its point of departure not that instruments for quantifying impact are insufficiently precise, but that different ways of thinking about benefits, costs and value, could be imagined.

In the early 1970s, the first section of the metro was defined as a 10.5km line between Modern Suburb (Slivnica station) and the city centre. The way the somewhat ambiguous signifier 'city centre' was exploited in reporting on the project's progress, and the revised definitions the 'first section' underwent in the next decades, is a topic I will return to in section 2.4.

A launch date was also agreed, postponing an earlier agreement from December 1974 to 30 August 1976 (the actual launch date, deliberately or not, was eventually scheduled for 30 August 1998, exactly 22 years later). Even with this additional time, it is unlikely that anyone expected to deliver an operational metro line with five stations in four years' time, given the minimal expertise and resources available. The state company planning the metro, HidroStroy (and its dedicated subdivision – MetroStroy) explained this first of many postponements with the "unique character of the project and the necessity to preserve the archaeological treasures of the city of Sofia" (Ministerial Council 1972b). The archaeological site at the central Serdika station would be 'discovered' anew in the 2000s, when the builders of Line 2 once again had to plan and budget for dealing with the city's older past.

One of the expert reactions to the 1972 plans raises the following concern:

"[The plan for a metro for Sofia] is drawn up in isolation from the other types of public transport and does not take into account the yet-to-be-finalised Sofia urban plan. (...)" (Pishtachev 1972)

To a greater or lesser extent, this has remained a valid criticism of the metro project throughout its history. In 1972, agreed routes included a Line 1 which would branch out towards Sofia Airport and to the peripheral Poduyane rail station. The idea of lines which branch out towards the outskirts of the city was retained in later plans, as it was seen as way of increasing the metro's limited catchment areas. The routes changed, however, and

the Poduyane branch subsequently became part of the plans for Line 3 (unlikely to be launched before the early 2020s). This reflected important changes in the urban and national economy after the fall of state socialism. Prior to 1989, Poduyane was the gateway to Kremikovtsi, a giant metalworking plant which at its peak was among the top employers in Sofia, with 35,000 workers (as well as almost certainly the top pollution source). The privatisation, in 1995, and eventual bankruptcy of the plant, meant the metro link to Poduyane, originally a key commuting route, lost most of its importance.

As the plans for the metro began to take a more concrete form, the project became increasingly complex, and even more difficult to interpret as the product of a single agenda. On one hand, the plans reflected broad ideological and geopolitical aspirations; on the other, a concern with 'everyday' issues such as commuting times and worker productivity. On one hand, the metro project had an air of exceptionality, of superseding the pre-existing socio-spatial setup. This exceptionality has been argued to be characteristic of most megaprojects (Flyvbjerg, Bruzelius, and Rothengatter 2003). On the other, it was under growing pressure to integrate well alongside cars, trains and pedestrians.

An intermediate 1974 Directive Plan seemed to envisage a metro network plan of four times the length discussed in 1972, at 97.3km (Guenchev 2009). By comparison, in 2.2 million Amsterdam of 2012, the metro network totalled 42.5km. Although the uproar from transport planners, engineers and the general public was condemned as un-patriotic and anti-Soviet by state officials, the plan was revised down in 1975 to a more modest 49.2km (Guenchev 2009). While some of these plans have been interpreted as megalomaniac, even irrational, echoing the wider literature which challenges the grand visions which inform large infrastructure planning (Flyvbjerg, Bruzelius, and Rothengatter 2003), they should also be examined in the context in which they were produced. Socialist Sofia's transport officials were preparing themselves for continued urban growth, and car ownership growth – and were proven correct on both accounts, despite the change of political order. In the 1970s, transport planners were drawing up a metro strategy with the year 2000, not 1975, as a point of reference. Arguably, the visioning of Sofia as dominated by automobility was in itself a self-fulfilling prophecy. The 1.25-1.45 million population in 2000 which was anticipated in the early 1970s was a fairly accurate prediction of what was to come (Stoilov and Panev 1972). While certain official statements might imply a naïve optimism, the repeated references to 2000 in the technical reports suggest that unofficially, planners probably had a fairly accurate idea of how long the metro project would take to complete. Despite the long period of time that separates them and the numerous socio-political changes which have occurred, the findings of the present

research project should be read against the background of these early ideas developed by the metro's planners.

By all accounts, the publication of the revised plan did not put an end to the lively debates around what and where the metro should be. In the next two years, eleven official consultations including 535 academics and civil servants were carried out, and some of their suggestions were used to modify the plans for the metro (Ministerial Council 1977). In the late 1970s, institutions were yet to agree on basics, for example whether 100m or 120m was the appropriate length of metro platforms.

There is ample evidence that the debates around the metro plans were tense, antagonistic and politically charged. They concerned both 'big' geopolitical issues, and much more often, 'small' interdepartmental politics. There are many examples that no information related to the metro appraisal comes from a purely technical or neutral voice – assuming such a thing could ever exist. For example, this chapter repeatedly references a strongly worded 2009 paper by Eng. Hristo Guenchev, which condemns many of the shortcomings of the metro planning process of the 1970s and 1980s. My research in the Sofia City Archive also revealed Eng. Hristo Guenchev to be the author of an alternative transport plan, rejected by local planners in 1977 (Ministerial Council 1977).

It is important to recognise how little expertise on building and managing metros was available in Bulgaria in this period. The way in which a report by SofProekt staff on their return from a study visit to Moscow jumps from topic to topic, illustrated this:

“The Soviet experts believe that given our conditions, we should seek to lay the tunnels at the shallowest possible level. (...) Each station is named after the place, where it is located. (...) This way, architecture can perform a civic education function. The 1960s fashion for stations built with cheap materials has been overcome, in favour of marble and granite, which are durable, and also inexpensive, compared to the overall cost of building a metro system.” (SofProekt 1972).

During the 1970s, Soviet metro planning companies from Moscow and Kiev began providing consultancy services to the official planning agency, SofProekt. This cooperation was first formally agreed between the Ministerial Council and the USSR government in February 1975 (Ministerial Council 1975). The metro might have been a symbol of the eternal Bulgarian-Soviet friendship, but these services were paid for, and at a generous rate (Ministerial Council 1975).

2.3. Slow progress: Building the Sofia metro in the 1970s and 1980s

By 1977, the plans for the first metro section to be built had been modified. Instead of the original 10.5km, the distance between the neighbourhood of Lyulin³ and city centre was now put at 7.7km (Ministerial Council 1977). This was the first sign of what was to become the flexible definition of the 'first section.' Its cost was now estimated at BGL 323 million (US\$12.9 million), including BGL 47.7 million for construction base and automation. The maximum capacity remained unchanged at 50,000 passengers/hour. This figure was calculated on the basis of train occupancy of 4-5 people/m²; as will be seen in Chapter 7, this is consistent with the threshold for uncomfortable crowdedness still used by transport planners today (Tirachini, Hensher, and Rose 2013). In the last days of 1977, it seemed like actual construction on Line 1 was going to begin in 1980, with the Ministerial Council now setting a launch date no later than the end of the Eighth Five-year Plan, i.e. before 1988. On completion, the first section was to carry 66 million passengers/year. The December 1977 Ministerial decree further mandated that by 30 June 1978, construction should begin on the housing necessary to meet the needs of the metro planning and construction workers. The severe housing shortages faced by expanding Sofia meant the local authorities were always having to prioritise between one 'strategically important' group of workers in need of housing, and another. Those involved in one of the largest and most high-profile national projects ranked very high in this hierarchy.

In March 1978, the ceremonial first sod took place – and little else. It would take a few days short of 20 years for trains to start running through the tunnels started in 1978.

Although the plan approved in 1975 focuses on Line 1, it was the future Line 2 that saw construction begin first. This was a case of opportunism, rather than design. Core elements of two Line 2 stations could be put in as part of the foundations for one of Sofia's monumental public buildings – the National Palace of Culture, opened in 1981 on the occasion of the 1,300 year anniversary since the founding of the first Bulgarian kingdom in 681 (Figure 2-4). This opportunistic approach, driven largely by resource scarcity, meant the metro started appearing on the Sofia map as a series of small specks, with little

³ References to places along the metro network have often presented a number of difficulties, then as well as now. References to Lyulin can mean Lyulin station, as well as Lyulin neighbourhood, where two contemporary metro stations are located – Lyulin and Slivnica. The same applies to the Line 2 station James Bourchier, which is often referred to as Lozenec, even on some official maps and signs, after the neighbourhood in which it is located. This often presents difficulties for people who are not familiar with the map of Sofia. In writing this text, I have aimed to specify what is meant whenever there is ambiguity about these names.

evidence of the network which would emerge eventually. Thus, a 1984 HidroStroy report made it clear that the bulk of what had been completed by that point was not the metro itself, but a construction base: an extensive area near Lyulin station, where various metal and concrete infrastructures for the metro could be delivered, stored and/or assembled. In terms of Line 1 itself, some progress had been made in constructing stations 2 (Lyulin), 3 (Zapaden Park), 4 (Vardar), and 7 (Serdika) and a part of the tunnel between stations 3 and 4 (see Figure 2-5).



Figure 2-4: National Palace of Culture soon after completion, 1981. Source: *LostBulgaria.com*



Figure 2-5: Map of stations under construction by the early 1980s

Documentation from this period recognised the technical difficulties encountered by the planners of the Sofia Metro. The main ones include the refusal of the Ministry of Engineering and Metallurgy (MEM) to produce the cast-iron lining used in tunnel construction. Despite being designated an “object of national significance” (Ministerial Council 1977), which mandated that all agencies and factories prioritise metro construction projects over all else, this was not always easy to ensure in practice. For

example, the MEM cited lack of free production capacity, and backed out. Further difficulties were encountered in securing a shield boring machine from either USSR or Hungarian People's Republic, but whether it was the price or the time limit that caused disagreement, is unclear (Ministerial Council 1975).

In the 1980s, the major obstacle continued to be that of funding. The local authority's 1982 budget included an allocation for metro construction of BGL 6,270,000 (US\$137,000). A desperate-sounding letter to the Sofia People's City Council reveals the scale of the shortages the metro's builders were faced with:

"The allocated sum of 6,270,000 is completely insufficient (...) It is crucial that the Metro features in the 8th five-year plan [1983-1988] with 310,000,000, and that a further 14,000,000 of capital investment is provided for 1980." (HidroStroy 1982)

Astonishingly, the request to provide extra funds for 1980 was granted. This fact is testimony to the huge importance the metro project was assigned by both the national and the local governments. The Ministerial Council approved the additional investment in May 1980, while also ordering once more that state companies give priority to the metro in supplying construction materials, and putting responsibility for the archaeological ruins along the metro route with the Ministry of Culture (Ministerial Council 1980).

2.4. Changing course: The metro and the fall of state socialism

In 1987, SofProekt launched a national architectural competition for the interior design of future metro stations. SofProekt documents from the following year make no mention of the competition, and it is unclear what came of it. However, 1988 was the year when the agency celebrated its 40th anniversary, and the special address of the Director made many references to the metro. Both the aspirational vocabulary of future visions, and the euphemisms of achievements to date, are palpable:

"...the task of providing Sofia with fast, cheap and convenient mass public transport [...] cannot be solved without a metro. [...] The preparations of the plan for it [...] *already have their history*. In the foreseeable future, the moment will come when the shiny electric trains will charge with a shriek through the tunnels, and at the modern underground stations they will welcome thousands of residents and guests of the city. Then *the long-standing dream* of planners and leaders will be realised – for the trip across the city to [take no longer than 25 minutes]." (Kovacheva 1988; my emphases)

The tone of the address may seem quite triumphant, but it is in fact a slightly more reserved, but otherwise very similar, version of the anniversary address at the same agency, 10 years prior:

"[...] for the Sofia Metro to be at the most contemporary technical level, and the stations – *underground palaces*, combining the patina of archaeological treasures and the shine of contemporary technical infrastructure;

representing a new stage in the development of Bulgarian architecture!"
(SofProekt 1979; my emphasis)

The extent to which certain aspects of this vision – which probably attracted many a sceptical smirk in the audience at the time – was realised, and what that meant for everyday mobilities, will be discussed in the coming chapters.

The 1979 address had also promised the start of construction works at stations 2 and 4 of Line 1. In practice, a minimum amount of work took place in this section of the network in the decade between the two SofProekt anniversaries.

In 1984, HidroStroy estimated the total value of the metro project at BGL 543 million (US\$12 million). What was seen as the first stage of construction had remained relatively consistent up to this point – the roughly 10km of track between Slivnica station (in Lyulin neighbourhood) and the city centre. By the mid-1980s, the plans for the downtown metro station had become more specific, however. It was defined as being located at a central square named after Lenin, which reverted to its pre-Communist name of St Nedelya after 1989. The station referred to as Lenin Square station eventually became Serdika, the transfer station between Lines 1 and 2, which features prominently in the coming chapters. The first section was to include seven stations, with journey time between Slivnica and Lenin Square (now Serdika) of 10 minutes. In 1984, Serdika was still envisioned as the station at which all three lines of the metro would cross; this was revised in the 1990s into a triangle of two-line transfer stations framing the centre of the city (see Figure 2-6).

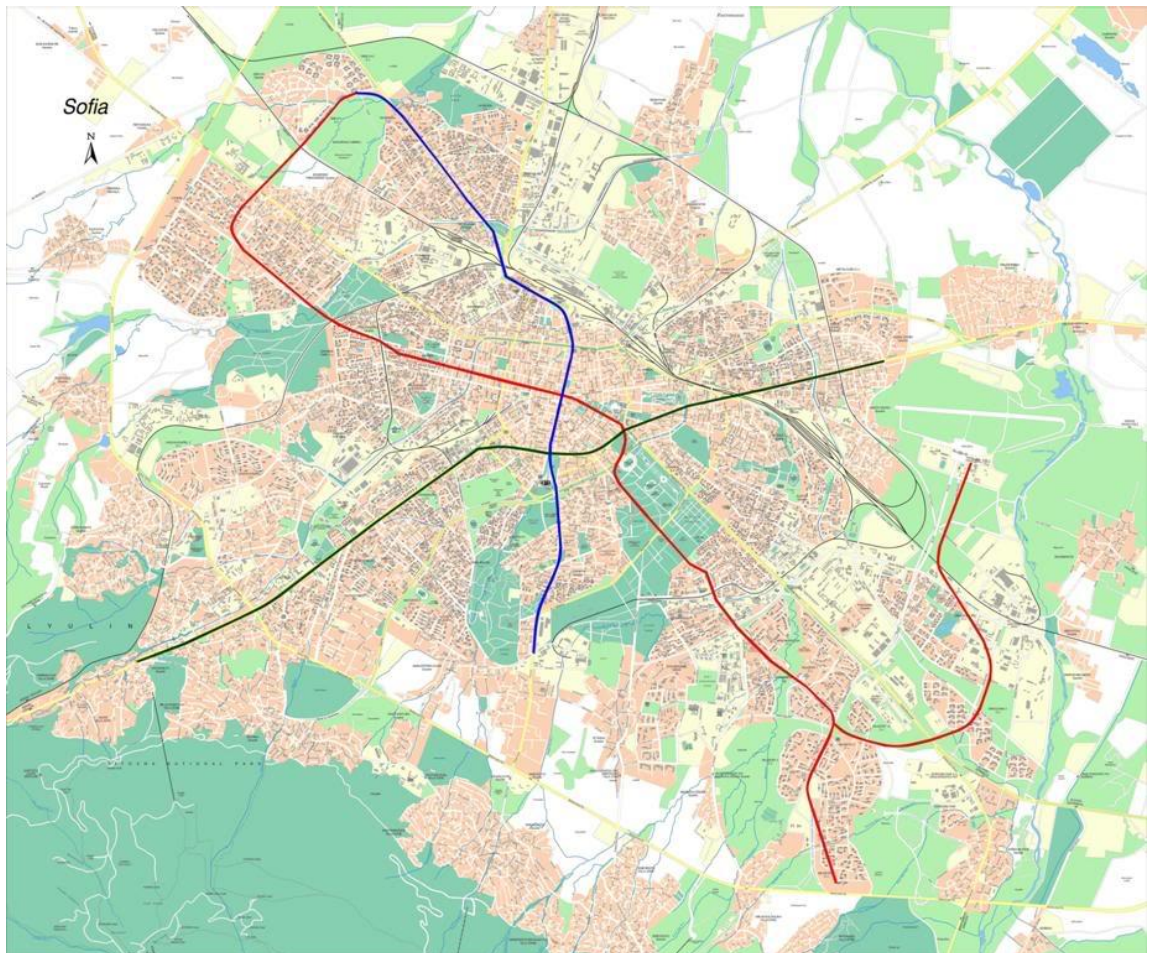


Figure 2-6: Map of all three lines as planned since the 1990s. Source: Skopje2020 for photobucket.com

Four years later, officials continued to claim that the first section of the metro would begin operations in a couple of years' time. However, what was now meant by 'Lyulin-City centre' was actually the five stations between Slivnica and K. Velichkov, rather than the seven from Slivnica to Serdika (HidroStroy 1984). Neither in the 1980s, nor today, K. Velichkov could be considered to be in the city centre. Instead, this terminological manoeuvre was another thinly disguised capitulation in the face of resource shortages, and in particular, the archaeological challenge presented by Serdika (the station most Sofians would likely associate with 'city centre'). It had once again proved to be too much for the metro's planners to deal with. Re-designating the 'first section' to now mean five stations, all located in the city's Northern residential areas, could not fool the public; the simultaneous moving forward of the launch date from 1991 to 1990 could not counter their growing dissatisfaction. So many launch dates had come and gone without leaving any tangible trace on the city, that cynicism towards the resource-hungry yet never-materialising project was spreading across Sofia and the country.

On 10 November 1989, Bulgarian Communist Party leader Todor Zhivkov was forced to resign his post as Head of the Party (and thus the State) which he had occupied for 35

years. The first democratic elections held in Bulgaria took place in June 1990. The ensuing period of transition, with all of its legal, political, social and economic turmoil, slowed down the metro project, but did not stop it. This was largely due to stubborn resolve to see underground rail in Sofia amid the MetroStroy leadership. As many state enterprises, MetroStroy demonstrates the ambiguities which hide behind the notion of regime change: it underwent several restructurings in theory, but retained many of its key Socialist-era staff. They continued to make sure the metro remained a political priority, while the growing number of cars and deteriorating urban environment in Sofia provided ample 'scientific' support for their cause. In addition, as large projects often do, the metro had acquired its own momentum. There was loose consensus that halting the project after decades of work and investment would be embarrassing for all stakeholders. Relying on international loans and Soviet-era expertise, the metro inched closer to becoming a reality.

2.5. 1998-2009: The launch

On 28 January 1998, the shortened first section of Line 1 began operations. The ceremony of the launch took place at the middle of five stations – Zapaden Park, apparently chosen for its aesthetic qualities. The ceremony was presided by the Mayor of Sofia, Stefan Sofiyanski.

By this time, Sofia was a heavily congested and polluted automobile-dependant city of 1.5 million with a hugely inadequate road, parking and pedestrian infrastructure, and underwhelming public transport provision. The metro was not able to resolve these issues – certainly not in its first incarnation. As a journalist wrote in her column discussing the metro launch, “it connects one part of Sofia poorly served by transport, with another part of Sofia poorly served by transport” (Rudnikova 1998). Interestingly, the first neighbourhoods to be served by metro in Sofia were also, and remain to this day, some of the least wealthy. However, the shortening of the first section had meant it now linked two adjacent and largely residential areas, without reaching anywhere the majority of residents were likely to need to go. Sofians had waited 30 years, only to be presented with a white elephant. The 'missing' two stations were added 24 months later, but the damage to the metro's reputation would take longer to repair.

Successive transport strategies between 1975 and 1998 had conceded to cost cuts by planning for a growing portion of the track to be moved above ground. These gradual concessions on behalf of the authorities, however, lead to continuous modifications over the course of decades of construction, and thus a number of technical complications: for instance, the rail track and trains purchased at earlier stages to run underground could not operate safely at high speeds when exposed to weather conditions; thus, when it was

agreed for some of the metro track to be above ground, light PVC tunnels had to be constructed to protect it from the elements (Guenchev 2009). Because of the colour of the material these tunnels are made of, Sofians refer to them, with mock affection, as “the blue intestines”.

The metro’s planners SofProekt had referred to the metro’s stations as ‘underground palaces’ in both their 1979 and 1988 anniversary addresses. This vision had been widely shared during the early stages of planning. For example, a 1977 decree of the Ministerial Council approved an increase of the stations construction budget by 3.5% for the purpose of “quality and luxuriousness of the interior design” (Ministerial Council 1977). At these earlier planning stages, this amount must have seemed like a drop in the ocean. However, by the 1990s, growing costs and extreme budgetary shortages forced the Sofia Metropolitan Company, MetroStroy’s successor, to cut every possible construction expense. Inevitably, the “luxuriousness” budget was the first to go, and the Line 1 stations opened in 1998 had been finished with cheap materials and minimum decorative elements. The “aesthetic qualities” of Zapaden Park, the station where the launch was held, were as questionable then as they are today (Figure 2-7).

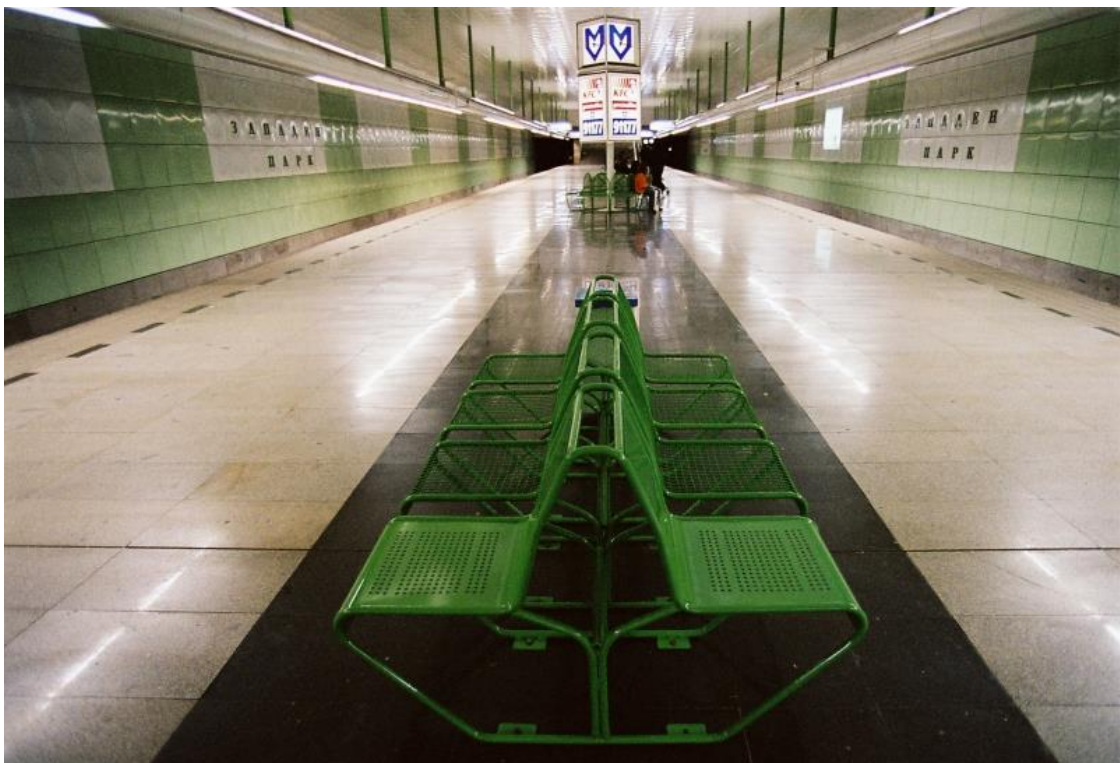


Figure 2-7. Zapaden Park Station. Source: Metropolitan.bg

While the planned 120m platform length was retained, the first metro trains were only 100m long (five cars instead of the planned six), reflecting both the initial low ridership, and the limited funds available for the continued purchase of new trains. This was quite frustrating in terms of the daily mobilities which are the focus of this study, as many

passengers found they had to move some way along the platform before they could get on (Figure 2-8):



Figure 2-8. Passengers boarding a metro train at Serdika. 13 September 2012. Source: Author.

This was all about to change, as EUR 441 million (US\$537 million) of EU Cohesion funds provided a much-needed financial boost for the metro project (European Commission 2013). The key role of the European Union, of which Bulgaria eventually became a member in 2007, was immortalised in a controversial naming of a Line 2 station in 2012 (Figure 2-9):



Figure 2-9. 'Euro' sculpture on the platform of European Union station. 13 September 2012. Source: Author.

On boarding a Sofia metro train, passengers can be faced with one of several different types of interior. For a network with a short history of operations, the Sofia metro has an unusually diverse rolling stock, with carriage models which span several decades (Figure 2-10). This is due to the fact that the first trains had been delivered by Soviet company MetroVagonMash in 1989, nine years before they actually started carrying passengers. Symbolically, an interesting metaphor for the 'new' Bulgarian reality was created, as 1980s trains, visually identical to some of those which had been running on the Moscow metro, pulled into contemporary metro stations: both the very modest ones of the 1990s, reflective of the country's economic hardship, and the much more ornate ones built in the 2000s, with funding from the European Union. There were also more mundane consequences of this mix of old and new. While full 3G coverage was introduced across the system in 2013, conversations on mobile phones were only really possible on the quiet, air-conditioned and sealed, new trains, but not on the louder, older ones where tunnel air rushed in through the open windows. These mundane ways in which the affordances of the long-awaited metro infrastructures were realised in their post-2012 uses, frame my interest in the kinds of micro-scale transformations of everyday mobility in which the metro has ultimately become entangled. Focusing on them in the next chapters, I aim to

contribute to a qualitative geography of the Sofia metro which can complement quantitative analyses of its utility.



Figure 2-10. Train for the Sofia metro being assembled at MetroVagonMash plant. Source: Metroblog.ru

Another particularity of the Soviet-made trains on the network are the seats, which are upholstered benches, and unlike later ones, do not have delineated individual cushions. The practical ambiguities this creates were summarised by one respondent thus:

“The delineated seats have an advantage in the sense that people are less likely to take up two seats. But on the other hand, when it’s crowded, the benches can always take one more person.” (Assya, 2013 10 10 PM)

This image of putting up with each other, of continuously intertwining irritation and accommodation, speaks to the particular spatial arrangement of the metro carriage. As discussed Chapter 7, it possibly also speaks to public transport as a collective experience more generally; and maybe even to the wider accommodations and irritations which colour everyday life in post-1989 Sofia.

2.6. 2009-present: The everyday metro

In 2004, construction began on the next section of Line 1, which was to connect the working line to National Stadium station through the critical transfer station of Serdika. The second section of the metro was finally launched in September 2009. The number of automobiles in the city had more than doubled between 1990 and 2005 from 288,000 to 615,000, passing the one million mark by 2008 (Sofia Municipality 2009). 27.0% of journeys to work in Sofia in 2009 were carried out by car (Eurostat 2009).

Further revisions and the decision to branch out in suburban residential areas in order to capture more of the population pushed the total length of the network up once more in the early 2000s, with the 2006 Sofia General Development Plan including a plan for 64km of metro tracks, with 56 stations (Bratoev 2008). Up until 2009, the metro was widely regarded as marginal and extravagant, leading from nowhere to nowhere, a fairground train that small children might ask to be taken to on a Sunday afternoon (Rudnikova 1998). From 2009 onwards, however, it occupied a progressively important role in the city's mobility. The city itself was changing. Sofia's population increased by 10.3% between the 2001 and 2011 censuses, reaching 1.4 million people officially, but likely up to 1.7 million in practice (National Statistics Institute 2012). This represented 17.5% of the total population of the country. Relative to the rest of Bulgaria, Sofia's population was also younger and more likely to be employed. In 2011, 71.1% of the population of the capital was of working age, or 15-64 years old (National Statistics Institute 2012).

The vision of the metro as an enabler of car transport proved much more resilient than the system of state socialism. The relationship between cars and metro in Sofia has always been tense as well as ambiguous. This has been visible in the way parking has been planned in relation to metro stations. As discussed above, the original rationale for the metro was focused on freeing up space for cars in the city's streets, by moving public transport underground. By 2000s, there was a stronger sense of valuing both modes, with officials calling upon the metro plan to rectify some of the damage inflicted by cars on the urban environment.

However, the automobile agenda had not lost its power, and 2005 metro documentation includes plans for parking spaces at every Line 2 station which is set deep enough to allow for multi-storey car parking facilities (Sofia Municipality 2005). It is important to note that the reasoning did not come from a logic of multimodality at this stage. Two of the larger station car parks made no sense from this perspective, as they were planned for the Central Station and Serdika stations. Rather, they were driven by the pressure to increase capacity in the central part of the city, where parking lots, sidewalks and even green spaces had become overwhelmed with parked cars. Metro car parks were seen as an opportunity to create ample parking space in a downtown which was suffocating. Eventually, through money shortages, engineering challenges, and slowly changing attitudes, these visions began to shift. When Line 2 opened in 2012, only one station offered multi-storey car parking. Located to the South of the city centre, it offered a good park-and-ride alternative to drivers coming from outside the city. This was supported by a park-and-ride ticketing policy, offering a discounted rate for a combined parking and metro ticket. These car parks at peripheral Line 1 and 2 stations lay largely empty for

several years, until a terrible hailstorm hit Sofia in July 2014. One person died, 40 people were seriously injured, and massive damage to cars in the streets, to buildings and to green areas, was caused. Since then, every time a summer storm featured in the weather forecast, the Sofia metro multi-story parking lots have been full. Their contribution to multimodal urban mobility remained more ambiguous, however. The implications of this for the metro as a useful infrastructure are examined in Chapter 8.

Line 1 was extended again in April-May 2012, with five new stations. However, the crucial moment in the development of the Sofia metro came on 31 August 2012, with the launch of Line 2. Its first 12 stations opened simultaneously, connecting a densely populated suburban residential area to the North, the Central Railway Station, the busy city centre with its concentration of retail, entertainment and office spaces, and a higher-income residential area south of the city centre. These 2012 additions to the network are the focus of this study. In 2013, Sofia Municipality announced its plans to buy ten additional metro trains, bringing the total to 52, still all manufactured by, now Russian rather than Soviet, MetroVagonMash (Staneva 2013). Each of the trains cost approximately EUR 4 million. The total cost of building Line 2 amounted to EUR 211.7 million (US\$290 million) (European Commission 2010).

Since 2012, centrally located Serdika has been the only transfer station on the Sofia metro. Eventually, there will be three, as the three lines form a triangle, enabling direct transfers between any two lines. But as of 2015, Serdika remained a particularly important hub of the Sofia transport system. It was named after the Thracian and Roman settlement which was located in the area in 7th Century AD. Despite its symbolism of continuity and heritage, the location of the station, amid some of Bulgaria's most important archaeological ruins, had sounded nothing but trouble for the planners and builders of the metro.

It often seemed that the local authorities were largely at a loss, through shortage of expertise and especially finances, about how to advance the strategic, modern metro project, amid such persistently obstructive artefacts from the past. Significant public pressure and the close scrutiny of a few civil society groups probably played a major role in the survival of the Serdika ruins – although this is tentative, since work on the site continues. But so far, the ancient ruins have been preserved alongside the transport infrastructure. Finally, when the station opened in 1998, it was named Serdika, and in 2012, with the opening of the second line, items from the archaeological dig went on display on the station's platforms. Informal conversations with Sofia residents suggested that commuters appreciated the aesthetic joys which enlivened the experience of waiting

for a train. But this, once again, is not a simple before-and-after story. It echoes a long history of Soviet metro planning policy which treats stations as civic education spaces, as 'museums for the masses' (Lemon 2000).

Further expansion of both lines continued between 2013 and 2015. Line 1 was originally scheduled to reach Sofia International Airport by autumn 2013, but delays meant the new section did not become operational until spring 2015. In 2015, two more stations were being added to Line 2 to extend it to a densely populated residential area in the South of the city. Plans for Line 3 were expected to be finalised by early 2016, with Lines 1, 2 and 3 totalling 29, 17 and 19km respectively when completed, and the network carrying 1.2 million passengers daily by the end of the 2020s. For the first time, the rolling stock of Line 3 would not be supplied by MetroVagonMash, but by Siemens.

As of August 2013, the metro authority confirmed that Line 1 of the metro was carrying 190,000 passengers per day, and Line 2 – 90,000 (Bratov 2013).

Conclusion: What does a metro project do?

The history of the Sofia metro involves numerous linear and non-linear temporalities. The rhythms of the everyday commute have been central to the project ever since its inception in the 1960s. One relatively linear progression has been that of the intensity of public opinions, from initial cautious enthusiasm, to growing cynicism and disappointment, to widespread satisfaction and even pride. In a country which repeatedly made the international news because of corruption, nepotism, and mismanagement of EU funds, it was an exceptional event that a large infrastructure project made it onto the EU-WWF 'Well Spent' list (European Commission 2013). Although Bulgarian politicians pointed to this rare example all too often to demonstrate their positive contribution, the vast and tangible presence of the Sofia metro did play a role in instilling some cautious optimism among a citizenry made up of habitual sceptics. Unpacking the idea of 'money well spent' when it comes to urban mobility is at the heart of the study presented here.

Throughout its history, the metro has rarely been justified in quantitative terms, and its calculated costs and benefits have not been explicitly compared to those from possible alternative visions for the city's mobility, such as tram network expansion, for example. Instead, the project was driven by a surprising level of consensus among local and national decision-makers, led by a few powerful voices. There is limited evidence of detailed appraisal of the costs and benefits associated with the metro project (Stoilov and Panev 1972). However, ticket prices were discussed at a very early stage, allowing transport planners to estimate the profitability of the future network. Calculations were presented

for ticket prices of BGL 0.10 (resulting in a loss-making operation), and BGL 0.15 (which would ensure a small profit). A single tram journey at the time, however, cost a mere BGL 0.048 (Panev 1977). The authors of the 1972 technical report on the metro ultimately recommended that it be priced below the ticket price of ground-level public transport, in order to attract ridership, but would mean huge operational losses (Stoilov and Panev 1972). In practice, many metro systems end up with prices which are prohibitive to many potential service users, in an attempt to recoup the high cost of building the infrastructure (Butcher 2011). In Sofia, the single journey on the metro has always cost the same as any other public transport journey. Chapter 6 will take up the themes of price, value, and access. From the perspective of passengers, this pricing strategy has contributed greatly to the metro's popularity. However, the impact of pricing on who and how uses transport infrastructure does not feature prominently enough in methodologies for infrastructure appraisal, as critics of cost-benefit analysis have repeatedly pointed out (Thomopoulos, Grant-Muller, and Tight 2009).

During the 1972 expert consultations over the first metro plan, one contribution challenged the view that cost-benefit analysis of such a large-scale project was even possible. Although it was written by an engineer, this comment puts forward qualitative, as well as quantitative, arguments in favour of constructing a metro system:

“The cost effectiveness of such a large venture is difficult to prove. However, the very life of the city requires it [the metro]. The metro will bring the following benefits, which cannot be monetised: reduced traffic in the streets (...); the opportunity to pedestrianise the central part of the city, with pedestrians able to pursue leisure and cultural activities without the fear of being hit; for working people, reduced time cost and stress caused by being late (...)” (Pishtachev 1972)

This succinct argument has inspired this study's attempt to qualitatively examine the changes brought about by the metro expansion on commuting in Sofia. By considering it from many angles, defined by the life of the city rather than specific technical characteristics of the metro as a bounded object, Pishtachev (1972) invited a reflection on what it is that a metro does, and how it can be accounted for. This is the challenge I take on in the remaining chapters.

Chapter 3. Theoretical framework

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Introduction

This study reflects my interest in a set of theoretical questions focused on the linkages between everyday travel habits and infrastructure change. However, as will be seen in the next chapter, the study's data collection was not guided by preconceived notions of relevant and irrelevant concepts which can illuminate the connections between small and large, between new and habitual. Instead, data collection was guided by the logic of grounded theory (Hammersley 2010) of not knowing what interdependencies might emerge from looking closely at diverse actors, interactions and processes. Only after the analysis of heterogeneous data had been carried out I was able to determine the eventual direction of the discussion as centred on value and usefulness, qualitatively defined. Because of the openness of this approach, the review of existing literature presented in this chapter is also necessarily broad in scope.

Thus, this chapter reviews key academic texts which approach the topics of everyday travel and transport infrastructure from different disciplinary traditions. The aim of this interdisciplinary review is to position the present study in relation to several relevant bodies of research: mobilities studies; cost-benefit analysis; behaviour change; social practice theory; sustainability transitions; and social studies of technology. While this is a wide conceptual lens, its application to the micro-level empirical analysis of a single case study provides focus to the resulting discussion. In the present chapter, I critically reflect on how some of these theoretical approaches have been used and combined to date, and

how a study of commuting and change on the Sofia metro extension builds on their contributions and omissions.

While this is a qualitative study of micro-practices, this chapter also engages with a number of quantitative studies of public transport infrastructure and planning. However, my goal here is to go further than the critique that quantitative models of transport and travel behaviour do not capture the diversity and richness of the lived experience of mobility (Vannini 2011). In challenging some of the assumptions which quantitative methodologies adopt in appraising the effects of new transport infrastructure, I aim to identify openings for dialogue and complementarity, rather than to reject and replace one paradigm with another (Schwanen and Kwan 2009).

The literature review is organised into five sections, using a thematic logic. This structure follows the arguments which run through the chapters that follow, and reflects the interdisciplinary ambitions of the study as a whole. Thus, the first section looks at how different perspectives have shaped the current place of public transport research within wider debates on sustainable urban mobility. The second section examines approaches taken in professional and academic practice to distinguishing those public transport infrastructure projects which are worthwhile and successful, from those which are not. This section helps me draw attention not only to the reasons why transport infrastructures get built, but also the ways in which this 'why' question gets asked of infrastructure in the first place. In the third section, I outline the approach I will use in "appraising" the Sofia metro extension as public transport infrastructure for commuting, relying on the conceptual tools of qualitative transport geography and cognate fields. The following section considers what such an undertaking, concerned with the practical limitations of infrastructure evaluation approaches, can offer to the theoretical task of thinking about the nature of urban infrastructure. In section 3.5, approaches to placing new infrastructure in the dynamics and stabilities of habitual mobility are outlined. Building on current interdisciplinary developments in research, travel behaviour change which does not rely on a rigid distinction between sameness and disruption, is considered as a useful analytical lens for framing infrastructural change.

3.1. Public transport and the future of urban mobility

Public transport – vehicles in which members of the public share journeys, regardless of who owns or operates the vehicles (following Pucher, 1995, and Walker, 2012) – has been ubiquitous in many cities around the world for a long time. One might even say that public transportation is one of the defining traits of urban environments. Public transport journeys have some characteristics which many urban dwellers will be familiar with.

These may include a timetable and route which are typically pre-defined; travelling with strangers in what appears to often be seen as uncomfortable proximity; and the need to get to and from stations and stops which are at least some distance away from one's origin and destination.

Through its long history and multiple technological incarnations, public transport has become embedded in the built fabric of many cities worldwide. Rails and bus shelters, underground rail stations and informal minibuses, trolleybus wires and BRT lanes, have persisted and evolved across decades of change in places as diverse as Bratislava, Curitiba, Johannesburg, San Francisco, and Tehran. At the same time, cities and their public transportation systems have highly specific local histories, only partly shaped by the spread of technological innovations and global political and social trends (Costa and Fernandes 2012). However, transport researchers have identified some broad regional trends. Thus, the 20th century trajectory of public transport in the global North (including Western Europe, USA, Canada, New Zealand and Australia) is often framed in terms of a short initial boom, followed by gradual decline in both ridership and government support (including capital investment and operational subsidies) (Hensher 2007). Research which focuses on urban mobility in the global South is often framed in terms of inadequacy of large infrastructure provision and small-scale, informal alternatives, in the face of rapid urbanisation; and growth in large-scale projects more recently, as a result of involvement of foreign investment, and funders such as the World Bank (Taylor 1988; World Bank and Gwilliam 2002).

Post-socialist cities are an underexplored context in which to trace the role of public transport in processes of urban change. Post-socialist urban mobility shares characteristics both with the global North (dominance of the private car), and with the global South (inadequacy of the existing public transit infrastructure). While there have been a number of studies on urban mobility in post-socialist Central and Eastern Europe (CEE), these have often focused on regional specificities, and largely remained outside wider debates on urban mobility (Lemon 2000; Horschelmann and Stenning 2008; Pojani 2010; Sgibnev 2015). One interesting exception is the study by Pucher (1995), who points to the rapid post-1989 decline in public transportation in the CEE region as an accelerated version of European-wide processes of growing car ownership rates, suburbanisation, and withdrawal of public finances from the sector. Overall, despite the many interesting developments in public transport provision in Eastern Europe in the last six or seven decades, this research has often fallen outside the purview of theory development in mobilities scholarship. In the present work, I address this gap in the transport literature through a detailed case study of one of the large public transport infrastructures built in

CEE cities in recent years. However, taking inspiration from Robinson's (2006) 'ordinary cities' comparative urbanism thesis, my ambitions go beyond that. As every urban transport system shares some characteristics with all others, while also possessing traits unique to its location, I suggest a case study of the Sofia metro can offer some insights into urban mobility change for cities across, but also beyond, the CEE region. Likewise, the history of the Sofia metro project is more than a history of Bulgaria's political development in miniature, as I aimed to demonstrate in Chapter 2.

Even if urban public transport infrastructures of different kinds continue to be built in many cities, the future of public transportation as a defining urban experience is quite uncertain. On one hand, public transport has been argued to be critical to the future well-being of urban dwellers, and the social and environmental sustainability of human settlements (Pucher 1995; Murray et al. 1998; Banister 2008). Calls to revive public transport have gradually strengthened, in response to the growing dominance of the car in cities. This increasingly car-centred system of technologies, infrastructures, practices, cultural meanings and conventions is what Urry (2004) refers to as 'automobility' (Conradson and Latham 2005). Strong academic, government and activist voices worldwide have repeatedly highlighted the damaging effects of automobility on the safety, health, environment, social cohesion and aesthetic qualities of urban areas (Adams 1981; Flyvbjerg 1998; Jain and Guiver 2001). Critiques of the unsustainable nature of growing car-dependency have been voiced at least since the 1970s (Adams 1981:37). Since the 1990s, arguments for remedying automobility by reviving public transport in places where it had been in decline for decades, such as Australia and USA, and extending it where it was insufficient, such as China and India, have become more prominent (Hensher 1998; Banister 2008:76).

While the trend of growing automobility had long been framed as relentless in transport scholarship (Taylor 1988; Pucher 1995), it has in fact slowed or reversed in recent years, even in 'paradigmatic' car cities such as Los Angeles (Nelson 2014). In a number of countries in the global North including Germany, the share of adults obtaining a driver's license has declined substantially. Similarly, between 1983 and 2008, the share of licensed drivers among 19-year olds in the USA dropped from 87% to 76% (Sivak and Schoettle 2011). These trends, collectively known as "peak car" (Goodwin 2012), imply that the dynamics of urban mobility can no longer be summarised in terms of a universal decline of public transport, and concurrent growing car ownership and use (as argued, for example, in Webster et al., 1986).

On the other hand, these recent trends do not imply a straightforward revival of urban public transport either. In practice, the role of public transport in the cities of the future remains ambiguous, and bound up in the specificities of local contexts. A degree of uncertainty exists around the question of whether socially and environmentally sustainable urban environments need public transport at all. Future urban mobility has increasingly been re-imagined around different kinds of private modes. This is partly a reflection of the powerful business lobbies and cultural conventions of private transport, and the imaginaries of freedom, autonomy, privacy which have come to be associated with them (Aldred and Jungnickel 2014). One strand of research into future private mobilities in cities has focused on electrically powered, autonomous, low-occupancy vehicles, known also as 'autonomous vehicles' or 'driverless cars' (Merat and de Waard 2014; Fagnant and Kockelman 2015). A related idea which has been explored extensively by researchers, consultants and entrepreneurs, is that of carsharing (Shaheen and Cohen 2007). Unlike autonomous vehicles, which are still at the experimental stage of development, shared cars are already a reality in many cities in the global North.

Other private modes of getting around cities have been even more influential in drawing the focus of sustainable mobilities research away from public transport. The prospects for growth in urban cycling (Horton and Parkin 2012; Gössling 2013; Aldred and Jungnickel 2014), and to a lesser extent, walking (Middleton 2009; Pucher and Buehler 2010), have occupied the most prominent space in the scholarly imaginary of mobility transitions in urban areas.

However, there are strong reasons to theorise and appraise the role that building public transport infrastructure might play in sustainable urban mobility. Arguably, there are affordances which public transit infrastructure provides, and which no other transport mode can. For example, concerns have been raised about the sustainability of driverless cars, given the high number of such 'pods' which would be needed, should current public transport users switch to them. Although emission-free at the point of use, electric driverless cars are likely to give rise to a number of other issues, not only around electricity generation, but also around the ability of pedestrians and cyclists to get around in cities where driverless cars are the dominant mode. While shared vehicles are an effective solution for occasional trips, and one which addresses the problem of rarely used privately owned cars taking up scarce urban space while parked, sharing schemes are not necessarily suitable for regular, rush hour trips such as commuting. Shared cars are also not accessible for many urban dwellers, for instance, those without a driver's licence, or those unable to afford the price, which is generally higher than a public transport fare. Similarly, pedestrian and cycling mobilities are contingent on the distances one needs to

travel, and different bodies' non-equal capacities for physical mobility. Transport research generally recognises that public transport provision is not only a more egalitarian type of mobility, but also a pre-requisite for popularising active modes of travel (Banister 2008; Pucher and Buehler 2009). Since much remains to be clarified regarding the potential impacts of the latest technological innovations in transport, public transit remains an important provision from the perspective of most urban areas worldwide.

More broadly, public transport has been argued to play an important role in sustaining the social life and economies of cities. Public transport provides access to jobs, education and urban amenities to urban dwellers of all socio-economic groups, thus countering social exclusion and inequality (Hine 2004; Stanley and Lucas 2008; Lucas 2012). In addition, public transport has the capacity to bring into the same space diverse groups who might not otherwise see, or spend time with each other, potentially contributing to the conviviality and open-mindedness of cities (Wilson 2011).

And yet, attempts to make the case for public transport, often based on traditional approaches such as cost-benefit analysis (section 3.2), are likely to be faced with scepticism, unless they can capture and critically reflect upon the benefits new transit infrastructure can offer. In general, public transport research has not kept up with the growing recognition that cities are places of multimodal mobility (Kuhnimhof, Chlond, and von der Ruhren 2006; (Buehler and Hamre 2014a). Qualitative approaches to urban mobility experiences, while now amounting to a substantial and growing body of research, have rarely been mobilised to this end. This is a contribution I pursue with this study, in ways laid out in the following sections. In changing social and technological urban environments, it is important to continue developing new ways of examining what makes transport projects useful or successful, what kinds of infrastructure gets built, and the ways in which diverse uses and affordances can orientate it towards inclusive and sustainable multimodality (Lavery, Páez, and Kanaroglou 2013). This is one of the challenges I seek to address in tracing the minute changes to Sofia's urban mobilities which came about with the recent expansion of its metro network.

3.2. Transport project appraisal: What makes good infrastructure and how do we know

Despite a long history of criticism, cost-benefit analysis (CBA) has remained the key tool for transport planners looking to appraise infrastructure projects and alternatives, ever since its first application for this purpose in the 19th Century (Thomopoulos, Grant-Muller, and Tight 2009). In CBA, all anticipated benefits and costs need to be quantified, and then converted to monetary values (Adams 1981). The process of identifying those costs and

benefits which are relevant to a project is a highly complex and hotly debated task (Mouter, Annema, and Wee 2013). Benefits included in CBA cover both users and non-users, and generally include four categories: travel time savings, reduction in the number of accidents, environmental impacts (such as reduction in air, noise and visual pollution), and economic developments (such as job creation, investment, social cohesion) (Bristow and Nellthorp 2000). There is agreement on whether and how to quantify and monetise some of these criteria, but less so with regard to others. In the example of the cost of noise pollution, research by Bristow and Nellthorp (2000) found that some European Union countries express it in monetary terms according to avoidance costs, while others consider it un-monetisable and use a descriptive measure of decibel levels and estimated number of people disturbed. Generally, because CBA takes a utilitarian approach of monetising all costs and benefits, every type of cost can potentially be offset by a sufficiently large gain in something else; for example, a large gain in travel speeds can offset a loss of biodiversity (Mouter, Annema, and Wee 2013). This is one of the most criticised aspects of CBA (Button and Pearman 1983).

Once losses and gains have been identified and quantified, the core procedure of the appraisal is a relatively simple one. The benefit-to-cost ratio is computed by dividing a total benefits value (B) by the total costs (C); if $B/C > 1$, the project can be considered further as potentially worthy of investment. The B/C ratio of different projects can then be compared so that the best option can be chosen (Bristow and Nellthorp 2000). A key simplification built into CBA is thus its utilitarian formula – it can only account for total net costs or benefits, but does not differentiate between the welfare loss or gain of different groups (Van Wee and Roeser 2013). This is a widely criticised element of CBA, since it has important implications for the way a project comes to be deemed beneficial or not. For instance, pricing decisions do not form part of appraisal, and generally come at a later stage in the planning process. By contrast, for the individual passenger, it is the price they pay for using the service that forms the basis for evaluating its utility, and quantifying the benefits it provides (White 1981). By focusing on individual commuters' repeated journeys, the present study takes a different approach. A qualitative, longitudinal method of appraising infrastructural change can offer an important extension to quantitative, utilitarian CBA, by tracing not cumulative costs and benefits, but change over time for individuals and individual practices. At the same time, it is important to develop more rigorous and systematic approaches to introducing qualitative data to CBA, using it as more than illustrative case studies and vignettes which add 'colour' to technical reports. This is a direction for qualitative infrastructure research the present study aims to contribute towards.

Too often, social scientists have produced convincing critiques of CBA, which have made little difference to the way infrastructure is designed and evaluated in transport planning practice (Adams 1981; Beukers, Bertolini, and Te Brömmelstroet 2012). This is partly a reflection of the fact that existing appraisal techniques and quantitative modelling practices have sometimes been too wholly, even indiscriminately, dismissed in social science critiques (Self 1970; Richmond 2005). To date, geographic scholarship has produced a number of engagements with transport infrastructure projects and their evaluation, but mostly with the aim of exposing their shortcomings. Human geographers in general, and urban geographers in particular, have often focused on the 'Why' of infrastructure projects: why do stakeholders make the decisions they do, and how do these decisions get justified (Diaz Orueta and Fainstein 2008, Gopakumar 2013; see Latham and Wood 2015 for a discussion). This is what Bennett (2010) sees as the social scientific enterprise of 'demystifying' – seeking to uncover the human agency at the centre of events and trends. The rationales for choosing to build a particular project are scrutinised, and the various political and economic agendas at play are revealed (Richmond 2005; McFarlane and Rutherford 2008). More often than not, critics find that the reasons to build tend to be politically driven, and the stated objectives of, for example, reducing congestion, improving safety, or cutting air and noise pollution, are, at best, of secondary importance (Frick 2008). Relatedly, researchers have found that, typically, large infrastructure projects tend to both overpromise and under-deliver in their utility (Mackett and Edwards 1998; Altshuler and Luberoff 2003; Flyvbjerg, Bruzelius, and Rothengatter 2003; Cantarelli et al. 2012). In an ever more damning strand of analysis, geographical research has emphasised the ways in which new infrastructures amplify exclusion, deepen socio-spatial divisions, and substitute discipline for freedom (Graham and Marvin 2001; Swyngedouw, Moulaert, and Rodriguez 2002; Gellert and Lynch 2003; McFarlane and Rutherford 2008).

However, as Furlong (2011:464) points out, and as Chapter 2 aimed to demonstrate, infrastructures are more than the physical manifestations of power relations (see also Harris 2013; see Rodgers and O'Neill 2012, for a contrasting view). Because of the focus on decision-making processes rather than actual use, urban geographical research rarely examines how projects then go on to function within everyday life, and what purposes they end up serving in practice. When urban research does pay attention to these 'How' questions, it often has two main limitations. First, due to the nature of the research process, it tends to be short-termist in orientation, despite the fact that large transport infrastructures in cities tend to have very long lifespans (Thomopoulos, Grant-Muller, and Tight 2009). There are few qualitative longitudinal studies which examine how the worth of a project changes over the long term. Second, social scientists who engage with the

worthiness of projects often discuss their outcomes in the same terms used in technical appraisals: for example, ridership, or level of state subsidy (Flyvbjerg, Bruzelius, and Rothengatter 2003). In doing so, they might aim to show the inadequacy of the method or calculations, but not necessarily propose alternative conceptualisations of benefits, costs and worthiness. While such critiques can help identify the interests at play in a particular project, and challenge the poor decisions made, they can rarely inform ideas about how to think about infrastructure differently, or how to plan it differently. Geographical critiques of large projects can sometimes appear to imply that infrastructure building is almost always harmful (Harvey and Knox 2012). However, this cannot be geography's only, or main, insight on transport infrastructure, given how crucial public transport infrastructure in particular is for the day-to-day functioning of cities.

However, transport geography and related fields of research such as mobilities studies have made substantial advances in developing the kinds of conceptual vocabularies for evaluating transport projects differently – even if, to date, they have rarely deployed them to that end. Qualitative conceptualisations of experiential aspects of transport service use, and quality attributes of infrastructure provision, have become increasingly sophisticated (Lyons and Chatterjee 2008; dell'Olio, Ibeas, and Cecin 2011; Paulley et al. 2006). Some of the challenges involved in connecting theoretical nuance in mobility to transport planning concerns have to do with identifying relevant experiential attributes, adapting them to reflect geographical contexts at different scales, and thinking through the different ways in which different transport modes create collective, as well as individual, experiences. The next sections outline the ways in which I have approached these challenges in this study.

3.3. Appraising infrastructural change qualitatively

Whatever the limitations of current appraisal practices, evaluating transport projects is not a gratuitous undertaking, but one which is critical to understanding, planning for, and communicating, the role of movement in sustaining and improving urban life. Transport geography and urban geography have developed theoretical insights for thinking critically and productively about the value of infrastructure. In this study, I adopt a qualitative transport geography approach which could contribute towards bridging the gap between planning practice and ethnographic description, building on an interdisciplinary approach to conceptualising what is valuable in transport infrastructure. To contribute towards this goal, a qualitative transport geography needs to understand the challenges of transport planning; mobilise its strong tradition of attending to local specificities and spatial dynamics; and orientate theoretical contributions on transport infrastructure-in-use from mobilities studies, anthropology, and science and technology studies (STS), to the practical

questions faced by transport in changing cities. To do this, the present study focuses on four core attributes of public transport journeys – time, cost, comfort, and stress – and applies them to the Sofia metro Line 2 case study in order to understand how these come to be realised in the everyday use of the new infrastructure.

The first set of ideas mobilised in thinking about what public transport infrastructure is and does, is concerned with the value of travel time. Qualitative analysis of the value of travel time have been motivated by the dominance of travel time savings in prevalent cost-benefit analysis (CBA) practice (Shapiro and Schroeder 2008; Department for Transport 2014a). They often account for up to 80% of the benefits new transport infrastructure schemes are expected to deliver (Banister 2008:74). Planners value saved time from the perspective of economic productivity, by attaching a monetary value to the time of different categories of passengers. Thus, 10 minutes cut from the trip of a business person will add more value to a transport project than 10 minutes saved by an unemployed person completing a shopping trip.

The dominance of travel time savings reflects, and sustains, the notion that shorter trips are the most important outcome users expect from transport projects (Shapiro and Schroeder 2008). Underlying the emphasis on saved time is an assumption that travel time is “dead”, unusable time. This idea has been repeatedly refuted, notably in the interdisciplinary field of mobilities studies (Watts and Urry 2008). There is now a substantial body of literature which argues that the intrinsic value of everyday journeys should be recognised - rather than simply a derived demand, time spent getting to destinations can itself be valued or even enjoyed (Mokhtarian and Salomon 2001). Similarly, Redmond and Mokhtarian (2001) found that only 1% of commuters identified their ideal commute duration as zero; on average, the ideal commuting time was found to be 16 minutes. However, in emphasising the richness and value of the travel time experience, it is easy to overlook the fact that saving time is also a lived practice, and one which is itself valued by travellers. A fuller understanding of travel time, as both inhabited and quantifiable, can help re-orientate mobilities’ contributions on the topic back to the need to account for the temporal benefits of new public transport provision such as the second line of the Sofia metro.

In transport planning, the key characteristics of journeys are generally thought to be origin and destination, time, and cost (Walker 2012). In choosing to study commuting (a concept discussed in section 3.4), I have examined journeys with relatively constant origins and destinations. The final core element in transport use – the cost to the user – is conspicuously absent both from cost-benefit analysis, and from qualitative accounts of

mobility experiences. What is paid, but also how, when, and where, places an important set of constraints on the utility transport infrastructure can have to a user, while being an embodied and lived experience in its own right. Once again, the approach taken in this study seeks to theorise the price of using public transport with both practical and analytical objectives in mind.

Finally, an evaluation of the impact of new transport infrastructure for its users, needs to consider that the impact exceeds the spatial and temporal container of the infrastructure itself, notably, by playing a role in users' well-being (De Vos et al. 2013). To conceptualise well-being, this study focuses on two aspects of the journey which have received extensive attention in transport research: comfort, and stress.

However, this is not to suggest that well-being is somehow equivalent to an accumulation of stressful or comfortable experiences as singularities. In fact, the approach adopted in this study questions the notion of 'overall' well-being altogether, focusing instead on the way comforts and stresses play out in specific interactions of well-being which do not simply aggregate over time. Neither the utilitarian approach of cost-benefit analysis, nor approaches focused on single individuals, reflect the situated socio-technical bundles (Carse 2012) through which a new metro line acquires its role in comfort and stress. In this sense, the approach I take to comfort and stress responds to calls for mobilities research which challenges the dominance of the solitary mobile subject, particularly in relation to well-being (Schwanen and Atkinson 2015). To do this, I draw on Bissell's (2010) work on the affective atmospheres of public transport, and apply it to the need to understand how infrastructure comes to play a role in comfortable and stressful journeys.

Comfort and stress are rarely studied together in transport research. They are generally framed as contrasting states of being, produced by the human body or mind in response to the conditions of the environment. Stress is mainly the object of study of psychological studies, as it is largely understood as a state of the mind. Comfort, by contrast, is generally associated with the body, and is thus a topic of interest for ergonomics, engineering, architecture, design, and medicine.

Comfort is the object of a large number of applied studies in disciplines concerned with the healthy interaction between human bodies and their environments. Notable topics include comfort related to posture in sitting, and comfort in relation to temperature. However, even sophisticated quantitative studies of comfort, such as those reliant on the well-established Body Part Discomfort Scale (Corlett and Bishop 1976), acknowledge that a widely shared conceptualisation of comfort is difficult to come by (De Looze, Kuijt-Evers, and Van Dieën 2003). A commonly used definition is one proposed by Slater (1985) in his

seminal study of human comfort: a pleasant state of psychological, physical and physiological harmony *between* a human and their environment. The 'between' is important in highlighting the less-obvious complexities intrinsic in the notion of comfort: for designers of objects, it is a subjective state, but one which is not only within the subject, but also in the interaction between the human and external objects (De Looze, Kuijt-Evers, and Van Dieën 2003). Ergonomics researchers Helander and Zhang (1997) argue against viewing comfort and discomfort as the two ends of a scale (cf. Levis 1976, Zhao and Tang 1994, on the comfort of bus passenger seats). Instead, they distinguish between discomfort as a purely biomechanical condition, and comfort as a state more related to aesthetic and subjective perceptions. Similarly, stress is not equivalent to discomfort, and comfort and stress should not be seen as the two ends of a scale.

In the social sciences, studies of comfort are less common. As a notable exception, Shove (2003) examined the history of thermal comfort from a sociological perspective, noting how meanings, technologies and skills evolve in a dynamic fashion to produce conventions around what is deemed to be comfortable. Shove's work is very influential in framing comfort as a field of interaction between human and non-human bodies, imbued with symbolic meanings and cultural norms. As Hitchings (2009; see also Hitchings and Lee 2008) also reminds us, this has important implications, as it reframes comfort not simply as a state in response to stimuli, but also as a process which is actively made by the person experiencing it. In this study, I go further in defining it as shared and distributed – as actively made in interaction and co-presence. This view of comfort is pertinent to public transport, which is defined by sharing space in close proximity over relatively long periods of time, particularly for peak-time users like the majority of commuters. Context-specific definitions of comfort, which explore the situated interactions between passengers and infrastructure, are extremely relevant to studies of transport and mobility. Such studies, whether qualitative or quantitative, have demonstrated that thinking of 'the commute' as either comfortable or not may gloss over important differences between the many fragments which make up the journey. A simple example highlights that bus passengers may find in-vehicle time to be comfortable, but be dissatisfied by the comfort provided by the bus shelter (as in a survey conducted by Páez and Whalen 2010). In more qualitative studies of comfort on public transport journeys, comfort has often been equated with creating private space, e.g. cocooning using books, digital devices, luggage or headphones (O'Dell 2009; Berry and Hamilton 2010). The assumption is, once again, that what makes public transport uncomfortable are the ways in which it differs from the private vehicle, and therefore the qualities of the journey can only be measured against those afforded by a car. Comfort which is shared and distributed in interactions, however, is less easy to compare across contexts.

The issue of stress in relation to commuting has been explored in some detail, particularly in the behavioural sciences. Most research links commuter stress either with particular modes of transport, or with disruptive events which interfere with the established journey travellers come to expect. With regards to stress as an outcome of disruption and lack of reliability and predictability on public transport, Evans, Wener, and Phillips (2002a) and Benezech and Coulombel (2013) have produced notable works. When it comes to exploring the levels of stress associated with different modes, LaJeunesse and Rodríguez (2012) found that car commuters report high levels of comfort, but also high levels of stress. The findings of Gatersleben and Uzzell (2007) were similar: car commuters experienced high levels of stress, whereas public transport passengers reported lower stress, but also boredom. Wener and Evans (2011) researched different commuting modes in the same area of New York, and found that commuting by car was more stressful than commuting by train. However, other studies have attempted and failed to find a statistically significant correlation between mode and levels of stress (Morris and Guerra 2015). This could be the result of the level at which the analysis is conducted, since every mode will involve both more and less stressful interactions if the journey is examined in detail. A major cause of commuter stress in public transport has been found to be crowding (Cox, Houdmont, and Griffiths 2006). Crowding is defined as the psychological response to an 'objective' external reality – the high passenger densities typical of public transport rush hours (Evans and Wener 2007). Transport planners have determined that the acceptable level of density in public transport is approximately 4-5 people per m² (Tirachini, Hensher, and Rose 2013). In all of these studies, stress is conceptualised as a psychological and/or physiological state, generated by commuters in response to external stimuli which are perceived as stressful. This is reflected in the idea of measurable levels of stress, which can be compared across modes or types of commute: for example, by analysing saliva samples, collected as passengers get off a train for cortisol levels (Evans, Wener, and Phillips 2002a). All of these considerations of stress are typically examined in the context of transport research on passenger satisfaction (Fellsson and Friman 2012). While transport research has increasingly sought to relate findings on satisfaction to important issues of transport users' well-being, the way in which these concepts are connected in transport studies is often overly straightforward (see Nordbakke and Schwanen 2014 for a summary and critique). Implicitly or explicitly, studies of commuter stress rely on a direct logic of aggregation: the number of stressful travel experiences and their intensity can be added up quantitatively in order to measure their cumulative effect on a 'higher-order' construct such as overall subjective well-being (Olsson et al. 2013; Ettema et al. 2012; Cantwell, Caulfield, and O'Mahony 2009). This simple mathematics of well-being might prove to be too simple indeed. The idea of an individual's 'overall'

subjective well-being which reflects an accumulation of cognitive evaluations and affective episodes, fails to explain how this 'overall' condition is experienced. It therefore might be helpful to try to account for the fact that all of these states and sensations – affective and cognitive, small-scale and 'overall' – are ultimately registered, sensed and generated – through the embodied and situated self; not as a 'higher-order' experience, but always at the scale of the body, the place and the moment (Latham and McCormack 2004; Thrift 2008).

Instead of assuming that comfort and stress in commuting translate into a greater or lesser degree of long-term service satisfaction, respectively, which in turn, is reflected in a quantifiable degree of life satisfaction, the approach I take in discussing data in Chapter 7, limits itself to the specific social and infrastructural interactions in which the circulation of stress and comfort can be traced.

Alternative conceptualisations of stress have begun to emerge from the social sciences, which regard stress as a quality of a context and an interaction, a highly situated experience made between bodies, and not intrinsic to a body. Thus, sociologists Smith, Phillips, and King (2010) describe stressful and rude interactions on public transport which are the product of a specific situation, rather than of stress or rudeness intrinsic to any of the participants. By contrast, Bissell (2014) discussed stress not in terms of momentary surges of negative affect, but as slow-creep transformation which exceeds the environment of the journey and is enacted through repetition. However, Bissell's reliance on a linear temporality, implicit in an idea of accumulation over time, can be problematic if the purpose of the research is to identify possible interventions in the commute-stress pairing. This may be a methodological, rather than conceptual shortcoming: where Bissell (2014) relies on one-off interviews, a longitudinal ethnographic approach can offer a more multifaceted perspective on how individual embodied interactions make up and disrupt the different temporalities of commuting stress.

All of this implies, firstly, that comfort does not happen within the body and stress cannot be located within an individual mind. Instead, comfort and stress circulate through both, and within the spaces created as objects and embodied minds move around each other. Individual experiences of comfort and stress reflect these atmospheres, and in turn generate them. Secondly, a distributed view can help move away from uni-sensory conceptualisations, such as thermal comfort, ergonomic comfort, etc, which imply that comfort or stress can be disentangled into individual stimulus-receptor couplings. Thus, while there are specific quantitative guidelines for seat design, density and temperature (most metro system authorities will aim for 26C, according to Jenkins et al. 2014),

relational approaches can contribute to a better understanding of how public transport journeys become stressful and comfortable.

These insights on comfort and stress can contribute to a richer conceptual vocabulary in discussions of the quality attributes of public transport provision (Redman et al. 2013). Rather than distinguishing between objective and perceived characteristics, and distinctions based solely on transport mode, a distributed view of comfort and stress can inform highly targeted approaches to designing mobility infrastructure which is experienced as valuable.

3.4. Thinking about transport infrastructure

In a practical reorientation towards evaluating specific infrastructural affordances-in-use, a qualitative geographical analysis necessarily also theorises what infrastructure is, and what it does. Building on theoretical contributions from science and technology studies (STS) and anthropology, qualitative transport geography can offer nuanced yet practicable definitions of infrastructure, navigating distinctions such as relational and intrinsic, and complicating the bounded object of infrastructure often implicit in cost-benefit analysis.

An infrastructure is more than a structure. It comes alive through its uses, and it is this socio-material interaction of use and usefulness that must be evaluated when new transport projects are launched. This definition, bridging STS and critical urban studies via geography, is illustrated in Latham and Wood's (2015) study of commuters' use of cycling infrastructure in London. A major difficulty which comes with CBA is the lack of distinction between an infrastructure project, and infrastructure-in-use. While at the construction project stage it might seem appropriate to treat a road, metro line or airport as a bounded container, this does not reflect the way infrastructures function within the wider socio-technical networks and circulations of a city, across sectors and locales (Hansman et al. 2006). Through everyday uses, infrastructures are layered across space and time, and acquire meanings and presences which stretch far beyond their physical boundaries. After the launch of a transport infrastructure project, quantifying the costs and benefits carried by it in its own right, has limited utility, since everything the project does as an infrastructure is connected to everything else which happens in a city. Examining ridership figures, or emissions, or traffic collision numbers, which are some of the typical criteria used to scrutinise projects, makes for a particularistic approach, one which exposes specific poor or biased decisions, without offering transferrable lessons about what makes good transport infrastructure projects. To address this, the present study conceptualises the new metro infrastructure as entangled in a commuter's journey,

focusing on the performance of the journey as one of making infrastructure, as much as being made by it.

In his work on affect, geographer James Ash (2013) argued that objects embody both relational and non-relational qualities. This contribution is important in making sense of infrastructure: while it is crucial to underline its relational nature and the way it acquires its qualities in interactions with humans and objects, infrastructure also has intrinsic properties (Suchman et al. 1999). To maintain a commitment to practicable ideas, this study takes a cautious approach to relativising the distinctions between sameness and change, and those between the infrastructure and its users. While multiple relationships of co-constitution are central to the theoretical framework adopted here, the different agents in the socio-material interactions being studied retain their recognisable contours.

Where new and different ways of understanding infrastructure-in-use have been defined, this has rarely been done with the objective of transport planning and appraisal in mind. It is this gap that the present study seeks to fill. While urban infrastructure is often framed as that which, once completed, becomes the invisible backdrop against which urban life unfolds (Ehrenfeucht and Loukaitou-Sideris 2010), anthropology and science and technology studies (STS), influenced notably by the work of Star (1999) have been at the forefront of the social sciences' rethinking of their engagement with infrastructure. STS research often sees infrastructure not as a technologically enabled connective tissue between the sites of social interaction, but as the domain of social life itself, in which the inseparability of the social and the technical is evident (Austrin and Farnsworth 2005). The most widely cited strand of STS literature to deal with change is probably the socio-technical transitions body of work based on the theories of Frank Geels (Geels 2004; Geels and Schot 2007). While this work offers a useful way of conceptualising the spread of innovation from niches to whole societies, its focus on multi-scalar transitions is less suitable for thinking about the everyday life of a metro line and its individual passengers. For the purpose of studying the dynamics of individuals' interactions with and within infrastructures, STS work more closely aligned with social practice theory offers a more accommodating conceptual vocabulary (Pantzar 1997).

Less linear theorisations of the interaction between humans and technologies have pointed to the way infrastructure users either take it for granted when it functions normally, or suddenly notice it if it fails or becomes disrupted (Trentmann 2009; Graham and Marvin 2001; Marsden and Docherty 2013). However, what constitutes a disruption to a user's infrastructural habits can be both subjective and contingent, and a researcher pre-identified one, such as the launch of a new line in the case of the Sofia metro, might not

reflect this. As a result, perspectives which see both disruption and sameness as intrinsic to everyday socio-technical interactions are likely to be more suitable here (Binnie et al. 2007; Graham and Thrift 2007; Koch and Latham 2013).

In an anthropological study of the Panama Canal, Carse (2012) argues that infrastructure is a process of relationship-building, in which people or things are intermittently connected to, or disconnected from, each other. In an important study of urban water, Furlong (2011) brings together STS and geography to demonstrate how different infrastructural systems are interconnected in cities through everyday use, and the way small daily practices and large networks shape each other (other examples of work bridging STS and urban geography include Graham and Thrift 2007, and Hodson and Marvin 2010). This kind of perspective challenges the idea that the effects of a new project can be easily compartmentalised, or that the infrastructure itself is a bounded spatial container. Similarly, this approach to infrastructure offers conceptual links across scales, between macro-scale studies of change and socio-technical regimes, and the study of the micro-scale everyday interaction between human actors and technical artefacts (Carse 2012:543). As a result, the lived experience of infrastructure use comes into focus, and the everyday journeys and encounters it shapes and is shaped by, can be attended to.

Large transport infrastructure projects are expensive and often controversial undertakings, frequently seen as extraordinary disruptions of pre-existing socio-spatial worlds, as moments which define a 'before' and an 'after' (Graham and Marvin 2001; Kells 2011). Evaluating new transport infrastructures, and the 'big' changes they bring about, is an extremely important task if cities are to address the challenges of socially and environmentally sustainable mobility (Monstadt 2009). This study outlines the role of qualitative transport geography of new infrastructure, as a bridge between planning's practical concerns, and the rich, but rarely actionable descriptive and ethnographic preoccupations of STS and anthropology.

3.5. Commuting, habits and changing behaviours

The success of a new transport infrastructure relies on ridership, which in turn is contingent on a transition taking place between urban dwellers' pre-existing mobility arrangements, and adopting the new provision into everyday practices. In the case of a public transport project such as the second line of the Sofia metro, ensuring this change happens with commuting journeys is considered especially important.

Commuting generally refers to a non-discretionary journey between home and a workplace which is frequently repeated – often many times a week (Sharp 1983; Song,

Preston, and Brand 2013). In order to recognise the diversity of everyday tasks and types of work habitually undertaken by urban dwellers, I have included in my definition also routine journeys for the purposes of studying, volunteering, or performing unpaid care duties. The key aspects of the commute I focus on is its weekly rhythm, instrumental nature and popular association with tedium, as well as stress (Richards 2015). While tedium or boredom in commuting is also a frequently encountered topic, it remains outside the scope of this study.

The commute is frequently seen as the definitive urban habit, part of what O'Dell (2009) refers to as the infra-ordinary structures – or should that be infra(ordinary)structures? – of everyday life. While performing various routine activities is the essence of everyday life (Ehn and Lofgren 2009), commuting represents a particularly evocative and recognisable metaphor of the tedious, the mundane, the predictable and the habitual. Therefore, from a conceptual point of view, commuting is a very useful device for complicating the dramatic 'before and after' implicit in new infrastructure launches.

With more pragmatic concerns in mind such as sustainable mobility transitions, commuting is similarly important. Data from the UK and the USA suggest that commuting represents roughly a fifth of all person-trips (Transport for London 2011; American Association of State Highway and Transportation Officials 2013). How and to what extent commuting habits can change is therefore a critical issue for the expectations placed on new infrastructure in terms of its social and environmental effects. Importantly, the sustainable urbanism discourse of which sustainable mobility is part, has become something of an empty signifier (Harris and Moore 2015). The present study cannot incorporate a sufficiently detailed account of contemporary critiques of the sustainability agenda, but a recognition of their importance is embedded in it. Thus, the term sustainability is used here as shorthand for the specific social and ecological issues relevant to Sofia's transport system – air and noise pollution, building degradation through exhaust fumes, limits to walking and cycling provision, and so on. It is first and foremost these issues, which have concerned local planners and civil society at least since the 1970s that I refer to when using the term 'sustainability,' rather than the recently globalised scientific-economic-political "meme" of the sustainable city (Davidson and Gleeson 2014).

Broadly defined as automatically repeated routine behaviours, psychology frames habits such as commuting as the performance of actions without deliberation (Gärling and Axhausen 2003). Relying on a strong distinction between the internal processes of the mind and outward behaviour, the cognitive sciences traditionally see habit (or past

behaviour), as one of the three main drivers of behaviour, alongside intention and circumstances (Gärling and Axhausen 2003). Once learned, cognitive scientists often argue, cognitive and bodily routines are 'proceduralised' – i.e., they move from the declarative to the procedural, unthought brain (Graybiel 2008). Past behaviour is seen as a strong predictor of future behaviour, and habits such as commuting are therefore seen as highly resistant to change (Bamberg, Rölle, and Weber 2003; Kurz et al. 2015).

The mobilities turn, or new mobilities paradigm, has made a major contribution to understanding the experience of habitual everyday travel as more than derived demand, and more than a mental shortcut (Cresswell 2010). Since the late 1990s, beginning with the work of sociologists John Urry, Mimi Sheller, and others, mobilities research has arguably contributed the most to opening the 'black box' of commuting (Sheller and Urry 2006; Bissell 2007; Jensen 2009; Latham and Wood 2015). Where transport geography had historically conceived of the commute as a purely instrumentalist activity, a temporal and monetary cost, and a means to an end, mobilities scholars have begun to unpack the layered interactions which take place between humans and non-humans when urban movement is produced. Thus, Middleton (2009) explores the various tactile experiences and corporeal states involved in the simple act of walking. Lyons, Jain, and Holley (2007) consider the variety of activities, individual or shared, which rail passengers in Britain engage in during their journey. Both Middleton (2011) and Nixon (2012), among others, have offered a strong critique of the view of a travel habit as autopiloted, unreflexive 'sleepwalking.' Instead, mobilities scholars have tended to emphasise the embodied and situated nature of habit, its richness in both skill and affect. This view of habit has most influentially been put forward by David Bissell in a series of publications (Bissell 2011; Bissell 2013).

However, the role of change in the commute has not been adequately considered in the mobilities literature. While mobilities scholars have convincingly argued the case for attending to the complexity and richness of commuting experiences, variability over time tends to be absent from such accounts. The temporalities defined **by** the individual journey **are** often examined in detail, but the all-important temporalities which exceed it, such as changing one's commute, are largely absent from this body of literature. As a result, mobilities research can only take us some of the distance when making sense of travel behaviour change. The commute, while richer and context-specific, returns here to being a repetitive, familiar and stable activity which appears to have an 'essence' that endures even when other aspects of everyday life are altered. It is thus necessary to look elsewhere for theoretical approaches which can shed light on how changes in habitual mobility can be conceptualised.

Although quantitative transport geography often takes a reductionist view of the richness of commuting experiences, the discipline has made important headway in engaging with change in travel behaviours, and attempting to conceptualise how this definitive habit, the commute, actually changes relatively frequently (Järv, Ahas, and Witlox 2014). These differences may be driven by cyclical rhythms such as the seasons, or one-off changes such as lifecourse events (Beige and Axhausen 2012). All of these variations add up to what is referred to in transport research as intrapersonal variability (Järv, Ahas, and Witlox 2014; Heinen and Chatterjee 2015). Intrapersonal variability makes what has traditionally been framed by researchers as one's 'typical' commute much more difficult to pin down than might be anticipated (Lyons and Chatterjee 2008; Marsden and Docherty 2013). However, the different temporalities of intrapersonal variability have not been studied systematically, and little is known about the dynamics of occasional versus periodic changes to commuting, or any accumulation effects leading from small variations to 'big change' (while in mobilities research, Bissell 2014 engages with this in relation to commuter stress). Thus, Gatersleben and Appleton (2007) identify different groups of commuters depending on their level of 'readiness' to cycle to work, but no indication is given as to how potential cyclists transition, for example, between precontemplation and contemplation. While some researchers and policy makers have focused exclusively on change in the sense of modal shift, and in particular on the potential for journeys shifting from the private car to more environmentally and socially sustainable modes (Stanton et al 2013), transport research has repeatedly demonstrated the importance of both modal and non-modal changes in everyday travel. Thus, Salomon and Mokhtarian (1997) and Choo and Mokhtarian (2008) have examined both the range of adjustments which commuters make in response to traffic congestion (from buying a car radio, to switching to public transport, to changing jobs), as well as, importantly, the intricate interdependencies between these different types of changes in behaviour. Similarly, Garling et al (2002) and Loukopoulos et al (2006) have demonstrated the significance of occasional and enduring changes in non-modal aspects of travel behaviour. In Chapter 8, I return to the distinction between variability and change, as well as the distinction between modal and non-modal change in travel behaviour.

A range of other academic disciplines have attempted to make sense of the mechanisms through which people change their habits, and particularly their travel habits. These disciplines differ in the relative importance they assign to human agency and the (infra)structures of the transport environment. In transport research, incalculable surveys have been conducted in an attempt to identify the factors which are most influential in people's travel choices, and relatedly, the aspects in provision which would have to change for them to choose a more sustainable mode. Thus, a survey by Kingham, Dickinson, and

Copsey (2001) found that frequency, reliability, convenient drop off sites, better connections and discount tickets were more important in considering whether to switch from car to public transport commuting, compared to, for instance, security and comfortable vehicles. On the other hand, a number of studies have shown that significant changes to service provisions do not always bring about equally significant rates of mode switching behaviour (Anable 2005). Following Adams (1981), I suggest that the difficulties in identifying some of these causal links can be traced back all the way to the origins of transport research in neoclassical economics. From this perspective, change in travel behaviour occurs when there is an external reason to rationally re-evaluate the costs and benefits of a particular course of action (Wood, Tam, and Witt 2005). Because of this reliance on deliberative decision-making, this strand of research can say relatively little about the dynamic and embodied ways in which everyday habits seem to change. Variations in the commute which result from getting carried away in a conversation, or doing something 'on a whim,' or 'for a change,' or 'finding oneself' doing something (Hitchings 2010), are both important, and excessive to deliberative logics of behaviour change.

In psychology, decisions such as the choice to use public transport are often explained using one of two sets of theories. In theories such as the value-belief-norm theory, pro-environmental behaviour is seen as an expression of altruistic concerns for society and the environment. In the theory of planned behaviour, the choice to travel by bus is seen as a rational choice driven by self-interest (Bamberg, Hunecke, and Blöbaum 2007). For both perspectives, and in line with traditional economic analysis, the underlying assumption is that behaviour is the outward expression of a state of rational processing: the mind gathers data from a world external to it, and determines the best course of action. However, values, attitudes and plans have been demonstrated to have limited influence on what people actually do as they go about their daily activities (Shove 2010).

More recently, the sub-discipline of behavioural economics has attempted to address some of these critiques through a rapidly growing body of research focused on drawing on psychology and economics, but with an explicit focus on explaining, and encouraging, changes in everyday behaviours. Behavioural economists recognise that what people do in their everyday lives is not necessarily, or usually, a reflection of aiming to maximise utility, as traditional economics imply, or of deeply held attitudes and beliefs, as psychology might suggest (Avineri 2012). Instead, habits, impulses, and importantly, specific contexts (referred to as 'choice architecture' and targeted by those seeking to influence decisions, for example, retailers), can all shape the decisions made. However, the instrumentalist orientation of behavioural economics towards servicing government policy-makers and

the marketing communications industry, have caused many scholars to question its ethical foundations and conceptual rigour (Jones, Pykett, and Whitehead 2011; Avineri 2012; Barr and Prillwitz 2014; te Brömmelstroet 2014).

In organising my own approach to habit and change in commuting, I have worked between mobilities research on everyday journeys, and STS approaches to infrastructure, with the help of social practice theory. Social practice approaches are increasingly used in sustainability research across the social sciences including transport geography (Shove 2009; Shove, Pantzar, and Watson 2012; Aldred and Jungnickel 2014) In social practice research, I have been able to find a notion of everyday travel which is embodied, situated, and enacted through specific socio-technical interactions, while also being always on the move itself, changing dynamically in response to wider cultural and material processes, and shaping them in return (Larsen 2015). Thus, sustainability researchers who use theories of practice have often attended to behaviour change. They have added nuance to psychological accounts of behavioural change, which understand it as an outcome of a rationalisation, a shift in attitudes or beliefs (Shove 2010).

At the same time, a social practice model cannot be universally applied to all aspects of daily life, without modifying it to reflect the spatial and temporal specificities of, in this case, commuting situatedness of that practice, and in the case of commuting, the mobility biographies of practitioners. Conceptual models arguing to identify the meanings, materials and skills in each practice gloss over the very situated specificity they claim to address (Jackson and Everts 2010). In addition, there are inherent dangers in relying solely on theories of practice, which result in caricaturing previous approaches by wholly dismissing them as reductionist or inadequate (Shaw and Sidaway 2011). In taking this warning seriously, I draw heavily on existing transport geography scholarship to devise a conceptual framework which speaks to these two concerns.

This approach further reflects ideas of embodied and distributed cognition, which have come to traverse the disciplinary boundaries between anthropology, the cognitive sciences, and philosophy of mind (Hutchins 1995; Turner 2001; Wilson 2002). Like social practice theory and ideas about the distributed nature of habit (Bissell 2013), embodied cognition theories suggest that as people, we talk, think and respond not as thinking machines, but mainly as bodies surrounded by other human and non-human bodies (Clark 1998; Anderson 2003). However, in emphasising the embodied nature of human behaviour, theories of embodied cognition can sometimes reject representational thought and deliberative decision-making entirely. In repeatedly meeting with the same commuter, and interviewing them about their perceptions and interpretations, I have

chosen to thread a middle ground between cognitivist and embodied perspectives on everyday actions. To account for the range of changes which take place when commutes and transport infrastructures change together, it is important to consider both mind and body, as well as the environments which they mobilise and are mobilised by. So-called 'weak' theories of embodied cognition and anthropological accounts of practices of being and doing can inform a more balanced discussion of where different changes originate when behaviours change (Wilson 2002). Emerging mobilities and transport research is beginning to recognise that a), habits are not necessarily the product of solidified past rational decisions, and b), changes in habitual behaviour are not always the product of re-evaluating external circumstances (Schwanen, Banister, and Anable 2012). The links which connect the environment, the body and the mind have increasingly been shown to be multi-directional and complex, stretching far beyond the linearity of stimuli-perception-decision (Ingold 2000b). In a history which traces the development of jogging as both a personal habit and a social normality, Latham (2015) makes a similar argument. For Latham, the adoption of a new habit necessitates both rational decisions, and the cultivation of new corporeal routines to replace existing ones. Both will be drawn on in the discussion which follows.

Change, therefore, can originate in a number of different places, be planned, be stumbled upon, be gradual or rapid, or be unavoidable. Importantly, it reflects on-going dynamics, and does not emerge to replace stability. Going back to the ways in which the launch of the new metro infrastructure re-shapes travel habits, the question becomes one of thinking through different kinds of change and sameness, enacted through the habitual interactions of the metro's users with its social and technological affordances. Situating the 'switch' to the metro in a typology of on-going changes, without pre-emptively assuming their significance or insignificance, this research seeks to understand the role of new public transport infrastructure in travel behaviour change, and vice-versa. This research objective is linked to a growing recognition of the place of each transport mode in urban mobility networks which are defined by multimodality. As argued by (Buehler and Hamre 2014a), studying and planning infrastructure from the point of view of the passenger means acknowledging that transport use is necessarily multimodal. Recognising that 'pedestrian,' 'cyclist' and 'driver' are actually fluid, continuously renegotiated categories, rather than unitary identities (as we will see shortly, a commuter's position vis-à-vis such categories can shift several times a week), can help transport researchers rethink the 'small' and 'big' changes in which both humans and infrastructures are always entangled.

Conclusion

The interdisciplinary review of relevant research presented in this chapter demonstrates the need to continue developing approaches to understanding what public transport infrastructure is, what it does, and how well it does it. In approaching these questions, it is important to seek answers which can serve the practical challenges of designing and evaluating transport infrastructure, and which can engage with established approaches, rather than dismiss them as inadequate. The theoretical framework of this study thus relies on a qualitative transport geography approach to appraisal, studying a new public transport project as tied into specific local networks of socio-material interactions, multimodal mobility provisions, and on-going change. The resulting study is not a blueprint for qualitative evaluation of transport infrastructure. It aims to demonstrate openings, and invite conversation, about the ways in which a specific project, the Sofia metro Line 2, in a specific urban location, comes to acquire value for its users.

The core concepts used in this approach – qualitative conceptualisations of time, cost, comfort, and stress – have been reviewed from a number of disciplinary perspectives. Finally, reflecting public transport's potentially significant role in urban sustainable mobility transitions, the basis for conceptualising infrastructural change and travel habits is examined, with particular reference to the 'ultimate' urban routine – commuting. Rather than thinking about a new metro line as a disruption of pre-existing stable routines, an approach is proposed which frames 'small' and 'big' change in everyday mobility as on-going and intertwined. In the next chapter, I discuss how these theoretical engagements were translated into the study's research design.

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Introduction

This study focuses on infrastructural change in everyday urban mobility, through the case study of the 2012 expansion of the metro system in Sofia, Bulgaria. The present chapter serves to make explicit the linkages between the theoretical background of the study (Chapter 3) and the empirical findings presented in Chapters 5 to 8. The first section of the chapter introduces the research questions which drive the study. I then discuss the epistemological inspirations for this research project. The third section turns to the longitudinal approach of the research design, and the ways in which it reflects the theoretical engagements of the research questions. Sections 4.4 to 4.8 describe each of the research methods used in data collection, starting with the main method of repeated ride-along interviewing. The approach to data analysis of the collected empirical material is then outlined. The chapter concludes with some reflections on my positionality in collecting, analysing and representing the data on which this study is based.

As discussed in Chapter 3, this study is not easy to categorise as either theory-led or data-led. It originated in a question which was pragmatic to the extent of being theory-free – “*Is this new line a good piece of infrastructure?*,” but quickly became entangled in conceptual issues which have long been debated in transport research (i.e. “*How do we know what good infrastructure is?*”) My aim has been to explore these debates, but then step back from them, collecting and analysing data following everyday themes related to commuting, rather than theoretical constructs. Using a grounded theory approach, the original research questions served only as a general orientation during data collection, with in-depth engagement and description prioritised instead.

The research questions were then revisited, and adapted slightly, finally taking their final form through the dialogue between the original motivation for the study, and the empirical material collected. They are as follows:

- 1) How can the value of the 2nd metro line project be understood through its users’ everyday socio-material experiences of travel time, journey cost, comfort, and stress?
- 2) How can the place of infrastructural change be conceptualised against the routine nature of commuting habits?
- 3) How does the launch of new transport infrastructure shape travel behaviour change, and what are the implications of this for the social and environmental sustainability of urban mobility?

4.1. Epistemological background

This study is inspired by the view that attempts at explanation should be preceded by extensive and attentive attempts at description (Latour 1991). From the early days of trying to pin down topics and methods, it appeared to me that this approach can produce a counterweight to a kind of social science which is quick to attribute what is empirically observed to pre-defined mechanisms and underlying structures. Taking my time to describe loosely connected events and interactions could constitute a productive suspension of prior knowledge of drivers of behaviour, social identities, and other such tenets of social research. In temporarily doing away with these categories, I sought to respond to Hinchliffe and Whatmore's (2006) call for research that is less hasty in condemning, judging or uncovering the real motivations behind actions.

My interest in deliberate and careful description as a method of doing social science developed alongside an interest in everyday life as a challenge of both theory and methodology. It seemed that a quintessentially mundane activity such as the daily

commute was an apt domain for practicing and refining ways of grasping that which is so familiar as to become invisible, a trope used to describe both infrastructure, and everyday life more generally (Highmore 2004). An aspiration to create detailed descriptions of mundane things can be seen as a bizarre research ambition. It is driven by a conviction, shared by many others, that descriptive studies of small things can generate sophisticated theoretical engagements with the 'big things' of urban life (Law and Lien 2012; Bendiner-Viani 2013). For example, looking closely at what commuters do on a busy escalator can ultimately offer insights into urban sustainability transitions.

In a 2011 publication, Stephen Graham described a large-scale restructuring in the city's physical infrastructure as a 'heuristic device.' I take this to mean that, as a research strategy, studying an instance of large-scale urban restructuring is more than studying that particular disruption of everyday life. The disruption also illuminates the everyday itself (Star 1999; Binnie et al. 2007). It is an opportunity to examine the otherwise taken for granted; the – often so familiar as to be invisible – things that urban dwellers do as they go about their daily business. In researching the Sofia Metro's expansion, I wanted to hold on to both of these aspects. More than that – I have pursued a research design which would not pre-emptively frame sameness and disruption as separate moments, but would be orientated towards the porous and fluid boundaries between the two.

A further inspiration for this study, both in terms of making sense of transport infrastructure projects and practices of everyday mobility, but also more broadly, in terms of epistemology, came from Phillip Vannini's work on ferry commuting in British Columbia (Vannini, Hodson, and Vannini 2009; Vannini 2011). In translating the theoretical framework of the project into a research methodology, I drew inspiration from Vannini et al's (2009) application of 'technography.' Technography refers to a method of collecting and representing ethnographic data which presupposes "a reflexive, narrative, embodied, and sensuous approach to ethnographic representation in order to make sense of, while evoking sensations of, corporeal presence and bodily movement in space and material engagement with technics" (Vannini et al 2009:464). This perspective offered a sense of continuity in navigating between epistemology, methods and theoretical perspectives on everyday mobility. While I do not use the term 'technography' in this study, and some of my more applied foci have come at the expense of the ethnographic description, I believe I have stayed close to its spirit and preoccupations. Crucially, acknowledging both embodiment and reflection frames the approach I take to the subject of the research participant, as discussed in more detail in section 4.4.

4.2. Longitudinal research design

This study is concerned with conceptualising change in everyday mobility. As a result, the research design responds to the repeated calls for more longitudinal approaches in research on routine travel (Chatterjee, Sherwin, and Jain 2013; Vale 2013). Longitudinal studies have repeatedly been pointed to as key to gaining insight into the linkages between infrastructures, individual journeys, and broader urban dynamics (Gatersleben and Uzzell 2007). Most importantly, a longitudinal approach is indispensable when studying change (Chatterjee, Sherwin, and Jain 2013). Repeatedly encountering the experiences of respondents highlights the fact that a simple before-and-after temporality is rarely suited to conceptualising change (Graham and Marvin 2001). Similarly, the small (and occasionally, large) differences witnessed over several encounters can contribute to complicating the straightforward causal links easily imagined around a large disruption such as new infrastructure. A longitudinal approach helps not only in opening up the discussion to novel theorisations of change and sameness, but also can help expose dubious attributions of causality. Falsely ascribing change to the primary object of my study – the launch of a new metro line – was a real risk which I was aware of throughout the research (Becker 2007:146). To be able to engage with change over time, and to set aside prior assumptions about what is and is not significant change, or what is one-off and what is cyclical change longitudinal research design was chosen (see Holland et al 2006:4-7; 32-38 on qualitative longitudinal research approaches). Data collection started in August 2012, two weeks before the opening of Line 2, and ended in January 2015, covering a total period of 30 months. This included a total of approximately 16 months spent in Sofia.

The project also explores the potential of qualitative longitudinal data for conceptualising the value (taken to mean not simply economic value, but worthiness and usefulness) of transport infrastructure. Data collection thus was centred on, but was not limited to a single infrastructural project, the 2012 expansion of the Sofia metro. Instead, the entire repeated journeys which traversed it and incorporated it, thus making it part of broader everyday mobility arrangements, served as the unit of analysis.

Importantly, the 2012 expansion of the metro network included both the launch of Line 2 in August 2012, and the addition of two new stations to Line 1 in April 2012 (see Figure 4-1). While for brevity I often use the shorthand 'Line 2 commuters' in the remaining chapters, this refers to those commuters who use any of the metro stations added in 2012 as part of their everyday journeys.

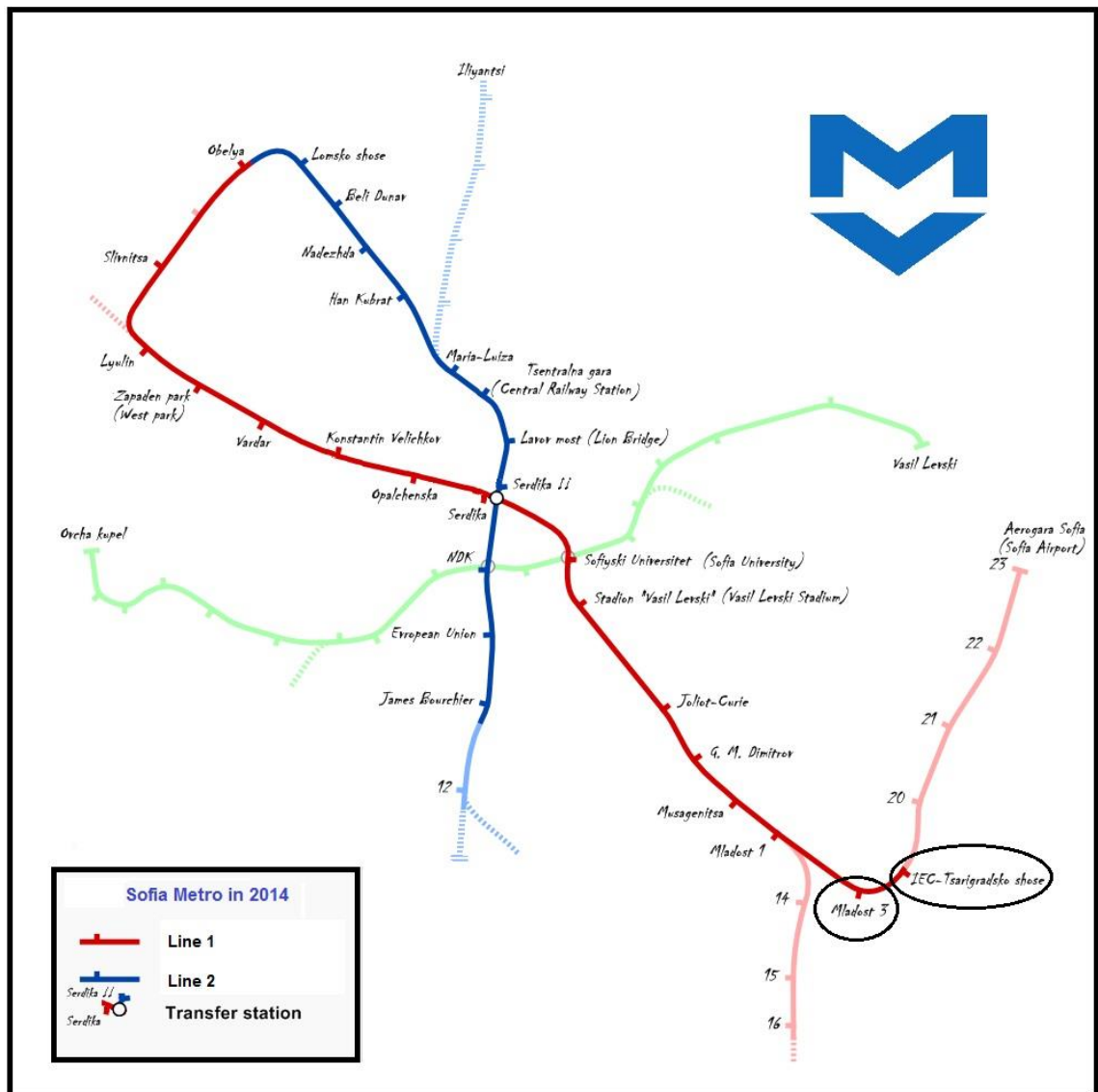


Figure 4-1. Diagram of Sofia Metro in 2014. The 2012 extensions which this study focuses on are the entire Line 2 (solid blue line on diagram) and the two end stations of Line 1 (circled). Adapted from Wikimedia Commons.

The core method of data collection was the repeated mobile interview, or ride-along interview: a semi-structured conversation which takes place during the commute itself. The next section provides more detail on how the mobile interviews were planned and carried out. Because of the core participants' differing commitments, there was some variation in how often interviews took place, and over what period of time. Each core participant was interviewed a minimum of four times, over a minimum period of five months. Five months were deemed sufficient to capture some seasonal and weekly variations; however, the majority of core respondents were interviewed on more occasions (between 6 and 8) and over a longer period of time (between 10 and 23 months).

4.3. Interviews on the move

The core method of semi-structured interviewing while accompanying the participant on their habitual journeys, sought to account for everyday mobilities and their entanglements with infrastructure, as both embodied and mindful. Interviewing outside the journeys' timespace would have missed out on the minute socio-technical interactions which are performed by the commuting body. Corporeality is a significant aspect of everyday urban mobility, yet traditional empirical approaches often fail to capture embodied experiences (Bissell 2007:295; Fusco 2008:160). Many of these may be difficult to recall in conversation, or deemed too insignificant to mention (Bissell 2007). However, the small practices of buying a ticket, or glancing at a clock, were central to compiling an account of how travel time, cost, comfort and stress are accomplished in changing metro commutes.

On the other hand, an approach to data collection based only on close observation of commuters' practices would have come with its own major limitations in terms of generating data which address the research questions. First, solitary observations of social practice may wholly misinterpret events by refracting them through the particular knowledge and experience of the researcher (Kusenbach 2003). As Bissell (2007) points out in relation to using video in ethnomethodology, the researcher can see only those gestures and experiences which involve physical movement. The second difficulty with observation stems from the fact that this project is mainly about the changes which occur in and through everyday practices. As I will argue in later chapters, change and sameness in everyday habits can be understood as on-going, asynchronous, minute, ambivalent and poly-directional. As a result, observing a sequence of instances and encounters, even if many and even over the course of several months, would not have revealed much about the unfolding of change. Some continuity of the passenger as a subject who injects meaning in the notions of sameness and change, was needed: in thinking about change, the traces of the commuter's past and present commutes, folded into a present journey, were important (Pile and Thrift 1995). Change plays out in snapshots of situated interactions, but is revealed more fully in the personal histories of each participant, which exceed single moments and connect them across spaces and temporalities. The reflections of both researcher and participants on practices were therefore of critical importance, gathered on several different occasions, allowing the finer details to be gradually explored and follow-up themes to be pursued (Hitchings 2012:63). This is particularly pertinent in the case of a study with a practical concern at its heart: albeit porous and fluid, the socio-technical arrangement of the new Sofia metro line necessitates that some spatial and temporal outlines are drawn around the object being studied, if the question '*What difference does the new infrastructure make to commuting?*' is to be meaningful.

It thus seemed that a combination of participant observation and in-depth interviewing would be most appropriate, so that both the participant and I could discuss and observe together the otherwise subtle, and often neglected through their triviality, interactions of human and non-human actors in everyday passengering. While the ride-along element ensures rich situated data can be generated, the interview aspect ensures that the focus on embodied presence does not result in neglecting the participant's own reflections and subjectivity (Shoval et al. 2014).

The repeated ride-along interview method, inspired originally by the emphasis on developing a longer-term relationship with respondents in Latham's diary-interview method (2003), involved a semi-structured interview while on the move. Mobile methods such as the ride-along interview have gained increasing popularity, amid calls that mobile practices are best studied by equally mobile research designs (Buscher and Urry 2009; Spinney 2009; Latham and Wood 2015). As argued by Kusenbach (2003), go-along methodologies can help illuminate that which is taken for granted in everyday routines. However, following a welcome intervention by Merriman (2014) in the expanding body of mobile-methods-based research, it is important also to recognise its limitations. Rather than a better version of the interview, a solution for gathering more, or more accurate, data, the ride-along interview is a particular type of research performance, with its utility as well as its limitations. I have adopted a mobile method in the knowledge that, as with any method, orientations towards some events and interactions will be prioritised at the expense of others. By also carrying out extensive observations, sitting still on trains and platforms, often for hours at a time (see section 4.6), I sought to 'slow down' the kind of research gaze generated within ride-along interviews, and notice some of the doings and sayings which would have otherwise been omitted.

One of the challenges I faced in doing ride-along interviews had to do with the different temporalities I referred to in my questions. I quickly realised that asking about the present journey – the trip we were doing together at the time of the conversation – would have been problematic. For example, querying the location on the platform which the respondent had just chosen would yield responses which directly reflected my own presence: "*We're standing here today because there's two of us and there's more space here. I wouldn't be standing here if I was on my own.*" Initially, I found myself asking hypothetical questions ("*Would you have taken that empty seat if I wasn't with you?*"), but this was also unhelpful: it meant trying to research concrete, situated practices by asking the practitioners to speculate about hypothetical events. Another approach I experimented with and quickly dismissed as antithetical to the ideas which were at the very heart of the research, involved asking questions about their "typical" commute ("*Where do you usually*

sit?") This seemed to foreclose rather than uncover the specific, pre-discursive, embodied configurations, and represented a return to an unfounded in experience average. Beige and Axhausen (2012) similarly recognised interview schedules designed around a “usual” commute as problematic. Finally, I opted for asking participants about the commute of the day before. While the present provided the context and the memory aids, the questions themselves focused on what the respondent could recall about undertaking the commute on the previous day. Thus, I would ask questions like “*Did you stand in the same place yesterday?*” or “*What did you carry with you yesterday?*” At first this seemed confusing to some participants, but repeatedly emphasising my particular interest in ‘yesterday,’ rather than a generalised ‘usually’ improved the robustness and situated-ness of the data. It also generated interesting reflexive discussions about memory, what is memorable in daily life, and what we take for granted or compress into mental representations of a typical day.

I eventually came to use the differences between one’s ‘typical’ commute (see Marsden and Docherty 2013 for a further critique of the concept) and the particular experience of the ride-along as a research device. This involved specifically asking participants to reflect on what felt unusual or disruptive about me accompanying them. By making the ride-along itself part of the conversation, I sought to make explicit the fact that it wasn’t somehow ‘outside’ of the experience of commuting: it was a lived and embodied mode of inhabiting the metro, it happened, and thus had to be acknowledged (Hill 2013). As argued by Bissell (2014), the interview itself was a vivid encounter which heightened both researcher and respondent’s capacity to be attuned to the research topic. The approach generated some interesting conversations, as in the following example: “*I would have taken a bigger bag, since I usually have to carry my book. But today I knew we would be travelling together, so I didn’t take my book, and so I only needed a small handbag*” (Nevena, 15 May 2013 AM). However, this could only take place during later ride-alongs, when respondents felt more at ease to reflect upon our experience of travelling together.

A further methodological challenge of studying socio-technological change in relation to situated public transport use, is the danger of reducing the impact of new infrastructure to its spatiotemporal boundaries. Although the practices of metro commuters may seem like something that takes place within the boundaries of the metro, in fact the implications of these journeys extend out (as Laurier et al. 2008 point out in relation to car driving and passengering). Spatially, commuting reaches into the socialities of the city’s other public spaces; into the domestic life of households; and into the work activities of urban dwellers. Temporally, the changes inside the metro in the present have an impact on the conceptualisation of the multiple pasts and futures of the city. In their research on household, income-earning and commuting arrangements in London, Jarvis, Pratt, and Wu

(2001) convincingly argue that everyday mobility practices should always be studied as part of a broad and complex interweaving of work, home and social reproduction. For Kusenbach (2003), research findings about situated practices need to be contextualised in the biographies and future plans of research participants. Similarly, time-geography research inspired by the work of Hagerstrand (1973), have repeatedly demonstrated the way journeys and activities work together to bring into being what can be thought of as the spatial and temporal dimensions of everyday life (Neutens, Schwanen, and Witlox 2011). These arguments were captured in the ride-along interview approach through two techniques. First, the interview guides for evening ride-alongs included questions concerning wider reflections on issues around household arrangements and re-arrangements, changes in the neighbourhood, and life in Sofia (the reasons why the evening commute was more accommodating to reflexive conversation form part of the discussion of findings in Chapter 7). Second, although the study focuses on metro infrastructure, all accompanied commutes started at the origin (home to study/workplace, or vice versa) and covered all the modes the commute involved. Commuters being picked up and dropped off, grocery shopping on the way home, fragments of phone conversations all offered a qualitative glimpse into the place of the commute, in its entirety, in the fabric of the everyday. Because of time constraints, it was not deemed feasible to also visit the participants' homes and places of work, although these settings would have offered valuable insights into how commuting arrangements are shaped by, and in turn shape, the other spheres of the everyday.

In conducting the repeated ride-along interviews, I found it useful to revisit and refine both the timetable and the interview guide repeatedly. Thus, my initial plan was for the outbound and inbound journeys (which mostly, but not always, corresponded to a morning and evening journey) to take place on the same day. However, this was not practical for two reasons. First, participants often had other commitments later in the same day, such as meeting friends or shopping. They did not always want to be accompanied on these journeys, although I was able to join several participants on such occasions. It sometimes seemed that participants were reluctant to be interviewed twice in the same day, and since I was weary of research fatigue in a repeated interviewing research design, I did not insist. The second reason was that travelling together once a week for two weeks, instead of twice on the same day, turned out to be an opportunity to gather data on a greater number of journeys.

As a rule, the first ride-along used more broadly defined themes, and was intended to establish rapport as much as gather data. The themes for the first interview included:

- Your commute before the metro
- Your commute immediately after the opening of Line 2
- Changes to your commute since, focusing on times, routes, stops, and tickets
- What else has changed in your own daily routine, and in your neighbourhood, since the opening of Line 2?
- What you wear and carry during your commute (bags, clothes, electronic devices, umbrellas, food and drink, shopping)
- Interactions with others (travelling with others; meeting people you know; interacting with strangers; the behaviour of other passengers)
- What makes you stressed in relation to your commute? What makes you comfortable?
- Yesterday's commute in all the detail you can remember

In preparation for the first ride-along, I found out the origin, destination, and all the transport modes to be used. I asked the participant if they would be alone, and if they would be under pressure to arrive at a specific time. I reassured them we would move at the pace they would have set for themselves if alone, and explained their schedule was the top priority.

Subsequent ride-alongs covered the same broad topics, but focused specifically on following-up key themes identified in previous interviews. An indication of how each broad theme was broken down into specific questions is given in Appendix 1. However, not all were covered, or covered in detail, with every participant. Before a second or later ride-along, I reviewed my notes from the previous ones, so that I could build on them, fill gaps, and follow-up on interesting points already discussed ("*Are you still finding it difficult to make it to work on time?*"). Thus, participants who had previously spoken at length about their choice of travelcard were asked what, if anything, had changed in respect of their ticketing practices since. When additional themes emerged in others' interviews, these became part of the interview guide for this participant's later ride-alongs. Some of these proved fruitful, and even central, to refining the overall interview guide (e.g., the theme of e-readers versus paper books), while others yielded interesting data only with a limited number of participants (coordinating schedules with other members of the household).

On a few occasions, arranged ride-alongs were cancelled when participants switched, permanently or temporarily, to modes of transport such as bicycles and motorcycles. On three occasions, on the request of participants, ride-alongs were replaced by sit-down interviews. These began with me asking the participants to retell in as much detail as

possible their last morning and evening commutes. This approach helped with recall of the specifics of the journey, and grounded the further discussion, but the immediacy of the ride-along interviews could not be reproduced.

Like any research method, ride-along interviewing has numerous limitations. Many of them concerned practical issues. A number of ride-along interviews were conducted in extremely busy spaces, with the respondent and myself packed tightly into a train carriage with dozens of other passengers. On such occasions, both respondents and I were conscious that some people around us could hear our conversation. It is safe to speculate that this limited and shaped what respondents were willing to discuss. My only strategy for managing this was to time questions so that the potential more sensitive ones (like the behaviour of other passengers, or one's morning routine at home) were discussed on the way to and from the metro stations, and on the platform. Relatively more innocuous topics, such as luggage, or broader changes in the built environment of the local area, were preferred for the time on the train. I also sometimes responded to participants' answers to my questions by briefly talking about my own commuting experiences. In doing this, I aimed to create a more equal atmosphere, where they were not the only ones discussing their private lives amid the relative quiet of the morning commute. I aimed to put something of myself 'out there,' while ensuring my experiences did not become the focus of the discussion (Rubin and Rubin 2012).

All interviews were recorded using a digital voice recorder, and transcribed within a few days after the encounter.

4.4. Sampling frame

The core sample included a group of 20 respondents who had become users of the metro after its Line 2 (or Line 1 extension) reached them in 2012. 13 of the 20 participants started commuting by metro as soon as the new Line 2, or the new Line 1 stations, opened, and the remaining seven adopted the metro extension as commuting mode within 6 months of the launch. 10 out of the 20 lived in the northern Sofia neighbourhood of Nadezhda. While the sample size was relatively small, a total of 82 core interviews, between 35 and 90 minutes in length, were conducted, generating a wealth of data. In addition to the core sample, ride-along interviews were carried out with 11 commuters who did not use the 2012 metro extension.

The most important question to address when determining the sampling frame for the repeated ride-along interviews was the question of who 'commuters' were. Rather than a process of straightforward application, the practical realisation of the research design

involved repeatedly moving between theoretical issues and emerging empirical findings. For example, what at first appeared to be issues of sampling (“*Should respondents include freelancers with no permanent offices?*”) quickly became important conceptual questions about the focus and limits of research on commuting infrastructures. Was it the regularity of route, destination, time, that made the ‘everydayness’ of everyday travel? How habitual is a journey undertaken on most days, but at different times? The process of thinking through the sampling frame was indivisible from the process of continuous refinement of the conceptual framework (Becker 1998:109-121). To capture the ‘routine-ness’ of routine mobilities, which is central to a study of change, commuting journeys had to be defined in relation to other types of journeys. As will be discussed in the coming chapters, there is in practice substantial variability intrinsic to routine journeys to work, and the commute incorporates many and frequent changes related to travel mode, journey purpose, duration and time, among others. Origins and destinations can exhibit variability too, as commuters occasionally stayed with family members or friends in a place other than their home, moved house, or changed jobs. However, for all participants, a regular, non-discretionary, recognisable commute could be identified among all journeys undertaken – both by me, and by themselves. For sampling purposes, in order to explore the interplay between routine and change, a cut-off was established of a minimum of three such non-discretionary journeys per week, taking place between (any) origin of regular overnight stay, and any non-one-off destination involving paid or unpaid work activities. Such a definition of routine trips, based around a weekly cycle, allowed me to incorporate the commutes of respondents who worked part-time, or combined work, care, volunteering, and study in a range of (often very complex) arrangements. While complex mobility arrangements can be found across socio-economic and demographic groups, gender has been found to be especially influential in this respect (Kwan and Kotsev 2014). Defining commuting around a 5-day working week, and a 9-to-5 working pattern would have left out many commuters, and many women in particular, and especially groups for whom public transport services are likely to be important.

Where initial contact with participants was made via email, they were directed to a web-based information sheet, providing details of the purpose of the study, the repeat ride-along interview procedure, as well as data protection and confidentiality procedures (see Appendix 2). In cases where I met prospective participants face-to-face, verbal consent was obtained, based on me providing verbally the information detailed on the study website. Because of the longitudinal research design, I re-iterated the key points from the previously obtained consent at the start of each repeat ride-along interview. These included: recording of interview; freedom to not answer specific questions or to withdraw at any point without giving a reason; secure storage of data; anonymity of findings.

All participants were recruited from friends' social circles using a snowball technique. My attempts to recruit people to the study who I did not have at least a tentative social connection to, did not yield any results. Such attempts were made online, via social media and a dedicated website, and through leafleting outside metro stations. The two participants who eventually responded to these recruitment drives dropped out after the first ride-alongs and had to be excluded from the sample. I suspect that this was due to the combined effect of two factors. First, the topic of commuting habits, while interesting to some, was probably perceived as somewhat trivial in a place faced with many serious and urgent socio-economic issues. Second, the research method of repeated ride-alongs over the course of several months could be perceived as unnecessarily intrusive. Privacy is no small matter in a post-socialist society with living memory of secret police departments and civilian informers (Kremakova 2014). I expect that a stranger waiting outside of one's house and asking questions all the way to one's place of work may look suspicious to people in any context, but especially in this one. By contrast, the introduction by a mutual acquaintance provided reassurance and credibility, and thus quickly became the only recruitment strategy. I addressed some of the limitations of this approach by having 12 different entry points into the core sample of new Line 2 commuters, and aiming for some diversity of locations, occupations, socio-economic and household situations, age, gender, without aiming for a representative sample.

An open-ended approach to change and causality meant there could be no presumption that demographic characteristics such as gender or residence would have a particular type of influence on commuting habits. Thus, while sampling aimed for diversity, the subsequent stages of data collection and analysis very deliberately 'suspended' assumptions about each of these groups. This approach is advocated by Barr and Prillwitz (2014) for research which focuses on social practices and the circumstances of their performance, rather than on individuals and 'lifestyles.'

Nevertheless, the core sample was fairly diverse in terms of gender, household type, age, residence and employment status. Figure 4-2 below shows some basic characteristics of the participants in the core and additional samples.

Core sample					
	Age at start of study	Gender	Nearest metro to home	Nearest metro to work/study	Occupation(s)
Anton	37	m	Mladost-3	NDK	Project manager in NGO
Assya	26	f	James Bourchier	Joliot-Curie	Assistant accountant
Bella	55	f	James Bourchier	Serdika	Legal officer
Maria	20	f	Serdika	James Bourchier / Sofia University	Full-time student, part-time English teacher
Nikolay	30	m	Expo Centre	James Bourchier	Call centre operative
Emma	33	f	Beli Dunav / K. Velichkov	European Union	Account manager in design agency
Stella	55	f	Central Station	Serdika	Project manager in government department
Rumen	28	m	Nadezhda	NDK	IT support officer
Gregor	23	m	Lomsko Shose	NDK / Sofia University	Full-time student, part-time legal assistant
Irina	22	f	Beli Dunav	James Bourchier / Sofia University	Full-time student, part-time administrator
Janna	32	f	Nadezhda	European Union / Sofia University	Designer in design agency, part-time student
Vladimir	35	m	James Bourchier	Central Station	Shop assistant, part-time photographer
Maya	29	f	European Union	Opalchenska	Accountant
Christo	29	m	European Union	Expo Centre	IT programmer
Natalia	37	f	Mladost-3	Sofia University	University researcher
Nell	42	f	Obelya	Serdika	Administrator
Raya	57	f	Nadezhda	Joliot-Curie	Construction engineer
Toni	25	f	Nadezhda	Serdika / Sofia University	Administrator, part-time student
Tanya	49	f	Nadezhda	Sofia University	University lecturer
Lilly	30	f	Lyulin	Expo Centre	Marketing manager
Background interview participants					
	Age at start of study	Gender	Commuting modes		Occupation(s)
Steph	34	f	bus and car		IT programmer
Boris	35	m	bus and car		IT programmer
Nevena	28	f	minibus and walk		NGO worker
Ivan	38	m	bicycle and metro Line 1		manufacturing worker
Milla	32	f	metro Line 1		project manager in IT company
Tina	34	f	trolleybus		administrator
Galla	50	f	metro Line 1		administrator
Kristina	30	f	car		manager in design company
Mark	26	m	tram		trainee doctor
Pavel	27	m	bicycle and metro Line 1		IT programmer
Iva	44	f	metro Line 1 and car		CSR officer

Figure 4-2. Sample characteristics

When I recruited the 11 additional participants, I chose some of them quite deliberately: they were people who had mentioned plans to move house, or change jobs. I expected that should their relocations lead them to become Line 2 commuters, I would be able to include them in the core sample. However, my secret plan did not come to be realised. Instead, one of the core respondents moved from her home on Line 2 to a new one on Line 1. Because her workplaces remained near a new metro station on Line 2, I was able to retain her as a

core participant. But I also considered it a warning: trying to pre-empt participants' life events amounted to bad research karma.

4.5. Background interviews

A series of background interviews were conducted in 2012-2014, in order to provide context, triangulation of data gathered during the core ride-along interviews, and identify appropriate interview questions. The background interviews were semi-structured qualitative interviews, including the 11 ride-along interviews with participants whose commute did not involve Line 2 of the metro. Driving, car passengering, walking, tram, trolleybus, and bus were covered in these additional ride-alongs. A further seven background interviews were conducted with individuals involved with the Line 2 project in a professional capacity:

- One interview with the trainee station manager of Maria Louisa station, covering the rules and regulations which manage the station during busy times;
- One interview with a construction manager, and one with a manager of quality control, covering the history of the Line 2 project and wider changes in Sofia's transportation system;
- Two interviews with construction workers on the Line 2 project, covering construction techniques and geological challenges;
- One interview with the legal advisor of Sofia Metropolitan, the metro authority, covering accessibility legislation, local activism, and the company's current provisions and future plans for station accessibility;
- One interview with a local cycling activist, covering provisions for bicycle-metro multimodal journeys.

These interviews provided direction for the archival research (see section 4.8), and the content and analysis of the core ride-along interviews.

4.6. Ethnography and autoethnography

Despite the richness of data collected through ride-along interviews and the depth of engagement this method permits, it was important to incorporate into the research design methods which focus more explicitly on the togetherness of commuting, and the scene in which the socio-technical interactions of the commute happen. These data addressed the research questions concerned with comfort and stress, which I framed as collective and distributed experiences based on the literature review presented in Chapter 3, and the nature of the metro infrastructure as a space of travelling together with strangers, in close

and sustained proximity. Schatzki (2012) has warned that the sociality of passengering is not simply the aggregated total of the individual experiences of travel, and it should not be reduced to it in data collection. Manderscheid (2013) has similarly offered a critique of the over-reliance on the solitary mobile subject in much transport and mobility research. Therefore, ethnographic observation was used to immerse myself in the spaces in and around the metro, looking closely at interactions and being exposed to atmospheres, mainly during busy commuting hours, but also outside of them. In total, observations were carried out on 45 individual occasions, ranging between one and four hours in duration, and spanning all seasons, days of the week, and times of the day. Observations informed core interviews, and vice-versa, in order to gather both data on socio-material interactions during habitual journeys in peak times, and the commuters' own reflections on how particular kinds of habitual interactions generate comfort or stress.

To provide structure and explicit linkages between ride-alongs and ethnography, I furthermore decided to undertake autoethnographic commutes. Autoethnography has recently gained prominence in qualitative social enquiry as an approach which foregrounds emotions and self-reflexivity (Anderson 2006; Wall 2008). While social scientists have been drawing on their personal experiences for decades, the explicit focus on autoethnography reflects a growing move away from scientific claims to objectivity and representativeness. Autoethnographic researchers have highlighted the emancipatory, even transformative potential of the method, realised through its attention to the subjectivities of knowledge production (Spry 2001). Despite the obvious advantages of having 24-hour access to a participant with significant knowledge of and investment in one's research, autoethnography has also attracted a range of critiques. Some of these considerations are particularly poignant in the context of my study's aspirations to study the difficult-to-access-discursively world of the habitual, and should therefore be highlighted here. For example, autoethnography should not be taken as a method which bypasses representations and taps into 'real' experiences. Not only are autoethnographies narrated through discourse; they are inevitably strategic biographies (Butz and Besio 2009). Autoethnography can be argued to make up for its narrow focus by the depth of its engagement; in the same vein, it can be seen as an easy way out of the potential messiness of participant-researcher relations. However, its apparent ability to make space in the research for the thoughts and sensations associated with being in the timespace of the commute have proven a valuable addition.

I carried out a total of 20 autoethnographic commutes between September 2013 and April 2014. On all 20 occasions, I 'commuted' to a café which opened early, and where I could spend a few hours working on my laptop. The café, representing a workplace, was chosen

for its location near a Line 2 station where no research participants were based at the time, providing me with a way into another part of the city. The route was also chosen so that it would incorporate a transfer from Line 1 to Line 2. Insights from the written-up autoethnographic commutes with transfers especially important to the discussion of value of travel time (Chapter 5) and comfort/stress (Chapter 7). During these journeys, I recorded my observations and reflections by dictating them into my mobile phone, which proved fairly inconspicuous. These narrations were then transcribed, and informed a number of interview and data analysis themes around minute details which I might have otherwise missed. Autoethnographic narration also offered a mode of self-reflection which was a qualitatively different way of thinking and doing research to reading, writing or interviewing (Ingold 2012).

4.7. Geospatial data

Although the focus of the ride-along approach is typically on qualitative data, its nature means a wealth of quantitative geospatial data can also be produced through interviewing on the move. Geospatial data on routes and speeds was used to record the duration and location of those segments of the journey which happened above ground, informing the discussion on value of travel time (Chapter 5) and multimodality (Chapter 8). It also allowed intrapersonal variability, or change over time in an individual's commutes, essential to understanding the place of the new metro infrastructure in on-going change, to be recorded accurately (see Chapter 8).

Geospatial data were collected using a free GPS tracker app for an Android phone. Although accuracy levels varied, I was generally able to record data with 20m accuracy, which was deemed sufficient for the purposes of this study (Bohte and Maat 2009). Geospatial data were used to produce the 'duration and cost' pictograms used throughout Chapters 5 and 6.

4.8. Archival research

Many large infrastructure projects have long and complex histories. With thirty years passing between initial plans and first operating section, the Sofia metro is no exception. While much of the metro's post-1990s histories could be traced through the online archives of general news media and professional publications, it was important to explore the project from its conception in the late 1960s.

Archival searches were carried out during July and August 2014, in the Sofia City Archive and the Bulgarian State Archive. Catalogues corresponding to key periods in the project's development, identified from secondary sources, were searched manually. Decisions

related to the Sofia metro made by the Local Assembly (known as the Sofia People's Assembly pre-1989) and the Ministerial Council were then read and analysed. The records which were examined closely covered the periods 1971-77, 1980-81, 1984, 1986-87, and 1989-90. These data were written up in the form of a case history (Chapter 2).

4.9. Data analysis

All core and background interviews, and recordings from autoethnography and observations, were transcribed by myself, which also involved direct translation from Bulgarian to English. While translation inevitably shapes the research material to be analysed, being alert to the biases inherent in the process has hopefully minimised the effects of this step on the end result. As I translated all transcripts myself, I was able to ensure consistency in the decisions which are made as part of the translation process.

The transcribed and translated research texts were coded using NVivo qualitative data analysis software. The coding frame was continuously refined, starting from the themes emerging in the course of data collection, which were gradually brought into dialogue with the original research questions. In the spirit of grounded theory, coding emerged from themes in the transcripts themselves, rather than from preconceived theoretical concepts (Gardner and Abraham 2007). Only then were data coded in these terms related back to the theoretical framework. The final coding frame included 36 codes (see Figure 4-3).

	Number of coding references	Number of items coded
Nodes\ \ Change milestones	751	84
Nodes\ \ Other people's behaviour	664	83
Nodes\ \ Navigating timespace\ Routes and navigation	584	84
Nodes\ \ Navigating timespace\ Organising time	570	82
Nodes\ \ Navigating timespace\ Stationery space	333	68
Nodes\ \ Activity while travelling	218	73
Nodes\ \ Walking	213	74
Nodes\ \ Rush hour	173	68
Nodes\ \ Ticketing practices	162	69
Nodes\ \ Cars	143	54
Nodes\ \ Comments on metro management	132	58
Nodes\ \ Senses\ Temperature	132	63
Nodes\ \ Attitudes to Public transport	118	55
Nodes\ \ Multimodality	94	48
Nodes\ \ Luggage	88	55
Nodes\ \ Other people\ Mobile conversations	72	39
Nodes\ \ At home or work	65	40
Nodes\ \ Transfer	64	25
Nodes\ \ Moming v evening commute	61	37
Nodes\ \ Stress	55	34
Nodes\ \ Escalator	54	31
Nodes\ \ Doing without thinking	41	27
Nodes\ \ Cycling	40	23
Nodes\ \ Cars\ Parking	37	24
Nodes\ \ Contact with the city	30	25
Nodes\ \ Fatigue	27	19
Nodes\ \ Food	23	21
Nodes\ \ Senses\ Smell	23	19
Nodes\ \ Comfort	22	19
Nodes\ \ Senses\ Sounds	22	17
Nodes\ \ Senses	20	10
Nodes\ \ Choosing where to live	16	12
Nodes\ \ Cleanliness	11	8
Nodes\ \ Multitasking	7	7
Nodes\ \ Multitasking\ Escalator multitasking	4	3

Figure 4-3. Coding frame used in software-enabled analysis. Source: NVivo.

I moved repeatedly between coding and analysis, in a process of refining both the way the research questions were phrased and the way the coding framework was organised. During this stage, abstracting from my findings involved significant changes to the conceptual framework of the study. An earlier research focus on embodied wayfinding did not make it into the final thesis, despite some interesting empirical data on the topic. Instead, knowing time became incorporated as one aspect of the process of making travel time, and thus transport infrastructure, valuable (Chapter 5). The discussion of comfort and stress of Chapter 7 was originally intended to include also data on boredom as a different aspect of commuter well-being, but the amount of collected data on boredom was much more limited. This was partly a reflection of studying the metro commute with a group of participants for whom it was still relatively novel and eventful, and thus unwelcoming to conversations about boredom. For Chapter 8, which presents findings on

change and sameness in commuting habits, further paper-based analysis had to be carried out. First, timelines for the changes occurring in each of the 20 core participants' commuters were constructed. The timelines were used to develop inductively a typology of change grounded in empirical data. This typology, in the form of a matrix, was then related back to the data, with empirical material categorised according to the different parts of the matrix. At the final stage of data analysis, pseudonyms were assigned to all participants' contributions, ensuring no individual can be identified in the final text.

Concluding reflections

My own position shaped innumerable aspects of how the methods for this study were chosen and implemented. While collecting data, I often moved back and forth across the insider/outsider boundary (Turner and Norwood 2013). I am from Bulgaria, but not from Sofia. I am a native speaker, yet particular turns of phrase give me away as a long-term migrant. In what was possibly the biggest source of confusion, I am doing a doctorate, yet my questions are often naïve and focused on the most trivial of topics – mundane commuting practices. The drawbacks with my positionality had to do with my limited knowledge of local transport politics, place references, and colloquialisms. All of these took a long time to get to grips with. For the most part, however, these ambiguities in my position seemed beneficial in making participants comfortable, and in establishing them as the knowledgeable party in every conversation we had.

One of my key concerns was the big demand on participants' time which ride-alongs made. I was aware that commuters were missing out on various relaxing and productive activities when I accompanied them. And yet, some of them found benefits in the experience of the ride-along for themselves:

“It is so nice to have an opportunity to talk about my routine. I feel like I have been given a platform! [*laughs*] It's not the kind of things that people will generally have the patience to ask you about. But you ask me about all these details, and actually I'm surprised how interesting it is.” (Lilly 2014-01-18 PM)

“It was a pleasant conversation in the morning. It made me think about interesting things. They are interesting things, but they are everyday things, and if you don't stop and think about them, they just pass you by.” (Nell 2014-08-5 PM)

Receiving such comments was gratifying and reassuring for me as a researcher.

This chapter presented the thinking behind the research design, the specific methods used for data collection and analysis, and the limitations which resulted from the methodological choices made. Despite these limitations, I believe the multi-method, in-depth engagement with each participant, sustained over an extended period of time, has generated empirical richness of a different kind than that provided by large or

representative samples, advanced quantitative analysis, or other tools available to transport and mobilities researchers. In the next chapters, I present the data generated by this approach, and consider how they might illuminate the usefulness of the 2012 expansion of the Sofia metro network.

Chapter 5. Valuing commuter time on the Sofia metro

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Introduction

The time spent commuting is generally understood in transport research as a cost. It is the temporal price paid by the commuter in order to reach their desired destination or, to put it in economic terms, travel time represents a disutility (Mokhtarian and Salomon 2001; Vale 2013). In prevalent approaches to planning transport infrastructure, value is understood to be created when travel time is saved. The shorter journeys become as a result of a new transport scheme, the more successful the scheme is considered to be (Mackett and Edwards 1998). Mobilities research, on the other hand, has argued that travel time has an intrinsic value – it should not be treated as ‘dead time’ to be minimised, since travellers experience it in subjective ways, and often populate it with meaningful practices (Jain and Lyons 2008). In this chapter and the ones that follow, I explore the possibility that these views need not be mutually exclusive, but can be integrated in the context of the planning and appraisal of public transport infrastructure. I take inspiration from an interdisciplinary social science tradition of studying time, to position travel time as non-linear and practised, and to show how value can be created by cutting commuting times, but also within the duration of commuting time itself (Hagerstrand 1973; Thrift and Pred 1981; Shove 2009; Ellegård and Svedin 2012).

A few studies have made attempts to acknowledge, and even quantify, the intrinsic value of commuting time. For example, Redmond and Mokhtarian (2001) famously found that the ideal duration of Californian commuters’ journey to work is not zero, but 16 minutes.

The authors further found that many commuters were willing to commute longer than their ideal commute duration, and found some intrinsic value in commutes even when they were substantially longer than the reported ideal. This thesis was supported by many of the Sofia commuters I spoke to:

I can't imagine living opposite the office. It would be like living at work. The time saved wouldn't be worth it, because the time I spend travelling is not wasted, I make the best out of it, I read a book. Also, the commute is your time of transition. I can't imagine not having it. (Emma, 2013 11 07 PM⁴)

In the next five sections, I use qualitative data from new commutes on the Sofia metro extension to explore how clock time is complicated by subjective time, and how personal time is in turn constrained within the quantifiable parameters of clock time passing. Subjective, or personal time, is used here to refer to the practices of inhabiting, making, producing and reproducing time as part of everyday life (Shove, Trentmann, and Wilk 2009). By contrast, clock time refers to the quantifiable time many members of contemporary societies tend to share and use in communication and coordination, coded through devices such as clocks, watches, chronometers and timetables. I aim to make the case for thinking of the value of commuting time as made up of both quantitative measures of Newtonian time, and qualitative and subjective practices of inhabiting time, a perspective most fully developed in time-geographical research on everyday journeys (Schwanen 2006). While many mobilities scholars have demonstrated empirically that travel time can be productive, a narrow definition of productivity as time with positive economic utility is not adopted in this work (Lyons, Jain, and Holley 2007). As demonstrated by Bjørner (2015), travel time is often made up of a minute interweaving of instances of work-related and non-work related activities. I discuss valuable travel time here in broad terms, not by the presence of any particular pre-defined productive activity, but rather as an overall absence of stress and tedium, and presence of a sense of meaningfulness, as a *possibility*, whether realised or not, to spend time in a way which feels productive. This implies a potentially useful reorientation in appraising infrastructure, from the value of travel time, to the different approaches to valuing travel time. In this conceptualisation, clocks and timetables play a role, as do embodied practices and sensations. The space where human and non-human actors come together to value commuting time in different ways is presented in the diagram in Figure 5-1 below:

⁴ All interview quotes are timestamped in the year-month-date format. AM or PM indicates whether the interview took place during a morning or afternoon/evening commute, as none of the participants in the core sample worked a shift pattern.

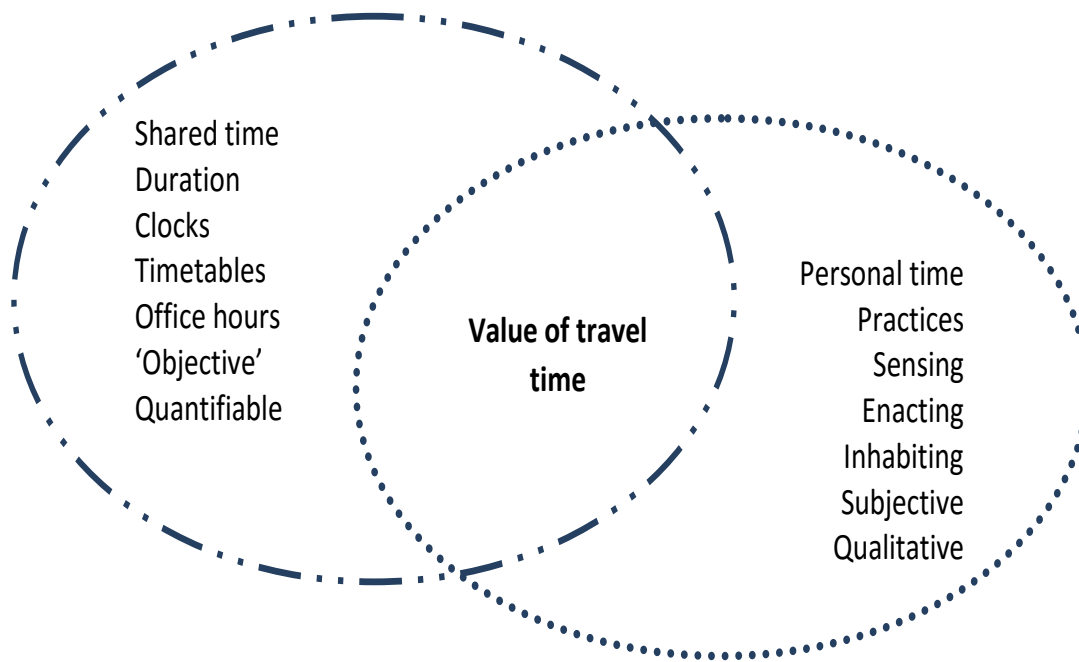


Figure 5-1. Quantitative and qualitative aspects of making valuable commuting time

This chapter presents time on the move as it was gradually assembled and reported by the research participants: through the interactions of people and objects. I explore the specific socio-technical configurations within the overall metro infrastructure which made travel time experiences more or less valuable. The subjective inhabiting of time of the new Sofia metro commuters offers insights into what, where, when and how value is created in the temporal practices of the commute. At the same time, this chapter does not aim to romanticise subjective time over clock time. It demonstrates that the 'objective' times of timetables, trip durations, working hours, and station clocks are inseparable from the subjective and embodied temporal practices of travelling. The lived experience of subjective time is not 'free' from the infrastructural arrangements which surround it, but is embedded in, and structured by, the temporal rhythms of transport infrastructure. Thus, travel time may be intrinsically rich and meaningful, yet not all metro travel time is equally meaningful. Instead, it is constrained by the specific socio-technical configurations within every journey. When considering the value of travel time from the perspective of transport planning and appraisal, a notion of valuable time as entirely subjective and intrinsic to the individual is not necessarily practicable. The implications of such a conceptualisation for infrastructure projects can be unclear and it has indeed had limited impact on appraisal approaches to date (Department for Transport 2014b). However, examining how specific infrastructural configurations enable or inhibit different experiences of valuing time can fruitfully inform decisions about their design.

In this chapter and the next, the focus is on individual commuters, and the ways in which they navigate the temporal and economic implications of adopting the metro following the opening of Line 2. This atomised view of travel behaviour will then be complicated in Chapters 7 and 8. In the context of travel time, when presenting data from qualitative ride-along interviews with commuters, it is important for the purposes of my argument to relate each individual quote back to a longer-term perspective on commuting practices as on-going transformations and negotiations in a broader ‘mobility biography’ (Lanzendorf 2003). As highlighted in the discussion of methods (Chapter 4), the value of repeated interviews is that they overcome a ‘snapshot’ view of the subject and grasp at ways in which mobility practices are ‘carried’ and transformed from one journey to the next. For this purpose, I use a simple system for visually representing qualitative data alongside basic quantitative data. Each participant quote is presented in a textbox using pictograms to link it back to the participant’s overall experience of adopting the metro as a commuting mode. Each of these textboxes details change in the duration of the commute, the cost, and the modes used before and after the Line 2 launch:

Mode before Line 2 launch » Mode after	🕒 change in daily commuting time	💰 change in daily commuting cost
[quote]		

The analysis which informs these textboxes, including calculations and assumptions made, is presented in Appendix 3. The Appendix also gives a detailed account of the many assumptions which had to be made when adopting a simple ‘before and after’ framework for the purposes of these illustrative devices. These assumptions and limitations then form part of the rationale for a different kind of approach in the latter two empirical chapters. The following example is an interview quote from the morning of 17 January 2014, conducted with Janna. Following the launch of metro Line 2, Janna gave up driving to work and started taking the metro (which includes some walking, as all studied metro commutes do). Her commuting time was reduced by a total of 40 minutes per day, and the cost of commuting cost was cut by 2 levs per day:⁵

Drive » Metro+Walk	🕒 -40	💰 -2.18
I really can’t think of where the saved time has gone. I don’t feel it that way. It just gets redistributed somehow. (Janna, 2014 01 17 AM)		

By using this format, I hope the reader will be able to engage with the utterances of each participant not simply as extensions of a particular point raised in the discussion of data,

⁵ The official exchange rate in early 2016 was BGN 1.00 = GBP 0.40. In terms of purchasing power and context, 2 levs per day can buy a sandwich, two single tickets for public transport, or a 1kg bag of rice.

but in the context of the broader changes individuals lived when the metro became part of their everyday mobility routines.

The chapter begins by exploring what time savings feel like as a lived experience. Section 5.1 suggests that the way in which each individual commuter perceived saved time was only partly dependant on the differences in the amount of time they saved. In the second and third sections of the chapter, I examine how valuing time is done differently in the different temporal segments which make up the commute, focusing in more detail on in-vehicle time and transfers. While travel time is often conflated with time spent moving with a 'main' travel mode, data from ride alongs with Sofia metro commuters demonstrates that being on a metro train is only one modality in which metro commuting travel time is made. Section 5.4 explores human and non-human infrastructures for knowing the passage of time, and discusses their role in how travel time is valued. In section 5.5, the effect of being in a hurry during the commute on the value of travel time is explored. Finally, section 5.6 focuses on the implications of switching to the metro mode from another way of travelling, in the context of an extensive body of research which interprets the value of travel time as first and foremost a function of the mode of travel used.

5.1. The quality of saved time

The time spent commuting is generally understood in transport research as a cost to be paid (Abrantes and Wardman 2011). As used in transport planning, the value of travel time refers to an important quantitative measure used to appraise transport schemes (Richmond 2005). It has significant implications for how transport infrastructure is planned, and which projects are considered worth building, or successful. The value of time is a monetary value used to express the cost to a traveller of spending time on the move. Transport planners calculate this value based on the traveller's occupation, and on the purpose of the journey (Department for Transport 2014b). An hour spent commuting to a managerial office job has a higher value (i.e. is a greater cost) than an hour spent by a parent taking children to a museum on a Sunday.

The idea of travel time value forms the basis for the concept of travel time savings, which is central to cost-benefit analysis. Because time spent travelling is a cost, new infrastructure plans usually have to demonstrate the amount of time new transport users will save. An estimated 80% of what transport infrastructure projects define and monetise as their value are shorter travel times compared to existing journeys (Munby 1968:10; Mackett and Edwards 1998).

Figure 5-2 below summarises the length of time respondents spent commuting before and after turning to the metro. The table has been compiled based on the participants' initial journeys following the switch to the metro, ignoring any subsequent changes for the moment. Also, since this analysis presents a passenger perspective, the entire journey is taken into account, rather than only the part of it which is completed by metro. These two points, only small assumptions for the purposes of this section, will be addressed in detail in Chapter 8.

	Old commute modes	Old commute duration (one way)	New commute modes	New commute duration (one way)	Change in duration (minutes per day)	Cost increased (↑) / decreased (↓)
<i>Anton</i>	drive	35	walk, metro	35	0	↓
<i>Assya</i>	walk, metro	30	walk, metro	30	0	↑
<i>Bella</i>	walk, tram	60	walk, metro	30	-60	x
<i>Maria</i>	walk	45	walk, metro	17	-56	↑
<i>Nikolay</i>	walk	10	walk, metro	40	+60	↑
<i>Emma</i>	walk, tram	55	walk, metro	40	-30	↓
<i>Stella</i>	drive	50	drive, train, metro	45	-10	↓
<i>Rumen</i>	cycle	65	walk, metro, tram	65	0	↑
<i>Gregor</i>	walk, bus, metro	50	walk, metro	30	-40	x
<i>Irina</i>	walk, tram	50	walk, tram, metro	40	-20	x
<i>Janna</i>	drive	55	walk, metro	35	-40	↓
<i>Vladimir</i>	walk, tram	25	walk, metro	25	0	x
<i>Maya</i>	walk, bus	25	walk, metro	25	0	x
<i>Christo</i>	drive	30	walk, metro	60	+60	↓
<i>Natalia</i>	walk, bus, metro	40	walk, metro	30	-20	↓
<i>Nell</i>	walk, minibus	60	drive, metro	47	-26	↑
<i>Raya</i>	walk, bus, bus	35	walk, metro	35	0	x
<i>Toni</i>	walk, tram	40	walk, metro	30	-20	↑
<i>Tanya</i>	drive	60	walk, metro	35	-50	↓
<i>Lilly</i>	walk, minibus, trolleybus	100	walk, drive, metro	85	-30	↓
<i>Average</i>		46		39		
Average change in daily duration					-14	

Figure 5-2. Time spent commuting before and after switching to the metro.

On average, the 20 respondents saved 14 minutes of commuting time per day by opting for the metro. This included 12 commuters whose journeys became shorter; six who saved no time; and two who spent an additional hour per day, or more, on their commute, than previously (for Nikolay, this was the result of also changing his home location at the same time as switching to the metro). Two participants saved an hour per day by switching to the metro, and a further three saved between 40 and 50 minutes. The average duration of the respondents' commutes went down from 46 minutes to 39 minutes, one way.

If I was to follow established practices of quantifying the worth of a new transport infrastructure, I could attempt to apply a monetary value to these saved minutes. This approach is central to prevalent cost-benefit analysis practices, and one which has been heavily criticised by qualitative transport researchers for decades (Bristow and Nellthorp 2000). Many shortcomings of this process have been identified, for example, its reliance on differentiating between the values of time spent travelling for work, and non-work, purposes. The second and related criticism is that travel time cannot be 'saved,' because it also cannot be 'spent,' 'filled' or 'wasted.' From this perspective, time is not a quantifiable resource, but is brought into being through the many minute practices humans engage in throughout their daily lives (Shove 2009).

The commuters I interviewed in Sofia felt uneasy about the idea of monetising saved time in any direct way. They confirmed that from their perspective, this was not necessarily meaningful. Their comments and practices appeared to point to the incommensurability of time and cost in everyday travel. Firstly, both the monetary cost, and what was being purchased, were fluid and complex concepts. There was no unit of commuting minute which could be assigned a monetary value. Each minute was instead shaped by the way a commuter might feel on the day, what activities they engaged in; and what happened around them both in and outside of the timespace of the commute. Secondly, despite an underlying trade-off logic prevalent in much research on travel time savings, changing one's commute is not necessarily defined by a trade-off between time and money (Lyons and Chatterjee 2008). As can be seen in Figure 5-2, only four of the 20 core respondents experienced such a trade-off when switching to the metro. For the remaining 16 participants, there was no straightforward trade-off between time and expenditure.

While individual commuter time savings were difficult to monetise, their value was not exactly ephemeral or unquantifiable. Commuters were involved in closely scrutinising time savings themselves, both immediately after switching to the metro, and at regular intervals thereafter:

Walk+Bus+Metro »	⌚ -40	€ 0
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Metro+Walk		
At that time when Line 2 opened, everyone was talking about it: how long exactly it takes to travel to different destinations. The whole neighbourhood was doing this sort of calculations. (Gregor, 2013 11 13 AM)		

Walk+Minibus » Drive+Metro	⌚ -26	💰 +2.09
[Nell takes the metro from Obelya to Serdika, so has a choice which of the two lines to catch] The duration matters for my choice. It is a bit shorter via Line 2. Only a bit, maybe 3-4 minutes. I think there are fewer stops, maybe 1 or 2 fewer. (Nell, 2014 08 5 AM)		

While time was treated as an aspect of utility which is entirely separate and non-equivalent to money, both the quantitative and the qualitative aspects of time savings were recognised.

12 of the studied 20 commutes became shorter following the launch of Line 2. On average, the participants whose commuting time was reduced saved just over half an hour per day. For three of the 20 participants (Bella, Maria and Tanya), the time savings involved in switching to the metro were dramatic, as all three were able to cut earlier journey times of more than 45 minutes each way by approximately 30 minutes. Respondents argued that this was a palpable difference as an ‘amount’ of time, but also discussed enthusiastically how the amount of time was lived in practice through their everyday routines.

Tanya used to drive to work before Line 2 opened, travelling 60min each way. Although her work in a university permitted some flexibility, eventually even leaving before 5pm on most days was not making a difference, and she frequently found herself ‘being stuck.’ She spent an hour or more every morning and evening driving in heavy traffic, which she found both stressful and exhausting:

Drive » Metro+Walk	⌚ -50	💰 -2.04
When I was driving, the journey home was horrible. I used to arrive all stressed out and tired. Also with time, and with age, it got increasingly tiresome for my eyes. My eyesight isn’t too bad, but I struggled in the dark, my eyes got tired. So I started leaving work earlier and earlier in order to be able to drive home while it is daylight and there isn’t too much traffic. (Tanya, 2014 02 14 AM)		

When she started travelling by metro, Tanya’s commuting time was cut by half, to about 30 minutes. The same decrease in travel time – from an hour to 30 minutes each way – was experienced by Bella. She used to take the tram to work, sometimes getting off a stop early and walking the rest of the way. The tram journey felt so long and tedious, that she found herself dragging out her morning routine until it was too late to get the tram and

she had to call a taxi. This happened with increasing frequency, going up to 2-3 times per week by mid-2012. Because of heavy traffic, taking a taxi usually didn't mean a shorter journey:

Tram+Walk » Metro+Walk	⌚ -60	💰 0
<p>The tram I used to take, the duration of the trip used to vary a lot more. Traffic, traffic accidents, protests. Also, the route of the tram is quite long, and not direct, it winds through the city centre. If it got unbearably slow with traffic, I used to get off at Graffa and walk. (...) I also used to take a taxi at least once a week. It didn't take less time, but at least it dropped me off at the door. (...) With the metro, my journey became shorter by 30-40 minutes. Once I did actually bother to calculate. I save an hour every day, 22 working days per month, 12 months in the year. It's a big economy, several days. (Bella, 2014 01 07 PM)</p>		

Finally, Maria's situation was slightly different. She used to walk to the language centre where she taught part-time, which used to take her 45 minutes each way. When Line 2 was completed, she decided she could no longer justify the long walks, which previously had seemed a good way of avoiding ground-level public transport, which was slow, unreliable and crowded. With the metro, Maria's commute took 15 minutes door-to-door each way, and delays and excessive crowding were extremely rare.

Several more participants reduced their commuting time, although their time savings were smaller. Six participants saved between 10 and 15 minutes per trip, typically cutting commuting time from 40-45 minutes to 30-35 minutes.

Two of the participants cut their commuting time by a relatively negligible amount – less than 10 minutes. According to previous research, putting a value to these small time savings can be especially problematic. Sharp (1983) has suggested that time savings of a few minutes cannot be used productively. On the other hand, he argued that the commute is a particularly stressful and tedious type of journey, and therefore a saving of a few minutes may be particularly valuable to a commuter, more so than to another kind of transport user. If time savings could be monetised, resolving this seeming contradiction would be easy, as every minute would have its equivalent monetary value. However, the Sofia respondents already rejected this idea as unreflective of their own understanding of travel time. This is where a closer examination of how lived, subjective time is put together, can make a valuable contribution.

When asked how they used their saved time, two of the ten participants were unable to give an answer. In doubting the meaningfulness of the question, they echoed framings of existing qualitative time research (e.g. Shove 2009) that the flow of time is not a quantifiable resource which gets cut up and re-invested:

Drive » Metro+Walk	🕒 -40	💰 -2.18
I really can't think of where the saved time has gone. I don't feel it that way. It just gets redistributed somehow. (Janna, 2014 01 17 AM)		

However, the remaining 10 participants provided an answer, and one which, surprisingly, they all shared. To them, the saved time was really felt, and it was felt in the mornings, through a more peaceful, less rushed routine of getting ready to leave the home. Everyone's accounts were about not having to jump out of bed, or having more time to get dressed, or sipping a cup of coffee, similar to this description offered by Nell:

Walk+Minibus » Drive+Metro	🕒 -26	💰 +2.09
So at least about 15 minutes [each way], I have definitely saved. I have invested these spare 15 minutes into a more relaxed departure from home in the morning. I usually have breakfast and drink coffee at home. I live near the mountain, so I like to spend some time enjoying the view, the sun rising, the storks. So I use the 15 minutes to savour this view. (Nell, 2014 08 5 AM)		

There are three key points which can be taken from these findings.

Firstly, the temporal benefits of switching to the metro were not proportionately related to the clock duration of time saved. They were described in very similar ways by those participants who saved 10 minutes per day, and those who saved 50 minutes per day. This finding is in contrast with Sharp's (1983) thesis that smaller time savings might have proportionately less value, as they are difficult to use productively. There is strong support from the Sofia respondents for the idea of viewing lived time in non-compartmentalised ways. A new activity did not appear in any of the cases, in order to 'fill' this new 'available' time. Instead, existing practices such as grooming routines and having breakfast were reconfigured, and took on new meanings and qualities. What was valued by most respondents was that saving *any quantity* of time resulted in a *qualitative* change in the morning routine, making it more leisurely and pleasant than it had been before.

Secondly, this fluidity of daily life does not suggest that saved time did not have clearly detectable, and potentially quantifiable, utility for the participating commuters. Instead of expressing any benefits of time saved in clock duration or monetary terms, the benefits are probably best thought of in terms of well-being (De Vos et al. 2013). Half of all core respondents were very clear about the ways in which they valued shorter journeys, which allowed them to start the day in a more comfortable and relaxed way. This is likely to have substantial implications for overall levels of stress and well-being experienced throughout the day, as the accounts of several participants demonstrated. Therefore, a qualitative view of the value of travel time as made through situated interactions need not dismiss

time savings as irrelevant, and could engage with them instead as a lived reality of infrastructure development.

Finally, although time savings are generally calculated per journey, in practice, saved time was experienced on a per-day rather than per-journey basis, as one 'amount' of time, and typically for the Sofia respondents, in the morning, rather than the evening. This highlights an important difference between travel time savings in transport planners' time, measured per trip, and the lived time of daily activities, woven together by practice. This relates back to the first point, since the benefits experienced by respondents in terms of increased enjoyment in how everyday time is lived, was not proportionate to the 'amount' of time saved. Instead, contrasted with prior commuting arrangements, the ability to be slower in the morning was always meaningful, and thus always added to the usefulness of the new transport infrastructure.

5.2. The different temporal segments of the commute

So far, my focus has been on the total duration of each commuter's journey. In analysing commuting time, transport research can often take a reductionist approach, whereby both data collection and analysis conflate the journey to a single 'main' transport mode, then implicitly or explicitly reducing that further, to the time spent inside the moving vehicle. Even studies of the subjective experience of travel time focus, explicitly or not, on the practices which make up in-vehicle time (O'Dell 2009; Bissell 2010). This is particularly evident in the growing literature on the role of information and communication technologies in travel time use (Lyons and Urry 2005; Bjørner 2015). Despite the fact that many scholars recognise that everyday journeys are typically multimodal, data collection instruments such as travel surveys, and subsequent analysis, are based on the perceived need to simplify, and focus on one main mode of moving. However, as Benezech and Coulombel (2013) point out in their study of service reliability, surveys have shown that public transport passengers value waiting time and in-vehicle time differently. While their finding that transfer time and waiting time was particularly likely to be reported as being of little value, how these different 'types' of time are lived as part of the commute, and how they are woven together, has not been studied in sufficient detail. Using detailed qualitative data backed by GIS data on durations and locations, I was able to discuss the differentiated values of the temporal segments which make up what we might otherwise call simply 'commuting by metro.'

The embodied and distributed subjectivity of commuters interacted with the different temporal infrastructures presented by each segment, making time differently valuable. For the Sofia respondents, typical segments of the commute included walking to a metro

station, walking from the ticket barriers to the platform, waiting on a platform, riding on a metro train (i.e. in-vehicle time), and transferring between metro lines or between different modes. The arguments of this section and the next draw on the data presented in Figure 5-3 below. The diagram breaks down the total duration of each new metro commute, showing the share of each journey segment, and actual in-vehicle metro time in orange, and thus complicates the idea of 'total journey time' in a number of ways.

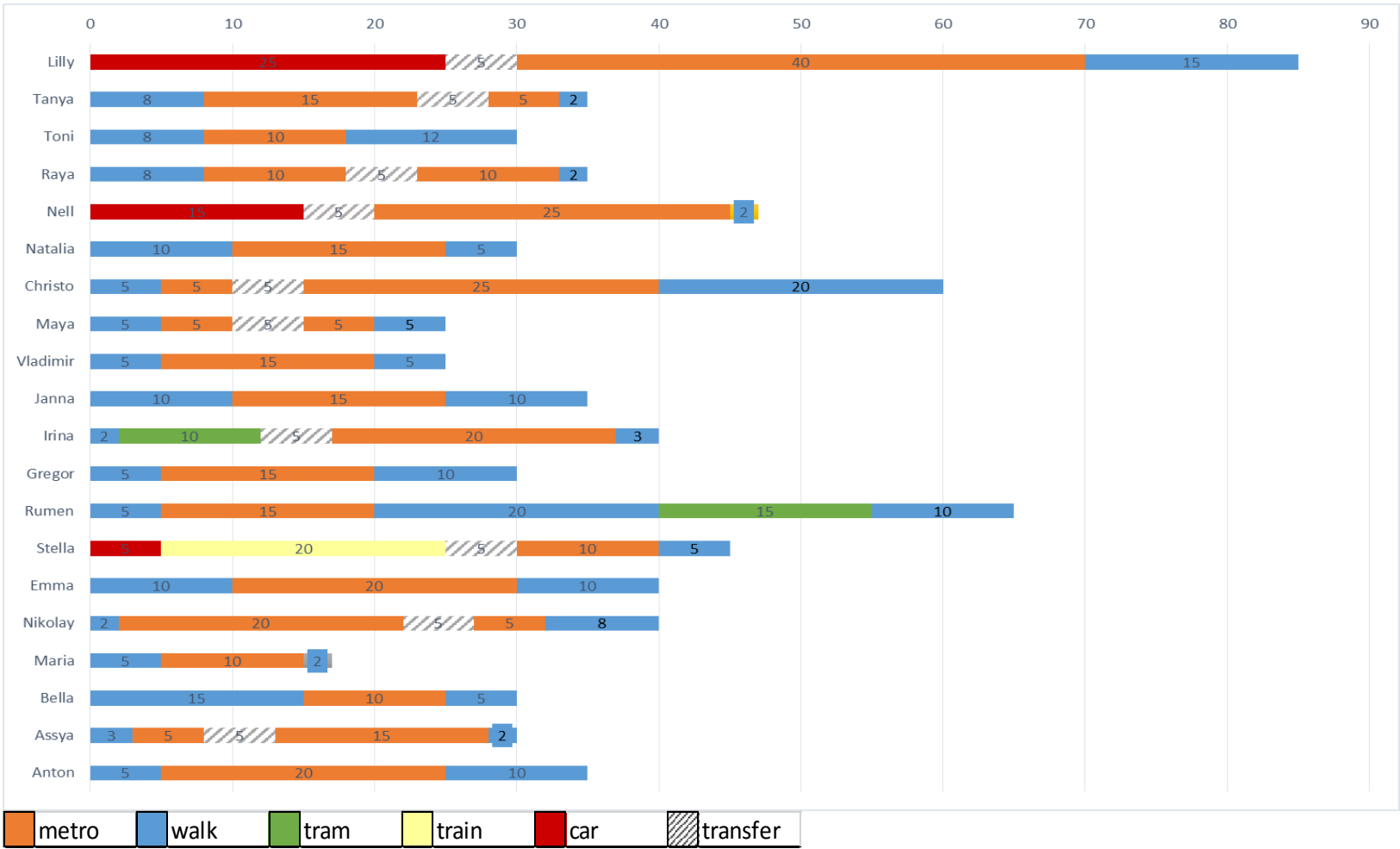


Figure 5-3. Breakdown of commuting time by segment.

Sofia is a medium-sized European city, the 14th largest in the European Union, with approximately 1.4 million inhabitants (Eurostat 2016b). Journeys to work are comparatively short, and commuting from the surrounding peri-urban area relatively uncommon. The relatively short journey incorporates periods which can accommodate a range of activities, such as sitting on a bus, and those where the range of possibilities is more limited, such as running down an escalator. The constraint of duration becomes even clearer when looking at the amount of time actually spent moving in different ways.

Prior to the start of data collection, I had anticipated that walking to and from metro stations would be experienced as particularly frustrating and 'wasted time' by the new metro commutes, particularly by those who had previously used a car. However, all except one, both public transport users and drivers, referred to a quick and relatively painless process of adjustment:

Walk+Bus+Metro » Metro+Walk	🕒 -20	💰 -0.82
<p>Before the metro station opened, it was such a short walk to the bus stop. It's almost outside of the house. But now I have come to take the longer walk to the metro as a positive thing. During the summer months it's especially pleasant. Obviously, one station can't be equally close to everyone and serve the whole neighbourhood. (Natalia, 2012 09 3 AM)</p>		

Drive » Metro+Walk	🕒 -40	💰 -2.18
<p>I was worried about the winter, as I was used to driving around in a car and never getting cold. This 10min walk worried me. But they launched it in August, and I tried testing it at a time when using it was very pleasant – people were on holiday so it was not crowded; the weather was nice, so I could enjoy a pleasant stroll. (Janna, 2013 06 20 AM)</p>		

One respondent, a woman whose health limited her mobility, chose to drive the distance to the station which others might have considered walkable. She referred to the 'bravery' of her friend, also a woman in her late 50s, in doing the same walk in the mornings and evenings:

Drive » Drive+Train+Metro	🕒 -10	💰 -1.54
<p>It was very difficult when I was trying to get to the train station without a car. It's a steep hill. And also I need to walk through the park – and I am scared. I wouldn't walk on my own, no way. I am not like</p>		

[friend] in this respect! (Stella, 2014 07 22 PM)

For Stella, the capacities afforded by her body limited what a walk to the station could offer her. Her commute of car-train-metro eventually proved too much, and in 2013, she started driving all the way to work once more.

Although both walking to a metro station, and walking inside one in order to transfer between lines, entail a similar kind of movement, the limits these different segments placed on creating valuable time were quite different. For most participants, walking outside seemed to gradually become more pleasant and meaningful, and to ‘feel shorter’. By contrast, the frustrations of transferring appeared to gradually increase, making the few minutes it required feel more and more worthless. The eroding effect transfers have on the value of the journey warrants closer examination, and I will turn to them in the next section. In terms of comparing the value of different types of time segments, however, it is possible to speculate that commuters who have the opportunity to choose between walking to a Line 1 or Line 2 station, would find value in walking further at ground level in order to avoid a subsequent transfer. This logic was reflected in Anton’s commute – but only during the warmer months of the year:

Drive » Metro+Walk	🕒 0	💰 -3.36
I am less likely to get off [at Vasil Levski, a Line 1 station] and walk to the office now. It’s winter. So I don’t do it like in the summer. Transferring at Serdika takes the same amount of time. (Anton, 2014 01 10 AM)		

The analysis presented in Figure 5-3 above provides nuance to the earlier discussion of total journey times of 30 minutes and more. Differentiating between total duration and in-vehicle time makes clear that most of the interviewed commuters only ever spent periods of about 10 minutes on a metro train. Only one – Lilly’s metro journey – was over 30 minutes long. While time is experienced subjectively, and can be made valuable to the individual commuter through a range of embodied practices, it is also practised within the constraints of these segmented durations:

Drive » Metro+Walk	🕒 0	💰 -3.36
I wouldn’t do something like that [<i>work</i>] on the Metro – the time is too short, I would have no time to concentrate. (Anton, 2013 10 11 PM)		

Tram+Walk » Metro+Walk	🕒 -60	💰 0
During the tram commute, I used to read more newspapers and magazines. Now I don't do it as much, it's not worth taking anything out. It's seven minutes on the actual train itself. (Bella, 2014 01 7 AM)		

This is significant because it circumscribes what ends up being defined as 'valuable.' A 10-minute period on a metro train differs from a 30-minute one, in terms of what activities can be undertaken and what spatial arrangements are possible.

For ten of the 20 Line 2 commuters I interviewed, the challenge of making travel time valuable included at least one in-train segment of between five and ten minutes. The value of such a short period of time often derived from the opportunity, and necessity, to do nothing. Those who spent only short periods actually riding a metro train were more likely to say they did 'nothing' or 'nothing in particular' during their commute: nine respondents described their commuting time in this way, of whom seven had in-vehicle times of 15 minutes or less. However, 'doing nothing' is a complicated notion, with many micro-interactions between mind, body and environment constituting doing nothing as a situated practice of inhabiting everyday spaces (Ehn and Lofgren 2010). For example, listening to music was considered to be 'doing nothing' by some respondents, but not by others.

However, segment duration was not the only predictor of whether commuters were likely to 'do nothing' or not. The mode commuters had used before switching to the metro was influential too. Notably, each of the five participants who had previously commuted by car now reported 'doing nothing' during their metro commute. Seemingly, the earlier inability to engage in an additional activity because attention would have been focused on the driving, had been carried by the practitioner into the new practice of the metro commute (Cass and Faulconbridge 2015). Despite the fact that the mode and the material arrangements of the commute had changed, its link with 'doing nothing' had persisted. This has important implications for those planning public transport provision or campaigns to promote sustainable urban mobility. I will return to them in the concluding remarks at the end of this chapter.

Importantly, 'doing nothing' does not imply that the time spent commuting had no value or meaning to those who experienced it. Because of the way everyday time is lived, doing

nothing can be a ‘productive’ way of spending the commute, to refer back to the typology developed by Jain and Lyons (2008). In a non-compartmentalised everyday temporality, doing ‘nothing’ can involve coming up with ideas; recovering one’s energies in order to be more productive later; or accumulating knowledge, conversation topics, or a positive sense of togetherness by observing other passengers. Doing nothing is a situated socio-technical practice, which takes on different guises in the car, on a bike, and on a metro platform or train. In the following comment, while Gregor is describing situations when he was doing nothing during his journey, it is evident that, in fact, this state is made up of various processes and sensations:

Walk+Bus+Metro » Metro+Walk	🕒 -40	💰 0
When I have nothing to do, for instance when I am going out in the evening and I don't have my bag, and therefore my book, the 12-minute trip seems much longer. My only entertainment is to play games on my really old mobile. Which gets boring... It is awkward, having nothing to do on the metro. There's nothing to look at, you're underground and it is dark. So I just sit there, and look at people, something I do like to do. (Gregor, 2013 11 13 AM)		

In the case of the Sofia metro extension, a number of technological provisions open up possibilities for making in-vehicle time valuable in different ways. Like any rail transport, the metro train moves in a smoother and more stable way than road transport, making reading and writing easier. The addition of mobile coverage in October 2013 opened up further possibilities, and the metro train became an infrastructure which is suitable for making phone calls and accessing the internet. The air-conditioning and bright lights of the newer metro trains also contribute to the infrastructure for *doing*. On the other hand, the absence of view of the city outside can be seen as both enabling and restricting – for those wanting to focus on a task, it limits distraction, while also removing the option to gaze out of the window and day-dream, so frequently associated with train journeys above ground (O’Dell 2009):

Metro+Walk » Metro+Walk	🕒 0	💰 +0.41
What I'm delighted about is that there's mobile coverage on the Metro now. I do carry a book, but now I use the phone a bit. I carry the book, I open it very often, but yesterday, when I sat down in the Line 2 metro, I didn't – I started texting with my boyfriend straight away. (Assya, 2013 1010 PM)		

From the perspective of valuing travel time, this preference of commuters for browsing the internet and sending text messages seems to reflect the short in-vehicle times prevalent on the Sofia metro. Within these constraints, this is not a system in which more absorbing

activities such as reading a book, or more economically productive ones such as reviewing documents for work, can be promoted with any substantial success. Commuting time spent inside the metro train is therefore more conducive to slowing down, and can accommodate some ‘mindless browsing’ in a way which other parts of urban dwellers’ harried and apportioned everyday time cannot. However, this is not a suggestion that the metro authorities should rush into a campaign promoting day-dreaming, especially given that one commuter’s relaxing daydream is another’s tedious waste of time. What they can do, however, is recognise the limitations of equating the value of transport infrastructure with the value – either negative or positive – of time on the move.

While the 2013 installation of mobile transmitters made travel time more valuable for some, it degraded its quality for others. Several commuters expressed their annoyance with the fact that most metro passengers seemed to constantly be on their mobile phones. They were disappointed with the atmosphere this created, and the message it sent about the alienation of urban society, and the state of individuals within it:

Walk+Minibus+Trolley » Drive+Metro+Walk	🕒 -30	💰 -0.27
<p>Once, I actually counted the number of people around me with their faces buried in their phones. Of the 10 or so people on the train carriage, only 2 weren’t looking at their phones. This worries and saddens me! I think it’s a big problem of the younger generations. It does give you stuff, but it also takes much away. (...) I realise that I read a book and thus also isolate myself, but somehow it’s not the same thing. I don’t know. It’s just nicer somehow. (Lilly, 2014 01 18 PM)</p>		

The role of the presence of digital devices in creating comfortable atmospheres is not to be underestimated in scrutinising the capacity of public transport infrastructure to make enjoyable and satisfying journey experiences. I will address this topic in more detail in Chapter 7, in a discussion of shared arrangements of comfort and stress. From the perspective of valuing journey times for short trips, however, the contribution of the smartphone is less ambiguous. In particular, a small handheld device with 3G access opens up possibilities for new uses of time when standing up. This is important, since the bodily position is rarely considered in value of travel time studies, almost always implicitly assumed to involve sitting down. Standing up, however, is often the norm for metro commuters worldwide during peak times, and Sofia is no exception. The intricacies of using a smartphone, and its implications for travel time value, were articulated by Natalia:

Walk+Bus+Metro » Metro+Walk	🕒 -20	💰 -0.82
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I do carry my [e-reader], but I don't use it as much. A few days ago, when those favourite spots of mine near the closed door were taken, so I needed to hold on somewhere. So I ended up holding on to the central hand rail. And I discovered that it's very uncomfortable. One hand holds the handrail, the other holds the [e-reader], and struggles to operate with it. So I took out the phone instead, a smaller device, more convenient to use with one hand. The [e-reader], to take it out, to turn the pages... Maybe I don't have the need as much at the moment. I don't need to do anything urgent for work. So I spend my time informing myself about news and Facebook, instead of actual reading. (Natalia 2013 03 17 PM)

Finally, digital devices play roles in the commute which are beyond their direct uses, too. Smartphones are not always being used in rational, goal- and activity-driven, ways. A smartphone as an object has a materiality beyond its function of connecting its user to global data networks. Consider this passage from my research diary:

"As a smooth, ergonomic object which is pleasant to the touch, the smartphone seems also to act almost as prayer beads in some people's hands. I caught myself doing this towards the end of my journey home today. There was too little time to start anything, and there was little going on around me. I started 'fiddling with my phone.' I didn't open any particular application (not intentionally, anyway), I just moved my finger across the display in a repetitive motion, just watching the different screens wizz past, with unfailing obedience as if they were physical objects which I was pushing across a table. This was a pleasant sensation, somehow soothing." (Autoethnography 2013 09 19 PM)

I witnessed many other passengers appearing to do some version of the above, and this scene was repeated again and again while riding the Sofia Metro. Passengers fiddled with their smartphones and stroked their touch screens, the same way fingers can absent-mindedly provide comfort by playing with a pen, a zip or an earring. In these cases, it was the textures and shapes of digital devices as material objects that reconfigured the commuters' experience of being inside the metro carriage. While this type of practice might be considered far too insignificant from the perspective of travel time 'activities,' it points to the ways in which time on the move is inhabited as well as done to the passenger, that is, is actively made by commuters' doings and sayings as much as by the affordances which the metro infrastructure does or does not offer (a similar argument is proposed about commuter comfort and stress in Chapter 7). It is important not to see valuable travel time as something that is done to the commuter, and therefore, to consider the capacity of the smallest objects, interactions and gestures to participate in the valuing of time.

Just like Stella's capacity to walk to the station was dependant partly on the walking infrastructure, and partly on her own embodied subjectivity, so do in-vehicle activities get shaped by the bodies of passengers, by their preference, the objects they carry, as well as

the affordances of the metro infrastructure. This can be best illustrated through the example of reading glasses as a time-making agent:

Walk+Bus+Bus » Metro+Walk	🕒 0	💰 0
If I want to use the phone, I need to take out my glasses too. It's too much hassle for such a short journey. (Raya, 2014 06 17 PM)		

Thus, what for some commuter bodies becomes accessible through the affordances of mobile signal and smartphone infrastructure, for others the additional 'infrastructure' of reading glasses is required. Retrieving them, putting them on and putting them away comes with its own temporal demands, which can shape what ultimately feels like it is worth doing, and what does not, and what the commute feels long enough, or short enough, for.

Existing mobilities research has often emphasised the different practices passengers engage in for the purpose of cocooning, creating private space in the public vehicle, thus regaining a sense of control, and minimising contact with, and dependence on, the behaviour of others (Berry and Hamilton 2010). However, the applicability of these insights to the Sofia metro commute is relatively limited. Firstly, opportunities to make public transport space private is dependent on vehicle design. While some train and bus seats afford the opportunity to cocoon, the rows of metro seats which face each other across a narrow aisle limit it:

Walk+Tram » Metro+Walk	🕒 -30	💰 -0.15
When you travel by bus, you can people watch. It's harder to do it on the metro train, because you would be staring directly at them, because of the way people sit opposite each other. (Emma, 2014 05 30 AM)		

Secondly, the making of private space and the activities it entails and enables, seem more widespread on longer journeys, such as those on suburban and intercity trains. Across the core sample of 20 participants, only Lilly's commute included a leg of being on the metro for over 30 minutes. The journeys of 13 participants involved only periods of being on the metro of 15 minutes or less. With such short durations, the nature of cocooning, and the kinds of habits which develop in pursuit of it, are very different. In smaller size cities such as Sofia, the uses of travel time seem to unfold within timespaces which remain fleeting and rather public. Within these constraints, Janna once again reminded me of the ways in which small and mundane objects can become mediating technologies, altering the affordances of large and complex infrastructures (Furlong 2011):

Drive » Metro+Walk	🕒 -40	💰 -2.18
I sometimes sleep for 10 minutes on the way to the office in the morning, if I have managed to find a seat. That started after a while,		

after I had gotten used to the journey. I put on my sunglasses and snooze, it's comfortable behind the glasses. (Janna, 2013 06 20 PM)

There is substantial variation within these broad insights, reflective of the variability of one individual's experience, the many differences between individuals, and the on-going changes in the environment. Some respondents could become fully absorbed in their novel for ten minutes, others could gaze absent-mindedly down the carriage for half an hour. Overall, short in-vehicle times offered some possibilities to choose and vary activities, but limited others.

5.3. A focus on transfer

Ten of the core respondents had to make a transfer as part of their regular commute, with six regularly transferring from one metro line to the other. The limited spatial reach of most metro systems makes it much more likely that their users will have to transfer between lines or between modes (Walker 2012). In this section, I focus specifically on the space of Sofia's only (as of 2015) transfer station, in order to closely examine how transferring affects the value of travel time through the specific socio-technical infrastructures of Serdika station (Figure 5-4):

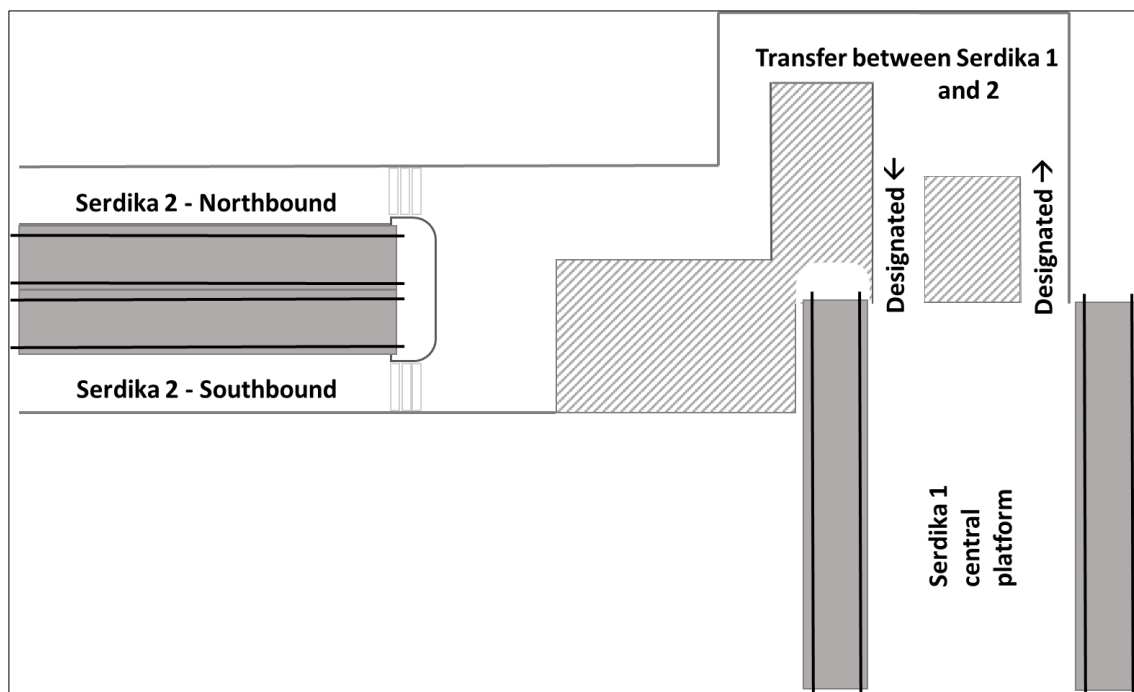


Figure 5-4. Layout of Serdika station showing transfer tunnels. See also Figure 7-2 for a photo of the transfer tunnels from the Serdika-1 platform.

Previous research has demonstrated that commuters see transfers as being among the most unpleasant and stressful aspects of public transport journeys, along with unpredictability, waiting and crowding (Wener et al. 2003). A transfer requires a different type of bodily and mental work from the commuter, and disrupts their in-vehicle activity or state of being. Transfers are a key argument in favour of looking beyond the clock duration of a commuter’s journey, to examine the minute socio-technical practices which make up total commuting time. In this section, I examine how the new Sofia metro commuters organised their time around transfers, and how having to transfer organised their commuting time in turn.

In section 5.2, I suggested that time spent inside a vehicle is not ‘dead’ time, but something which is practiced and made active through the different configurations of humans, things, and infrastructure, albeit within the constraints of clock duration. Where a transfer is necessary, a further constraint is introduced, as the sum of the two 5-minute segments separated by a transfer is a qualitatively different temporal resource to a single 10-minute segment. While passengers have many embodied skills and strategies for making travel time valuable, these arrangements of value are also fragile and fickle. A transfer is often a significant disruption of these arrangements. The ten commutes which did not involve a transfer were equally split between those involving a named activity, and those which participants described as ‘doing nothing.’ By contrast, of the ten respondents who had to transfer, seven said they did nothing during their commute. The power of the transfer to limit the ability of commuters to engage in an activity was illustrated by Emma’s experience. When Line 2 was first launched, she took it to travel directly from her home to her office. She then moved house to a location near a Line 1 station, and the newly arisen need to transfer reconfigured her commuting time:

Walk+Tram » Metro+Walk	🕒 -30	💰 -0.15
I used to like my 20-minute commute. The quiet train, getting my e-reader out as soon as I reach the platform. Since I moved house, the journey is longer, and I have to transfer. Since I travel from here, I read less often. If there was no transfer, I would read my book peacefully. (Emma, 2013 11 7 AM)		

As Elizabeth Shove points out (2009:17), everyday practices do not fill up time in a zero-sum game, but they do organise the temporal rhythms of everyday life, by competing for time and creating continuities and frictions between activities. One of the most important points which came up during interviews on travel time activities was the fact that human beings can be, and often are, simultaneously involved in several processes or ‘activities.’

This was especially evident in relation to transfer times and waiting times. As discussed by Bissell (2007), waiting on a platform is a way of ‘doing nothing’ which is alive with the possibility to be otherwise. According to Bissell, the waiting body is alert and actively inactive, orientated towards shortly being on the move again. Expanding Bissell’s focus to include not only the body, but also the passengers’ mind, engaged in thinking, planning, daydreaming, even reading while waiting for the train, demonstrates the multiplicity of the waiting situation which makes it much more than dead time. And yet, because transferring and waiting are connected with the temporalities of what is done before and after the specific moment, they can both enrich travel time, and impoverish it.

Transfers can erode the value of commuting time by making it frustrating, tedious, or stressful through specific arrangements in space between people and infrastructures. For example, respondents argued that a particularly unpleasant type of transfer is one which requires moving in the opposite direction to the final destination – regardless of its ultimate effect on duration:

Drive » Metro+Walk	🕒 0	💰 -3.36
The key difference between the two walking routes is that I would be walking in the direction opposite to [home]. Here, I walk and I gain two stops. There, I would walk a similar distance, but then I would have two more stops on the metro. Even if the distance here is a bit longer, it seems to make more sense. (Anton, 2014 03 17 AM)		

A key reason for commuters to dislike transferring is the additional uncertainty about the duration of the commute which the transfer introduces:

Metro+Walk » Metro+Walk	🕒 0	💰 +0.41
I run late much more often now. One reason is that I started going to the gym. The other is the transfer at Serdika. Waiting for two trains is more uncertain than waiting for one. (Assya, 2013 07 07 PM)		

If taking one metro train can involve a varying waiting time of anywhere between zero and seven minutes of waiting time from one day to the next, many commuters will often factor in a safety margin of up to seven minutes in their commuting time (Benezech and Coulombel 2013). Waiting for two metro trains would, in theory, require double that. However, in the context of a relatively short commute (an average of 39 minutes across the core sample), a 14-minute safety margin seems frustratingly long. Thus, the effect of the transfer is to place the commuter between the options of turning up early for work, running late and rushing, and spending time waiting on platforms twice within the same journey.

The resulting uncertainty is manifested in the overall planning of the commute, but it also shapes the situated experience of the transfer itself. The Serdika station transfer consists of a series of 90° turns through tunnels with no information boards. Unable to see or know whether their second train is coming, passengers rushed through the corridors of the station, hoping to avoid arriving just as the train's doors slam shut:

“In the subway after the escalator, it is very quiet. Everyone's body is alert, hunting for clues: can you hear a train coming? We can't. And once we emerge out of that tunnel, bodies become more relaxed: after you've reached the concourse, you will definitely get to the platform on time for the train, even if you only hear/see it last minute.” (Autoethnography, 27 01 2014 AM)

It appeared that Serdika could greatly benefit from live departure boards or a video link to the other side of the station. Such devices, familiar from many metro systems worldwide, could reduce the stress of transferring by cutting some of the uncertainty it entails. The availability of this information could mean a more relaxing transfer for more people, opening up the possibility for the mind to wander once more to whatever occupied it on the train.

Metro infrastructure has been discussed in the past in terms of its sterile, uniform, disciplined and disciplining spaces (Ziegler 2004; Tomic, Trumper, and Dattwyler 2006). However, in Sofia the smoothness, predictability and bareness of metro spaces should be read in the context of the street infrastructure available at ground level. Walking on Sofia's sidewalks often involves a lot of looking down and focusing on choosing stable and dry places to step on (Figure 5-5).



Figure 5-5. A winter sidewalk in Sofia. 4 February 2014. Source: Author.

This is a landscape which is often quite different to the one described by Ingold (2004), for who cities are places where feet move unobstructed across smooth surfaces. Inside the metro station, by contrast, it is possible to walk confidently, and for the body to increasingly navigate the route it is becoming accustomed to, with no unanticipated obstacles. As a result, it is possible to walk while doing other things. Commuters were able to look at others, look at their phone, even read a book while walking from their Line 1 to their Line 2 train:

Walk+Bus+Metro » Metro+Walk	🕒 -40	📖 0
I get off without rushing, and I slowly walk through Serdika's transfer tunnels without stopping reading my book for a second. It's perfectly comfortable, because I know every turn, every step on the escalator. I just walk and read. (Gregor, 2014 01 27 AM)		

The escalators of the metro is another infrastructure which supports this ability of those commuters who are able to walk quickly, while simultaneously 'filling' their time with activities. Escalators are both particularly strongly associated with underground rail systems, and particularly well-suited for multitasking:

'I walk into the station. Like so many previous mornings, I am immediately faced with the choice – take the stairs down to the platform, or take the escalator. Like so many previous mornings, I pick the escalator. It sounds like an excuse, but I actually pick the escalator so that I can keep moving forward while opening my bag, unzipping the internal compartment, putting the travelcard away. I don't think I could manage all of this safely while walking down stairs quickly. And slowly isn't really an option, since there are all these people around me, and I would slow them down (at my peril!). As I walk down the final few meters of the escalator, I think about how nice it is that there is no ticket validation on exit. Saves me having to do the whole dig-through-bag routine a second time.' (Research diary, 2013 09 9 AM)

The choice between stairs and escalators came up often in conversations with respondents, but almost always framed as a choice between moving in an active or a less-active, manner. However, the above paragraph demonstrates an aspect of the escalator which is less obvious. The escalator, is, of course, a substitute for walking, but it is also a device for multitasking. Walking quickly in a crowd of people is not a very effective position from which to take out gloves, put away wallets, or adjust backpacks. All of these activities might be unproblematic in many contexts, but as part of the speedy movements of the commuting body, can present a challenge. By contrast, the escalator is a good infrastructural solution for doing-while-moving:

Metro+Walk » Metro+Walk	🕒 0	💰 +0.41
<p>If I'm in a hurry, I walk down the escalator. On Friday, I just stood on it. I use this time to dig through my bag; I take out my book; I look for my glasses. (Assya, 2013 07 07 PM)</p> <p>When I arrive at James Bourchier, sometimes I read to the second escalator, or even to the top. And if I am getting off on the other end of the station for whatever reason, I even read on the third escalator, because on that end there is a third escalator, to the very street level. (Assya, 2014 02 12 AM)</p>		

Walk+Bus+Metro » Metro+Walk	🕒 -40	💰 0
<p>I always start my radio when I am on the escalator on the way out of the metro. I take that time to unbundle my headphones' cables. That's what the escalator is usually for. (Gregor, 2014 03 10 PM)</p>		

In their recent work on multitasking and travel experiences, Rasouli and Timmermans (2014) highlight the need for more research on multitasking in the context of transport use. As the authors ponder the relevance of multitasking on the refinement of activity-based travel demand modelling, it seems important to probe the kinds of conceptualisations of

multitasking which may shape future transport research. The micro-practices and situatedness of multitasking as a way of making valuable travel time is a small exploratory move in that direction.

Furthermore, what do these reflections suggest about the apparent sterility of underground stations, and its capacity to amplify the annoyances of the transfer? While the metro frees up a certain amount of attention through its reliable walking surfaces, the benefits of being able to look up can be quite limited. A few agile and confident commuters like Gregor might be able to read while walking, but this is not possible or desirable for most. As I will argue in Chapter 7, Gregor's reading relies on the non-reading of the majority of other passengers, who maintain the smooth and predictable flow of the collective movement through the station. Whereas at street level looking up from one's feet presents a vivid and dynamically changing urban environment to feel and think with, this is not the case in Serdika station. As a result, many commuters end up focusing on the behaviour of others – and particularly on those instances when it falls short of expectations, such as pushing, or blocking the way for others. In the case of my respondents, this often amplified the stressfulness of having to transfer, suggesting that a more engaging and frequently changing sensory environment, which would provide variation without obstruction, such as music or art displays, could add to the benefits offered by the smoothness and predictability of the metro's surfaces.

Another option for dealing with transfers is to avoid them where possible. The Sofia metro permits this for many of the commuters who live in the Northern part of the city (see Figure 5-6), because Lines 1 and 2 are connected at Obelya station, the Northernmost station at which, in practice, a northbound Line 1 train becomes a southbound Line 2 train, and vice versa. Five respondents had experimented with alternative routes which would avoid the Serdika transfer:

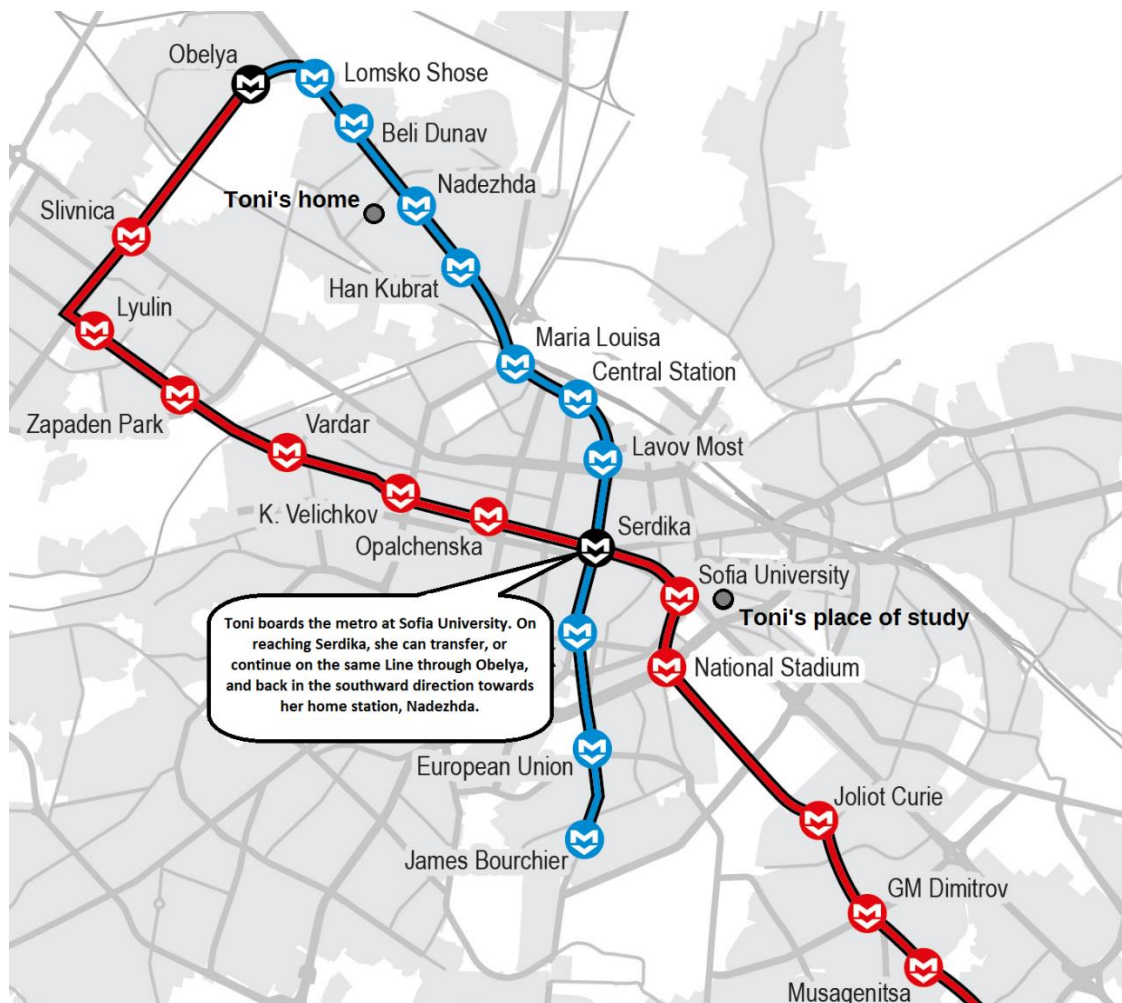


Figure 5-6. Alternative routes between Toni's home and Sofia University, where she studies part-time. Based on map prepared by Miles Irving, UCL Geography Drawing Office.

Tram+Walk » Metro+Walk	🕒 -20	💰 +0.41
<p>If I am at Uni in the evening and am then travelling home, I sometimes pass through Obelya without changing at Serdika. But not always. It depends on whether I'm too tired and can't be bothered with the transfer at Serdika. Most times I am with [friend], and she likes to go through Obelya too. If I'm on my own, I can read my book without interruption. (Toni, 2014 06 11 AM)</p>		

The opportunity to make the commute a longer, but uninterrupted journey, was thus embraced by five of the respondents. However, changing at Serdika or avoiding it by travelling through Obelya became two options which participants chose from depending on circumstances, rather than one strategy replacing the other. This variability in commuting behaviour will be discussed in more detail in Chapter 8. In terms of appraising the new metro infrastructure, linking the two lines seamlessly at Obelya can be seen as an important contribution to the network users' capacity for making valuable travel time.

5.4. Knowing time

Drive » Metro+Walk	🕒 0	💰 -3.36
Yesterday, I was in the office at ten to ten. I noticed the time on the wall clock in the office. Usually, I have a look on my phone just as I'm approaching the office. Just to check how I'm doing for time. (Anton, 2014 03 19 PM)		

The timespace of commuting often involves a heightened awareness of the passage of time, compared to many other activities of everyday life. Some researchers have argued that this fact is in itself sufficient to make commuting time unpleasant, stressful or tedious – when humans wait for time to pass, repeatedly glancing at the clock or counting passing stops, the flow of time seems to slow down (Danckert and Allman 2005).

Because the new metro commutes of the respondents I interviewed were typically made up of a series of short journeys and quick transfers, for most of them it was difficult to be fully absorbed in an activity for an extended period of time. As argued above, this reduced the likelihood of experiencing travel time as productive time in the narrow sense. However, infrastructures such as mobile coverage and escalators made it possible for time to be sensed to be valuable nonetheless. In this section, I discuss how specific socio-technical setups for knowing the time can make short durations feel valued. I examine how metro commuters maintain an embodied awareness of the passage of clock time during their journey, even when they are not actively finding out the time.

First, consider this story from 'the surface.'

Steph is an IT expert and young mum. She travels to work by bus, a journey which takes approximately 45 minutes each way. She describes how she organises her travel time thus:

"I play a game on my phone or read my [e-reader]. I never miss my stop. I feel the sharp turn right and that means we're at Orlov Bridge, and then when it gets brighter it means we're out of the neighbourhood built-up area and are moving along Tsarigradsko Road, which means it's time to get off at the next one." (Steph, 2013 05 21 AM)

Steph does not even have to lift her eyes from the display to know all this. Hers is a vivid description of being absorbed in an activity, while at the same time having a minute, precisely tuned awareness of one's surroundings.

Underground, knowing time is a different kind of task. A metro commute can seem like a challenging environment for the human body to follow the passage of time, without concentrating on a clock and thus making time feel less worthwhile. The speed of the metro train is relatively constant. In the case of the Sofia metro, so is the rhythm of the stops, since

the majority of the new stations are almost exactly 1.1km apart. The sound and light of the journey also remain relatively constant.

And yet, the respondents' accounts showed that embodied practices of knowing time were an intrinsic part of metro commuting. I found that commuters' bodies were extremely well attuned to detecting the temporal clues which can keep them 'plugged into' the passage of clock time while their attention was on other things. Typically, within several weeks of practicing a new metro journey, respondents had established easy to perform and extremely useful time-related routines. Time was sensed through a number of different socio-technical infrastructures which could be mobilised as devices for non-deliberative time-knowing. These included the rhythms of people getting on and off the train; the number of songs heard on the mp3 player; and the side on which doors open:

Walk » Metro+Walk	🕒 -56	📊 +0.32
And going to Serdika, you feel it, because a lot of people get off. Even if I am distracted and daydreaming, the crowds moving off the train remind me that I need to get off too. (Maria, 2014 02 11 AM)		

Walk+Tram » Metro+Walk	🕒 -30	📊 -0.15
[Yesterday] I just got on the Metro and fell asleep. But somehow I still know where I am, even through the slumber. I don't miss my stop. (Emma, 2013 08 9 AM)		
One way of telling is the side the doors open on – only at NDK they open on the opposite side, so I know I need to get off at the next one. (Emma, 2014 05 30 AM)		

It is important to stress the distinction between the type of situated time-knowing practices discussed here, and a disembodied notion such as the idea of an 'internal clock' (for contrasting views on the idea of cognitive maps and internal clocks, see Ingold 2000, and Wallace 2003). Respondents in Sofia confirmed that they did not experience their awareness of commuting time as an internal clock:

Drive » Metro+Walk	🕒 -50	📊 -2.04
When I'm teaching, yes, I have an internal clock for the 50 minutes of the lesson. But this is different. (Tanya, 2014 02 5 AM)		

If anything, knowing time while commuting is about 'external clocks,' albeit unconventional ones. The practices I discuss in this section are more akin to the distributed cognition described by Hutchins (1995). Like on the bridge of a ship, navigation in commuting timespaces is a "socio-material" way of thinking (1995:361). The embodied mind of the

commuter knows time by engaging with the humans and a range of physical objects around them in subtle ways. For most commuters, these distributed knowledges and skills for time-telling only took a few journeys on the new infrastructure:

Walk » Metro+Walk	🕒 +60*	💰 +2.27*
<p>I just happen to know this particular train at 19.11, I don't know the full timetable. One of the first times I travelled like this I left the office at 7 and walked very casually, without hurrying, and missed a train for just a few seconds. This happened a couple of times. Then I left a bit earlier once and caught it and I realised that I the train is always at the same time, and it was 19.11, so I assumed that obviously there is a timetable. So I started aiming for this train. But I also know the interval is about 7 minutes, so I can guess when the trains before and after are. (Nikolay, 2014 06 13 PM)</p>		

The above quote demonstrates how Nikolay gradually assembled his temporal knowledge, by combining information which he 'stumbled upon,' that which the metro authority shared on electronic displays, the rhythms of his own body, and his capacity to weave past and future moments of the day into his present actions. Therefore, despite taking place underground, a metro commute does not have to impede the passenger's useful capacity to 'unknowingly know' time. The key point to highlight here speaks to the substantial body of literature which differentiates travel time values according to transport mode (Wardman 2004). Embodied ways of knowing time are directly linked to practices of valuing travel time, and there is nothing intrinsic in underground rail as a mode that prevents this type of value from being made as part of everyday journeys, including the commute.

In terms of physical infrastructure, the Sofia metro has a large number of provisions for making shared, 'objective' clock time visibly present. Compared to most metro systems I have seen, the Sofia metro has more clocks in every station, and it is difficult to find a vantage point from which at least one is not visible (see Figure 5-7). Without exception, they are digital clocks with red numbers displayed on a black background. All newer trains are also equipped with clocks, although these are not visible from everyone in the carriage. Respondents glanced at these clocks, often unknowingly, to reassure themselves that their personal time and the objective metro time remain in sync:



Figure 5-7: Examples of clocks on the metro: platforms, ticket office, train. Photos by author.

Walk+Bus+Metro » Metro+Walk	🕒 -20	💰 -0.82
<p>I was curious about that question you asked me about the clock; where I check the time. It turns out, I do notice it at Mladost 3 station, even though I said I didn't. It's as if I check my personal watch against their clock as I enter the station, even if I don't actually physically look at my watch and compare. I just want to know what time it is according to the metro, as I assume the timetable is coordinated with the metro time, the one shown on their own clocks and that's the one their trains move according to. (Natalia, 2013 03 17 PM)</p>		

Announcements of the next stop play an important role in orientating oneself in time while inside the metro carriage. While I expected more regular commuters to speak of their grating repetitiveness, I only received accounts of their utility. This was possibly due to the relative novelty of the metro commutes I was studying:

Drive » Metro+Walk	🕒 0	📍 -3.36
<p>Generally, even though I am listening to music, I hear the announcements, because they are quite loud. Also, I can tell where I am according to the design of the different stations. I recognise all of the ones along my usual route. (Anton, 2013 10 01 AM)</p>		
Metro+Walk » Metro+Walk	🕒 0	📍 +0.41
<p>I either hear the announcements over my music, or I might stop the music to hear what's going on. But generally I just know how many stops there are. I know there are three stops and that's all I need. (Assya, 2014 02 11 AM)</p>		

In other respects, the in-vehicle infrastructures for knowing the time vary significantly between models. The older trains have no clocks or electronic displays of the train's progress inside the carriage. Newer trains, however, have both (see Figure 5-8).



Figure 5-8: Electronic indicator of train progress. 13 September 2012. Photo by author.

Respondents generally had an awareness of whether they were boarding an older or newer type of train, and orientated their time-knowing practices towards the infrastructure that was available:

Walk » Metro+Walk	🕒 -56	💰 +0.32
<p>I do notice whether it is the old trains or the new trains. But I don't mind the old ones either. The only thing they lack is the electronic indicators above the doors which tell you where you are. But I don't mind that, I can tell where I am anyway. I hear the announcements through my music, or I might stop the music to hear what's going on. (Maria, 2014 02 11 AM)</p>		

Finally, a very important time-knowing infrastructure on the Sofia metro is the design of the stations themselves. If metro stations were designed to look uniform, with similar colours and features, commuters would need to concentrate a little more on identifying the stop at which the train has just arrived. This would mean drawing one's focus slightly further away, and for slightly longer, from the snooze, the phone, the book, or anything else that the commuter uses to make their travel time valuable. My own experiences of commuting on the London Underground Victoria Line have informed my thinking on this. When listening to music or absorbed in a book, awareness of the passage of time can slip away. I would often find myself remembering to check how far I had come only when the train had already stopped at a station. The announcement had passed by then, and could not help me. Stretching my neck to examine the small portion of the platform visible through the window behind numerous human bodies, I often found it difficult to tell where I was because of the uniform tiling and layout of the platforms. By the time I had finally reassured myself I had not missed my stop, the state of being fully absorbed in my reading had dissipated, and it could even feel like it was not worth starting again. By contrast, the brief glance to the platform in the metro in Sofia was often sufficient, and I was able to continue using my time on the train in the way I had chosen. My observations were confirmed by Raya:

Walk+Bus+Bus » Metro+Walk	🕒 0	💰 0
<p>Also the colours of the stations. You look out and you know where you are. Sometimes, with my friends, we mix up Lavov Most and Serdika, because they are similar colours. Because we're chatting, suddenly we wonder where we are, we look out, but we can confuse the two stations. (Raya, 2014 06 17 PM)</p>		

This reflects the decision of the Sofia metro management to design each of the new Line 2 stations around bright, distinctive colours. Compared to Line 1 stations, this is an important improvement from the perspective of commuters. Unlike the mostly difficult to distinguish stations built between 1998 and 2009, the stations of the 2012 extension make contrast work as an infrastructure for knowing time. On the other hand, the very similar distance between stations (most are exactly 1.1km apart) produces a very even rhythm of movement.

Unlike a subtle awareness of longer and shorter gaps between stops, this spatial organisation is less conducive to being unknowingly aware of one's progress along the route.

There are few people who would consider sitting on a train watching the hands of their watch move, to be an enjoyable, meaningful or valuable way of spending one's commute. At the same time – and especially during a relatively short journey – any commuting activity needs to be accompanied by an awareness of time passing. The basic purpose of the commute is to arrive at one's destination, and progress towards that destination, and no further, has to be monitored during the journey. This is achieved in a number of different ways by the new Sofia metro commuters in the sample. The conscious mind, the body and the infrastructures of the metro all play a role in assembling the type of knowledge of time which is particular to familiar, everyday journeys.

5.5. Rushing

Despite the existence of intricate socio-material infrastructures for knowing time, commuters' management of time is not infallible:

Drive » Metro+Walk	🕒 0	💰 -3.36
It has happened for me to miss my stop because of daydreaming. The last time was about 2 months ago. I realised just as we were leaving Serdika. So I ended up on the stop after Serdika [hesitates about the name]. So I got off, went to the opposite platform, and then travelled back. (Anton, 2013 10 01 AM)		

Walk+Tram » Metro+Walk	🕒 -30	💰 -0.15
It has happened several times that I don't notice, and I miss my stop, I get off at [the final stop, the one after Emma's office] and have to take a train in the opposite direction. It's especially likely if I'm both reading and listening to music. (Emma, 2014 05 30 AM)		

However, the skilled commuting body is not the only device for telling and managing time which can prove unreliable. Both respondents and I noticed clocks on trains and in stations which were not showing the accurate time; some were ahead or behind by as much as ten minutes. In the context of imperfect knowledge and failures of predictability, a commuter could often find themselves having to rush:

Walk+Tram » Metro+Walk	🕒 -30	💰 -0.15
<p>At Serdika, if you are very fast, one minute faster, you can get the Line 2 train immediately. But you can manage only if there are no people, or if you're at the very front. (Emma 2013 11 7 AM) <i>[Emma is wrong; the timetable regularity which she observes and which compels her to hurry during the transfer, does not exist]</i></p>		

However unpleasant, many of these situations rarely resulted in serious disruptions to the flow of the commute. Unlike with buses or trams, on the metro it was possible to fall asleep, miss one's station and then travel back without incurring an extra cost, even when travelling on a single ticket. Furthermore, intervals between metro trains are both shorter and more predictable than those of ground-level public transport modes. Overall, losing track of place and time, or failing to catch the anticipated connection, was not likely to delay one's arrival by much.

Paradoxically, and seemingly more commonly, the other reason for rushing is the very fact of the metro's predictability. While transport planners generally expect waiting times to translate into safety margins (see section 5.3 on transfers), the experience of the Sofia metro commuters demonstrated this relationship was more ambiguous, and unstable over time. Because of the reliability of the new infrastructure compared to their previous modes, some commuters gradually reduced or completely dropped the practice of allowing for a safety margin in planning the duration of their commute. As a result, in the later months of the research period, they were more likely to be running late, and thus were more likely to have to rush during their journey. This was the situation described by 11 of the 20 core participants. Take the example of Maria. She used to walk to work and university, then became a metro commuter, eventually moved to a new home and started walking everywhere again. Maria had interesting reflections on the effect of the metro's reliability on her time-keeping:

Walk » Metro+Walk	🕒 -56	💰 +0.32
<p>I also now have a better understanding of distances, because of walking. While taking the metro, I always left the house at the last minute. Since moving here, I know exactly how long it takes me to walk everywhere, and I leave on time and I am never late. I am definitely late a lot less.</p> <p>With the metro, you know there is a train every few minutes, and in rush hour, every three minutes. So I used to postpone going out, postpone and postpone, safe in that knowledge. As a result, I was</p>		

constantly late. I never thought about the fact that I might have to wait for the train for 7-8 minutes. I just took into account the number of minutes I spent inside the train, the actual ride itself. (Maria, 2014 06 13 AM)

If commutes consisted of a long period of time on a metro train, rushing would not make this kind of difference – once again, the fixity of metro speeds and durations would minimise the difference between hurrying and not hurrying. However, as section 5.2 demonstrated, the metro commute is made up of a number of different segments, many of which can be made ‘elastic’ through different ways of practicing them: taking the stairs versus the escalator, running for the arriving train or not, walking at a different pace from the station to the office. Thus, while rushing can cause stress and erode the value of the time spent commuting, its capacity to make a difference to how long the metro commute takes is an important aspect of the journey. Rather than fixed and predictable, the speed of the metro can be affected by the speed of the commuting body. This can be significant in the way the technology of infrastructural spaces are interpreted, as their large, highly planned and highly engineered environments in fact remain malleable and responsive to the practices of the individual user. However, this also highlights the fragility of the well-being benefits to metro commuters from saved time and slower mornings, which were described in section 5.1. Because these behaviours are not rationalised through decision-making processes based on weighing costs and benefits, it cannot be assumed that they will be ‘optimised,’ or at least not in any objective sense of the word. Thus, an event such as a ride-along interview could in fact become an inadvertent intervention, whereby the participant could reflect on what they value or not in the way they organise their commuting time:

Walk+Minibus » Drive+Metro	🕒 -26	💰 +2.09
<p>From the organisational point of view, I find it irritating that there is no transfer tunnel between the two lines in Obelya the way there is one here. You had asked me what my expectations had been about what the connection would be like between the two lines. I now realise I was expecting that I would have the option to transfer from one line to the other. But there isn't. (Nell, 2014 08 05 PM)</p>		

Finally, rushing was much more likely to be a morning phenomenon, as only three of the 20 respondents were directly responsible for dependants after work. The majority found themselves in a greater hurry on the way to work than on the way home. As discussed above, 12 commuters had to arrive at their workplace at a specified time, and with no safety margin, they frequently found themselves hurrying. Their morning commute was therefore dominated by the need to catch up the shortage, which limited their ability to focus on

activities which would make the journey time pleasant or valuable. While rushing made the journey's clock duration shorter, it also made it more likely to be experienced as a disutility.

Time on the move is an individual, embodied and subjective experience, which is anchored in collective temporal infrastructures such as clocks, train timetables, and headways. The eight respondents who had flexible working hours had a lot of freedom regarding their arrival time at the office:

Drive » Metro+Walk	🕒 +60*	💰 -2.09*
<p>It also does matter that there is no pressure on me to be in the office at a particular time. I don't think I'd be able to cope with a very fixed working time in Sofia. I think like this both the worker and the employer lose. The employee arrives all stressed out at work. (Christo, 2015 01 6 AM)</p>		

This was a powerful factor in determining how travel time was experienced. Depending on whether a passenger is in a rush or not, different parts of the metro infrastructure became important. For the 12 passengers with fixed working hours and the pressure to arrive at their workplace on time, it was the general predictability and reliability of the metro timetable that was significant, particularly in the morning. This predictability represented a major change compared to the transport modes used before the metro, all of which were dependant on the traffic in the city's streets. Being in a hurry and being slowed down in traffic was not conducive to feeling travel time to be valuable. Instead, bodies come to be filled with tense anticipation for the traffic light to change, eyes glance repeatedly at the clock, and the mind cannot focus on anything but the passage of minutes. For commuters who have to arrive on time, the new metro infrastructure created opportunities to value travel time by reducing significantly the stresses of lateness:

Drive » Drive+Train+Metro	🕒 -10	💰 -1.54
<p>[At Serdika, she glances up and checks the electronic clock. It's 8:54] This is normal time to arrive here, so I don't have to run. We clock in, so I need to be there at 9.00 sharp. (Stella, 2013 06 25 AM)</p>		

Overall, the above discussion suggests that flexible working hours could make an important contribution to the sense of value of commuting time, and its broader implications for quality of life in cities. Further aspects of the ways in which the morning and evening commutes are much more than mirror images of each other (see Gonzales and Daganzo 2013 for a discussion) will be discussed in Chapter 7. For the purposes of this section, a topic worth mentioning in anticipation of the more detailed discussion is that of the distributed nature of the 'rush.' Rushing is a part of the commute even for some of the passengers who work flexible hours or are not in a hurry themselves for some other reason.

Rushing becomes part of their commute through the atmosphere of the rush hour – the heightened speeds and tension of those around them.

Thus, flexible working hours affect the valuing of commuting time in a positive way, by complementing the relative reliability of the metro. Flexible starting times cut the need for allowing for a safety margin, reduce the anxiety of rushing, and add to the overall utility of the metro as a commuting infrastructure. In terms of theorising public transport infrastructure, they serve as a reminder that the costs and values of a metro project are not bounded within the imagined spatial container of the new line, but can only be gauged in terms of the socio-technical relationships with urban society and space which exceed it.

Conclusion

Commuting time is generally understood as a cost, and on the few occasions where researchers have attempted to assign it intrinsic value, it has been noted, with great restraint, to provide a transition between work and home (Vale 2013). In this chapter, I have aimed to show that such arguments do not go far enough in recognising the processes which come together in the valuing of travel time – not just in the case of leisure travel, but in relation to the mundane, repetitive daily commute. Using data from Sofia metro commutes, this chapter has examined different ways in which valuable travel time can be made. At the same time, the opportunities to spend travel time in ways which are meaningful to oneself, and pleasant, are not boundless, but configured with and within socio-technical arrangements. In the case of the Sofia metro, some of the most notable ones are the relatively short periods of time actually spent inside a moving metro train, the relatively frequent and stressful disruptions of transfers, the affordances for knowing the passage of time, and the availability of a 3G mobile network underground which makes mobile devices a prominent presence in metro commute spaces. The commuters' practices of knowing time, repeated and gradually honed over many journeys, weave the connections between subjective, embodied time, and 'objective' metro time. The habitual and embodied nature of the commuters' time awareness permits them to be engaged in an activity which creates value in their journey time, while also knowing whether they are running late, when to get off, and how many minutes until the next train. In planning metro infrastructures with valuing travel time in mind, the design of metro stations and trains can take into account the particular ways in which habitual time-knowing is accomplished. Reflecting commuters' want to know the time without having to find out what time it is can make transport infrastructures more conducive to comfortable short, repetitive journeys.

For the respondents cited here, travel time value is produced through a combination of advance planning, the capacities of situated bodies, and the affordances of different infrastructures. The importance of the duration of the journey is not negated by the subjectivities of passengers, but it is complicated through them. Because of the subjective nature of making travel time valuable, a longer commute is often more worthwhile than a shorter one, but a smaller time saving can also be valued more, or as much as, a larger one. Time savings, as well as travel time itself, are experienced in practice as both quantitative durations and qualitative entanglements. An activity engaged in while sitting on a metro train is shaped by the number of minutes available, the spatial arrangement of the seats, the lights and mobile transmitter, as well as by the senses and intentionality of the passenger. Qualitative appraisals can incorporate reflections on the ways in which time savings are realised, and to what effects, rather than deny their importance.

If travel time is not simply a temporal cost, what kind of time-making infrastructure is the metro? Can time on the move be seen in non-instrumentalist terms, the way home time, or leisure time is imagined in ambiguous terms, rather than as having a particular value per minute? After all, everyday travel time is made up of a subtle mix and frequent interchange of work and non-work activities (Bjørner 2015) – just like time spent at work or at home often tends to be. Quantifying the resulting use of time therefore presents a significant challenge.

Like any transport infrastructure, the metro's main purpose is to get people from one place to another. However, there are many different infrastructures, technologies and things which enable people to move, as well as others (for example, teleconferencing) which make not moving possible. All these mobilities infrastructures work through different kinds of configurations, and one is not a direct substitute for another, because one kind of movement is never equivalent to another, even if the origin and destination are the same. All mobilities infrastructures enable particular kinds of activities and interactions, while impeding others. Two configurations may permit similar activities, but they create lesser or greater frictions, and different kinds of costs.

Transport mode is often considered to be a significant factor in determining the available ways of spending travel time. As a result, transport research often interprets travel time value as a function of mode (Wardman 2004). A meta-analysis of value of time literature by Abrantes and Wardman (2011:11) demonstrates this, where findings state, for example, that "rail users have values [of time] 43% higher than car users." However, this

interpretation relies on a narrow definition of valuable time as productive time (Lyons and Urry 2005). Unlike a survey, the qualitative and longitudinal data I collected in Sofia could not be fitted easily into such broad mode-based 'lifestyle' and modal categories. The critique of travel time values assigned to, and compared across, transport modes, has been one of the key contributions of mobilities research in recent years (Sheller and Urry 2000; Bissell 2010). In practice, cycling, driving, walking and riding public transport, even for mundane everyday purposes, can all be experienced as having intrinsic value. In particular circumstances, each mode can enable day-dreaming, working, relaxing, interacting with others, listening to music, catching up with the news, etc. In other situations, each of these modes can also create a sense of time being wasted, through a sense of loss of control, tedium, or stress. Building on the contribution of mobilities scholars, it seems appropriate to interpret the data on the travel time use of the new metro commuters in Sofia beyond an effort to assign a value to metro time as opposed to time spent on previous modes.

Similarly, the framing of public transport time as more productive than driving time may prove to be an appealing, yet unhelpful oversimplification from the perspective of sustainable transport planning. In encouraging former drivers to take up public transport commutes, it should not be assumed that they will automatically start 'making the most' of their freed up hands and attention, by engaging in newly available productive or relaxing activities. Considering these possibilities might require that they first spend some time observing other public transport commuters, or public communication campaigns, but even then, the preferred arrangement for some transit users would be to 'do nothing.' Valuing differently time spent 'doing nothing,' could, in turn be a worthy cause to pursue from the perspective of societal and individual well-being. Since travel time could only represent one small facet in such a pursuit, this interesting wider question falls outside of the scope of the present study.

Switching to the metro thus does not in itself mean travel time becomes more valuable. Planning infrastructure for valuable travel time might not entail so much comparing one mode to other modal options, but rather detailed accounts of the particular affordances for meaningful time, which can help identify those specific to modes, and those which can be provided across a range of modes. Thus, as an alternative to a focus on mode, the chapter drew attention to the value of distinguishing different segments in a journey, such as sitting or walking; with or without mobile coverage; rushed on non-rushed, taking into account also the different ways these setups play out for different subjects and bodies.

In relation to the segments of the commute, it is important to highlight that there appears to be a limit on the number of transfers people are willing to undertake as part of their commute. Stella was the only respondent who used to transfer between three modes as part of each journey, but she gave this approach up less than a year after Line 2 opened. David Metz (2008) has argued that everyday travel has remained constant across centuries, at an average of one hour per day. However, according to the Sofia metro commuters' experience, the limit to travel time expressed in terms of duration should be qualified, taking into account what commuters might consider to be an acceptable number of transfers. Similarly, these findings probe transport planners' tendency to underplay the significance of transfers, emphasising instead how they enable farther reach and frequency at lower investment in public transport (Walker 2012). The significant effect which transfers, and particularly multiple transfers, have on how commuters might value the time they spent travelling, should be given consideration in the planning urban transport systems.

Furthermore, public transport is often understood as an infrastructure which performs the same function as the automobile, but at a different cost: typically, at a lesser financial cost, but at the expense of time, privacy and independence. For many researchers, cars allow their users to determine the atmosphere of their being-on-the-move, and thus give them control, whereas public transport leaves passengers powerless to shape the timespace of travel (Lyons and Urry 2005). Consider this quote:

“At all times, those who could afford to choose a means of transport that minimised contact with other people and which gave them maximum control over their journey and their personal space. Only when public transport offered distinct speed advantages could it compete with more privatised transport modes” (Pooley, Turnbull, and Adams 2006:256)

As mobilities scholars have argued in the past, this framing of public transport as an inferior alternative to the car obscures other types of functions which are unique to this particular kind of infrastructure (Watts and Urry 2008). In the case of the Sofia metro extension, only five of 20 core respondents saw their choice of mode as a trade-off between time and money. The financial cost, with its own, non-equivalent qualities and quantities, is discussed in the next chapter.

In this chapter, I discussed different ways in which metro passengers spend their travelling time. While I explore these through a mobilities lens, I also offer a critique of the dichotomy of the productive/unproductive travel time use framework (building on the work of Lyons and Urry 2005). Instead, mobilities scholars' insights on the value of travel time are used to explore the uses and meanings of public transport infrastructure. Rather than as a less

private, less convenient, less flexible way of getting from A to B than the car, I suggest looking at public transport as a socio-technical infrastructure which makes possible a particular kind of 'doing while moving.'

Qualitative analysis of travel time use can contribute to a reconceptualization of the value of time, and as a result, a reconceptualization of how transport infrastructure is valued. The metro is much better suited than the car for reading during one's commute, but its infrastructures for gazing out of a window are extremely poor. Importantly, the specific technological setup of the metro – the minimalist, predictable layouts, high frequencies, smoothness of movement on rails, to name a few – creates opportunities for the commuting mind-body to be alert to its surroundings and otherwise occupied. Through exploring how valuable time is made by humans and non-humans, it is possible to begin to imagine a less instrumentalist view of travel time.

Chapter 6. Price and practice: The cost of new commutes

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Introduction

This chapter examines how particular ways of paying – or not paying – are becoming part of the repertoire of practices of Line 2 commuters, and what this repertoire implies for the usefulness of the metro as infrastructure. Along with time, origin, and destination, cost is considered a core characteristic of the commute by transport planners. Cost is generally understood as the price paid by the passenger in order to gain access to a transport service. It is therefore often framed as a ‘tangible’ characteristic of commuting, as opposed to its more ‘experiential’ aspects (Lyons and Chatterjee 2008:185). An economic or psychological argument might frame the process of considering a new commuting arrangement as a process of weighing the price of the service, i.e. the economic cost, against the largely duration related benefits a transport service can offer (Marchese 2006). On the other hand, price is hardly ever considered in qualitative studies of everyday mobility. However, just like the interaction between commuters and the notion of travel time are quite nuanced, as I aimed to demonstrate in Chapter 5, so is cost lived, interpreted and enacted in a range of different ways.

Since this study aims to present a qualitative research perspective on valuing transport infrastructure, cost was not part of it to begin with. However, the fact that research participants were interested in discussing the cost of adopting the metro, but also the wide range of ways in which they went about the discussion of cost, pointed to the relevance of the topic of cost to the study. What I had not seen prior to the start of data collection was that the cost of travel entails much more than an amount of money paid. Paying for the commute is in itself a practice, with many temporal and spatial aspects which can be obscured by the simple disembodied notion of price.

The perspective on travel cost presented in this chapter therefore differs from the currently prevalent approaches to cost and travel behaviour. The vast majority of studies on the subject are rooted in economics, and focus on price elasticity: the idea that service users will accept price increases up to a certain threshold which can be mapped using a demand curve (White 1981; Paulley et al. 2006). In contrast, I focus on the on-going embodied considerations and negotiations involved in paying for one's everyday journeys. In this chapter, price does play a role in how the metro commute is put together, but only in the sense that paying it and making sense of it are considered as situated practices of the mobile mind and body – practices which are part of, but also excessive to, the journey itself. This approach questions whether transport planning can proceed on the assumption that passengers evaluate newly available alternatives based on straightforward recalculations of cost and duration. Instead of simply dismissing the importance of price and price elasticity in travel behaviour, I frame paying for the metro commute as one of the everyday uses of the new infrastructure which can be thought about in both quantitative and qualitative terms.

This chapter therefore seeks to fill the gap in existing mobilities and transport research when it comes to experiencing the cost of travel. In the sections that follow, I trace the making of infrastructure value through both quantifiable and non-quantifiable socio-material encounters of paying.

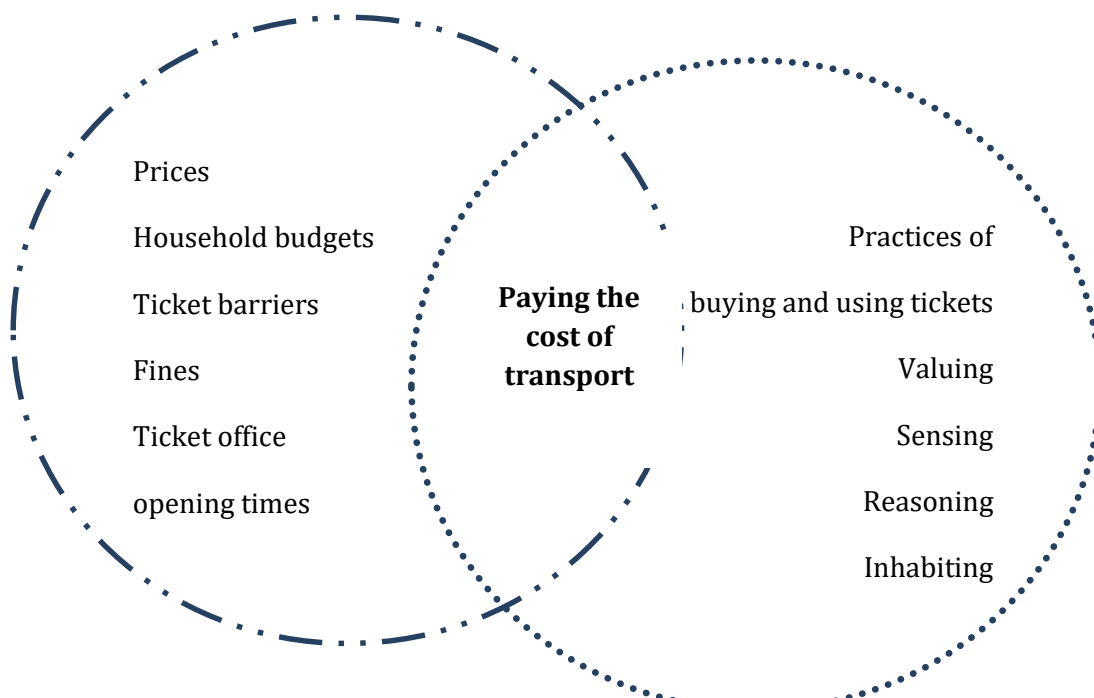


Figure 6-1. Quantitative and qualitative aspects of paying for the commute

Figure 6-1 above illustrates this approach. The aspects listed in the diagram are of course interlinked in numerous and subtle ways. Becoming a metro commuter means dynamic changes take place in some, but not necessarily all, of these aspects from the perspective of the individual commuter. I explore some of these dynamics in Section 6.1. In the rest of the chapter, I suggest that the transport pass which commuters use in order to ride the Sofia metro is a particular kind of continuously transforming technology, which shifts its shape and meaning depending on the social and material interactions it becomes a part of. In section 6.2, the metro ticket is framed as an object to be bought, an item which changes hands in an economic transaction. Section 6.3 zooms in on the different socio-material configurations which a single ticket and a travelcard can create as part of incorporating the metro into a commute. In the following section 6.4, the ticket is presented as an infrastructure in its own right – a material object which acts as a mediating technology (Furlong 2011) to enable and make fairly uniform and predictable the interaction between metro and commuter. Section 6.5 examines the role of ticketing infrastructure from the perspective of fare evasion, a practice which is more prominent in conversations about commuting in Sofia than an outsider might expect. Section 6.6 turns to the on-going transformations of technologies and practices of ticketing, and reflects on possible innovations which the Sofia Metropolitan authority could introduce to reflect them.

6.1. The cost of becoming a metro commuter

Similar to the approach to travel time savings presented in Chapter 5, here I engage with the implications of the cost of commuting in both quantitative and qualitative terms. This section begins with an estimate of the monetary effects experienced by the 20 core respondents as they started commuting by metro after August 2012. These are then used to contextualise the qualitative material presented in the rest of the chapter, alongside time, in the form of pictograms. As before, this approach aims to, first, complicate the idea of simple trade-offs between time and cost in changing commuter behaviours; second, to reinforce the idea that subjective and situated experiences unfold with, within, and through infrastructural processes, enriching rather than refuting the type of knowledges quantitative data may offer; and third, to reflect more of the long-term experiences of each respondent than can be captured in each quote on its own.

Figure 6-2 below summarises the monetary benefits and dis-benefits of switching to the metro for the core sample of 20 commuters. The background calculations for the table are presented in Appendix 3.

	Old commute modes	Old commute cost (one way)	Old commute cost (BGN per month)	New commute modes	New commute cost (one way)	New commute cost (BGN per month)	Change in cost (BGN per month)	Duration increased (↑) / decreased (↓)
Anton*	drive	2.05	90.00	walk, metro	0.36	16.00	-74.00	x
Assya	walk, metro	0.52	23.00	walk, metro	0.73	32.00	+9.00	x
Bella	walk, tram	1.14	50.00	walk, metro	1.14	50.00	0.00	↓
Maria	walk	0.00	0.00	walk, metro	0.16	7.00	+7.00	↓
Nikolay	walk	0.00	0.00	walk, metro	1.14	50.00	+50.00	↑
Emma	walk, tram	0.80	35.20	walk, metro	0.73	32.00	-3.20	↓
Stella	drive	2.27	100.00	drive, train, metro	1.50	66.20	-33.80	↓
Rumen	cycle	0.00	0.00	walk, metro, tram	1.14	50.00	+50.00	x
Gregor	walk, bus, metro	0.39	17.00	walk, metro	0.39	17.00	0.00	↓
Irina	walk, tram	0.39	17.00	walk, tram, metro	0.39	17.00	0.00	↓
Janna	drive	1.82	80.00	walk, metro	0.73	32.00	-48.00	↓
Vladimir**	walk, tram	1.00	22.00	walk, metro	1.00	22.00	0.00	x
Maya***	walk, bus	1.00	22.00	walk, metro	1.00	22.00	0.00	x
Christo	drive	2.05	90.00	walk, metro	1.00	44.00	-46.00	↑
Natalia	walk, bus, metro	1.14	50.00	walk, metro	0.73	32.00	-18.00	↓
Nell	walk, minibus	1.50	66.00	drive, metro	2.55	112.00	+46.00	↓
Raya****	walk, bus, bus	0.00	0.00	walk, metro	0.00	0.00	0.00	x
Toni	walk, tram	0.52	23.00	walk, metro	0.73	32.00	+9.00	↓
Tanya	drive	1.82	80.00	walk, metro	0.80	35.20	-44.80	↓
Lilly	walk, minibus, trolleybus	2.5	110.00	walk, drive, metro	2.36	104.00	-6.00	x
						Average monthly change	-5.14	

Figure 6-2. Cost of commuting before and after the metro. Notes: * 50% of public transport travelcard covered by employer; **Works part-time, at approx. 50% FT; ***Gets free lift from neighbour most mornings; ****Monthly travelcard paid by employer.

Across the sample, the average cost saving resulting from the switch was a modest 5.14 levs per month. Overall, eight of the 20 core participants saved money by adopting the metro; six ended up paying more than before; and six participants saw no change to their monthly commuting costs. Among the eight who reduced their expenditure, the average monthly saving stood at 34.23 levs. The largest saving was that seen by Anton, who used to drive, and who then cut his commuting costs by 74.00 levs per month. Among the six commuters who lost money on the switch to metro, the average loss was lower, at 24.43. Nikolay and Rumen saw the largest increase in expenditure, since their previous commutes, as pedestrian and cyclist, respectively, involved virtually no cost. Both of them spent 50 levs per month more than previously when they adopted the metro.

From the perspective of sustainable urban mobility transitions, a notable finding is that all five respondents who stopped driving to work and started using the metro, saw a decline in their commuting costs. The savings experienced by this group were substantial, and exceeded the average saving of 34.23 per month.

In research which sought to offer a human perspective on the daily commute, Lyons and Chatterjee (2008) demonstrated some of the tensions of conceiving time and monetary cost as resources which can be traded off against each other. Similarly, a trade-off of time and cost was not the typical experience across the sample of new metro commuters, as can be seen in Figure 6-2. This applied to only four of the 20 participants. Three commuters found themselves spending more than before, but for a faster commute; among these were two people who used to commute on other public transport modes, and one who used to walk to work. In addition, one former driver experienced a trade-off, saving 46 levs per month, but taking longer to get to work and back. For four commuters, both time and cost were reduced; in one case, both were increased. For the remainder of the sample, either time or cost remained unchanged, and for three commuters, neither of the two changed. As discussed in Chapter 5 in relation to duration and travel time, these quantifiable changes should be read in the context of how travel costs are made through different activities and interactions.

Changes in expenditure represent an important aspect of becoming a metro commuter, but only one of many. For example, the cost of driving to work may be higher in terms of absolute price, but as a set of practices, paying for car maintenance and fuel also has an entirely different distribution in space and time to buying public transport access. In the rest of the chapter, I propose thinking about expenditure differently, as a more-than-monetary, socio-material and geographical set of interactions which are central to the practices of commuting. This contextualised view of paying for travel can reflect the fact that rationality and embodied sensations both play a role in how the price of the commute is experienced:

Drive » Metro+Walk	⌚ -40	₺ -2.18
<p>Financially, I can't say I am feeling the difference between driving and taking the metro. I'm glad I'm not spending that money, but you know how it is with money, it's not that you're left with anything spare. It gets spent anyway, one way or another, so <i>you don't feel it so starkly.</i> (Janna 2014 03 12 AM; my emphasis)</p>		

The calculations presented in this section should therefore be considered in light of at least two qualifications. First, they reflect the initial change in cost when the commuters began using Line 2, but not the on-going variability of everyday mobility arrangements, including

those around payment. The transition to metro as a change which unfolds in the context of on-going variability is the focus of Chapter 8. The second qualification relates to the fact that while I carried out these calculations, not all commuters did so in explicit terms themselves. Therefore, calculations should not be taken as the rational basis of a decision-making process, but as a nuanced, sensed, and often partial engagement:

Drive » Drive+Train+Metro	⌚ -10	₹ -1.54
<p>AP: So how do the prices compare, what you used to pay for petrol and parking when you drove to work, and what you pay now?</p> <p>Stella: (Starts calculating out loud... then gives up) I have never bothered to calculate the monthly cost in such detail. I <i>knew</i> the petrol and parking cost was much higher in any case. (Stella 2013 06 25 PM; my emphasis)</p>		

This approach also highlights the ways in which everyday activities are linked, meaning that commuting practices exceed the spatial and temporal ‘container’ of the journey itself, connecting it through thoughts and doings to other spaces and times, and to other costs (Jarvis 2005; Shove 2009). As I discuss in section 6.5, any effort to evaluate the barriers to switching to, and persisting with, metro commuting, should carefully consider the implications of this excess.

6.2. Transaction



Figure 6-3. Ticket office and vending machines inside Sofia metro stations. September 2012. Photos by author.

This section focuses on the economic transaction which is part of paying for the commute. As argued above, for the new Sofia metro commuters this transaction involves more than a

price per ticket and a cost per journey; it requires a situated interaction with a human or machine, seeking out and assessing information, handling different forms of money and different objects such as tickets and travelcards. Even the discursive rationality of planning and calculating happened within specific settings, involved bodies and objects, as in the examples above of the processes of calculating taking place within the context of the ride-along interview itself. In examining these arrangements in some detail, I aim to engage with two points which have been made repeatedly by mobilities scholars, but have rarely been orientated towards the need to develop new perspectives on the value of new public transport infrastructure projects. The first point is that like most aspects of travel behaviour, decisions about paying are never simply an outcome of a rational evaluation of the information available. While price is important to each of the respondents cited below, many of them occasionally paid more than what might be considered objectively necessary - sometimes because it felt right in the circumstances, and sometimes simply through miscalculation. Economic decisions were thus not immune to emotional, affective, embodied factors, to whims and experiments:

Walk+Tram » Metro+Walk	⌚ -30	₪ -0.15
I'm a bit spontaneous. In a given moment, I might walk past a ticket office, see there is no queue, and just walk in on a whim and put ten journeys on my carnet card. (Emma, 2014 02 04 PM)		

The second point is a related one. Not only is the purchasing decision more than a straightforward reflection of what are traditionally framed as travel 'choices' (Barr and Prillwitz 2014). Once bought, a ticket or travelcard inevitably shapes the behaviour in question, by influencing the options available in terms of both mindful choice and practical repertoire. As will be discussed shortly, a metro-only travelcard was likely to reduce one's propensity to use trams and trolleybuses, while an all-network travelcard could encourage opting for short rides over walking. Thus, the outcome of the transaction constrained and modulated the parameters of the metro commuter's everyday mobility domain. In addition, the experience of the transaction often shaped how the metro as a whole was experienced and valued. It therefore makes sense to examine closely what happens before, during and after the transaction in which the commuter acquires access to the metro.

Sofia's post-1989 approach to semi-integrated public transport governance, the frequent changes in legislation, and erratic decision-making, have together brought about an exceedingly complex ticketing system. Its intricacies relate both to points of sale and to the products on offer. There are four separate transport authorities in Sofia, with their own administration, budget and approach to ticketing: one for buses, one for trolleybuses and

trams, one for the metro, and each of these reporting to one overarching but separate body, the Sofia Urban Mobility Centre (SUMC).

SUMC oversees all public transport management, as well as parking enforcement, and is responsible for those ticket offices which are not inside metro stations. Metro tickets can only be bought inside metro station ticket offices, but a monthly travelcard covering all modes including metro can be purchased at a SUMC office and not at a metro one. Inside the metro station and only if buying a single ticket, passengers can choose whether to buy it from the ticket office or the ticket machine (Figure 6-3). Until February 2015, these machines accepted only coins.

There were over 50 SUMC ticket offices in Sofia in 2015. However, over half were located in the city centre, and only a handful opened on weekends. Queues would form in front of many ticket offices, particularly during rush hour. As a result, learning to plan ahead for the transaction was an important part of learning to commute by metro. Only three of the 20 core respondents had been using Line 1 regularly when Line 2 of the metro opened in August 2012. The experience of the majority of respondents in learning how, when and where to buy metro travel documents served as a reminder that while public transport interactions including those with tickets and travelcards are material, embodied and situated (Bissell 2010), the participation of the mind needs to be theorised as an important part of ticketing as transaction:

Tram+Walk » Metro+Walk	⌚ -20	💰 +0.41
<p>I have a monthly travelcard for the metro only. It expires on 9 July – I am so certain, because I only just renewed it yesterday. I renewed it near Serdika on my way back, even though that means I spent the morning fare in vain. But I can't recharge it here at the Nadezhda station. You can only do the ones where you have number of trips, not the monthly ones. And then if you need a new plastic card issued, there is even fewer offices that do that. (Toni, 2014 06 11 AM)</p>		

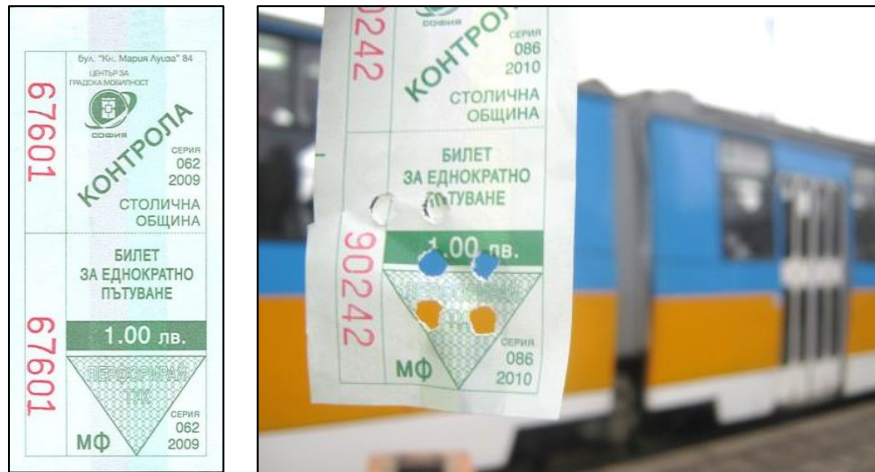
Toni's summary highlights the range of locally specific knowledges and skills required of a commuter seeking to negotiate notions of convenience, economic utility, and access to mobility, through the act of opting for a particular travel document. Many of the commuters had such frustrating encounters with the complex ticket and travelcard vending system, despite the fact that 17 of the 20 had more than 10 years' experience of living in Sofia, and navigating its transport system. In terms of valuing the expansion of Line 1 and the addition of Line 2, this ticketing landscape highlights how the utility of infrastructure projects can be comprehensively considered when framed in terms of the networks they become part of. Thus, the complexities of ticketing probably eroded some of the perceived utility of metro

commuting compared to private modes, the addition of metro tickets and travelcards to the list of available fares in turn added to the potentially discouraging complexity of Sofia's public transport ticketing.

6.3. Between the ticket and the travelcard



A single ticket valid only on the Sofia metro. Photo by author.



A single ticket valid on bus, tram and trolleybus only. It can be bought in advance, although is occasionally available from drivers and ticket machines on board. Has to be perforated on entering the vehicle and a new ticket is required when transferring. Source: Ikonomika.org and Denislav Georgiev, www.denislavgeorgiev.eu



1) A single metro ticket; 2) Anonymous and named (photo not visible) travelcards for all types of public transport (each of these can cover a period of time from 1 to 12 months, and either a single bus/trolleybus/tram line, or the entire network); 3) A blue carnet travelcard which can hold only pre-paid metro tickets (multiples of 10), giving a 20% discount on the price. Source: BNR.bg

Figure 6-4: Types of public transport tickets and travelcards in Sofia as of 2015.

Transport economics suggests that the travel document the commuter opts for is a reflection of what they can afford, on one hand, and the travel needs they are looking to satisfy. At the same time, research has largely been unable to quantify the connection between travel document type, and price elasticity (Paulley et al. 2006:299). Transport planning scholars have recognised that fare types are significant, but in highly contingent ways, framed by the specificities of local contexts and infrastructures (Gkritza, Karlaftis, and Mannering 2011). The difficulty in quantifying these is arguably due to the fact that price and travel demand are linked in complex and co-constitutive ways from the perspective of the transport user:

Walk » Metro+Walk	⌚ -56	₺ +0.32
I don't need a travelcard for those other kinds of public transport, because I don't use them. And the other way around - I don't have a travelcard for those modes, so I try to avoid them. (Maria, 2014 02 11 PM)		

Walk+Tram » Metro+Walk	⌚ -30	₺ -0.15
In October it was cold and rainy. So I stopped cycling and bought a monthly travelcard. And even though the weather then got better, I had a travelcard already, so I just kept getting the metro. (Emma, 2013 11 7 AM)		

In this sense, the ticket and travelcard not only enable entry to a pre-defined metro system, but configure it for different types of uses and different kinds of utility.

First, let us examine the range of travel passes available to metro commuters. Reflecting Sofia's rather head-spinning transport organisation, in 2015 the SUMC website listed a total of 42 types of tickets and travelcards. Two different kinds of paper single tickets are sold in the city; one can be used on the metro only, the other one, only on ground-level modes. As can be seen in Figure 6-4, they look different, but both cost 1 lev. The metro ticket has a barcode which is scanned at the metro ticket barriers. Bus/tram/trolley tickets are bought in advance from a range of different outlets - occasionally, drivers do sell them, but most Sofians would not rely on this outlet. On boarding, the bus/tram/trolley ticket has to be

perforated in antiquated perforators located throughout the vehicle, thus making the physical performance of ticket use feel different to that involving the metro. To make matters more complicated, some trams and trolleybuses have recently installed self-service ticket machines: these accept 1-lev coins only and produce a third different type of single journey ticket, which is digitally stamped and does not need to be perforated. Unlike the bus/tram/trolleybus ticket, the single metro ticket is printed with a barcode at the time of purchase, and is only valid for 30 minutes from that moment. Humans are not the only ones to need a ticket to ride on Sofia's public transport. Bicycles (which are only allowed on the metro after 9pm and on weekends), luggage over 50x50x40cm in size, as well as pets, require a separate ticket.

Apart from single tickets, there are different types of travel cards which can be used to access the Sofia metro. One is a simple 'carnet' type card (in blue in Figure 6-3), which is an electronic card capable of carrying a number of single-journey tickets in multiples of ten. The carnet card reduces the cost per journey from 1 lev to 0.80 lev. The other two types of travelcard are period-based, and can cover a month, three months, or 12 months. Furthermore, they can cover the metro only, a single line of bus/tram/trolleybus only,⁶ or the entire network. The only difference between the two types of period-based travelcards is whether they are personalised, with the name and photo of the only person who can use them, or non-personalised, and thus legally transferrable. In 2015, the metro-only travelcard cost 35 levs for a personalised, or 42 levs for a non-personalised card. Period-based travel cards also have different concession rates for students, retired people, people with mobility-limiting conditions, and other categories of citizens, such as war veterans.

Unusually, the cost per journey did not decline progressively with the longer-period travelcard purchased. In 2014, twelve personalised monthly travelcards for the entire network were cheaper than one annual pass (Sofia Urban Mobility Centre 2015). This policy was probably appropriate in the economically turbulent 1990s and 2000s, when near-monthly surges in inflation would have rendered the sale of annual passes disadvantageous to the transport authority. However, its persistence to this day can erode the ability of commuters to create valued commuting arrangements. I will return to this issue at the end of the section.

⁶ This is due to the fact that for the purposes of ticketing, SUMC treat the metro as one line, since it is possible to transfer seamlessly between Lines 1 and 2.

Among the commuters I interviewed, the choice between travelcard and single ticket was not necessarily about the weighing of arguments. This ‘choice’ was in fact a negotiation between mind, body and technology, which took place in the continuous flux of the passenger’s mobility arrangements on one hand, and the transformations of transport infrastructure on the other. As noted above, three of the 20 commuters were already using the metro regularly when Line 2 opened –they had been taking a bus, or walking, to a Line 1 station and continuing by metro from there. As a result, they already had the knowledge required to navigate the differentiated functions of SUMC and metro ticket offices. Assya, Gregor and Natalia were already using monthly metro travelcards in August 2012. For everyone else, the transition to metro involved an initial period of buying single tickets from the metro ticket office on entry. When those unfamiliar with the metro system entered it on their first days as metro commuters, walking up to the ticket booth and buying a single ticket was the obvious way of getting access to it.

However, the first time the new metro commuter opts to switch from ticket to travelcard is an important step, from the perspective of the passenger, as well as from the perspective of the Sofia Metropolitan (metro authority), as it represents a significant moment in the potential gradual entanglement between the commuter, and the new infrastructure. It is therefore important to examine the spatial, temporal, economic and affective dimensions of this first transition from single tickets to travelcards.

Importantly, the economic incentive to switch from ticket to travelcard proved relatively insignificant in the case of the Sofia metro:

Walk+Tram » Metro+Walk	⌚ -30	💰 -0.15
<p>To start with, for about 4 months, I was using single tickets. I’ve had a travelcard for two months. I’m a bit disappointed, it doesn’t seem that much cheaper. The travelcard is 35 leva, the single ticket is 1 lev. (...) At the moment, all I save is 5 leva a month. And I guess the fact that I don’t have to look for change every morning when getting into the metro. (Emma, 2014 05 31 PM)</p>		

Emma’s point about not having to spend time looking for change and buying a ticket every morning, is a significant one, especially when considered from the long-term perspective of an activity repeated over many days, weeks and months. She was one of 17 participants who bought single tickets to begin with. The fact that she continued doing so for four months (a total of six commuters were still using single tickets several months after the metro became their regular mode), points to the ‘stickiness’ which characterises the ticket as a

technological artefact, its materiality complicating the view of it as a rational economic transaction (Conradson and Latham 2007).

There was more to the persistence of single tickets than the ‘power of habit’ a notion which can blackbox processes of socio-technical entanglement, thus precluding any explanation instead of offering one (Aarts and Dijksterhuis 2000). For some, the single ticket’s stickiness manifested itself through the affective properties of its price, equal with the single ticket price on buses, trolleys and trams at 1 lev. The public transport single ticket price had remained unchanged since 2008, a stability which followed two decades of frequent price hikes, and which made the 1 lev coin synonymous with a journey (Dnevnik 2009). Despite repeated efforts by Sofia Municipality to increase the price to 1.20, the rounded simplicity and convenience which came with the 1 lev price helped it to endure. These meanings worked through, and were amplified by, the material properties of the 1 lev coin, similar in appearance to a £2 coin, but widely available and with purchasing power around the ‘cheap cup of coffee’ mark, 1 lev per journey simply ‘made sense’:

Tram+Walk » Metro+Walk	⌚ 0	₾ 0
I don't have a travelcard. The metro ticket is cheap, and also it's a convenient amount, just 1 lev, a single coin, very easy. (Vladimir, 2013 05 10PM)		

Walk » Metro+Walk	⌚ +60*	₾ +2.27*
<p>Nikolay: I don't know how much the travelcard is, where to get it from, or whether it is worthwhile for me to have one. I don't know if I make enough journeys in a week.</p> <p>Anna: Can't you get a carnet-style travelcard? You get 10 journeys for 8 levs, and there's no time limit.</p> <p>Nikolay: That would be worthwhile, 2 lev in savings per week; that's 2 lev after all! I guess I was a bit lazy to check this kind of information online. 1 lev for a single ticket feels so reasonable, after all. (Nikolay, 2014 06 13 PM)</p>		

For other participants, this was not what shaped their persistence in using single tickets. While, as Emma pointed out earlier, a travelcard can be a time-saving device from one perspective, from another it was the single ticket that saved time and effort. For example, Lilly explained her preference for the single ticket by contrasting it with the complexity of vending arrangements, described in section 6.2:

Walk+Minibus+Trolley » Drive+Metro+Walk	⌚ -30	₾ -0.27
I still haven't gotten around to going to one of the offices that issue		

travel cards. Do they open on weekends? That's when I can go. I'm not sure how they work. I want to have a monthly travelcard that is for the metro only – that can be done, right? (Lilly, 2013 10 18 AM)

Thus, on one hand, single tickets could offer simplicity and flexibility which new metro commuters could welcome. However, single tickets also brought to the journey ambiguities and uncertainties which were not characteristic of travelcards, and which were amplified for new commuters through their lack of experience with the metro infrastructure. From this perspective, single tickets could add small yet grating anxieties and annoyances to the daily commute:

Tram+Walk » Metro+Walk	🕒 -20	💰 +0.41
<p>The metro ticket is valid only 30 minutes. Does this mean you have 30min to enter, or that your journey can only be 30min in duration? In rush hour I see that the women in the ticket offices have lined up some tickets which they have printed in advance and they sell them to people. My friend once got a ticket which was issued 14min earlier! So we were wondering – have they calculated that from end to end it takes less than 30 minutes, and that's why they've organised it that way? It's a bit strange and a bit off, I think. Imagine I buy my ticket, but then I realise, that I need to go back to buy cigarettes. If she has sold me a ticket issued 15 minutes ago, and there is a queue at the shop, the ticket won't be valid anymore. (Toni, 2014 03 26 PM)</p>		

Apart from affording a type of embodied certainty of access which single tickets did not have, a travelcard configured the metro infrastructure to offer a qualitatively different kind of flexibility. This often had to do with the ability to diversify one's commute in spontaneous and potentially pleasant ways. This could alter the worth of the new infrastructure to the individual service user, by generating new uses and new kinds of utility. One example of this is the way a travelcard for the metro opened up the underground spaces as alternative routes through the city in bad weather. This was made possible through the architecture of many of the stations of the Sofia Metro, which includes long platforms, just below ground level, and parallel to the main roads overhead. On several occasions, when both the respondent and I had travelcards, we were able to use this way of progressing along our route while staying sheltered from the rain (Figure 6-5).



Figure 6-5. The long platform at NDK which I and respondents used repeatedly in bad weather, to avoid having to cross a large open space. 13 September 2012. Photo by author.

Another interesting set of practices shaped differently by tickets and travelcards, were those of walking. In several cases, taking a walk was a practice facilitated through travelcards which can seem relatively minor, but which carries interesting implications for the comfort, stress and broader public health effects of metro commutes. Four of the participants frequently left the metro briefly on their way home, typically in the city centre, shopped or simply took a stroll, before re-entering the metro a bit further down the line.

Public health research has repeatedly highlighted the detrimental health effects of sedentary urban lifestyles, and the importance of walking for countering them (Pucher and Buehler 2010). A number of studies have explored the effects of different transport modes on the propensity to walk, and it is evident that regular drivers walk shorter distances and less frequently than public transport users (Yang and French 2013). Further differentiation could be made among segments within the wide category of public transport users, and exploring the effects of different approaches to ticketing on walking practices is one direction which has been pursued in this area (Sharaby and Shiftan 2012:69). It is often assumed that travelcards would have a limiting effect on walking, since they enable

travellers to take unlimited additional journeys on public transport, replacing even very short walks. One participant's experience confirmed this view:

Walk +Tram » Tram+Metro+Walk	⌚ -20	💰 0
If I have a bit more time, I probably would go on foot to the metro station. But I haven't tried that yet. Or if my travelcard was only for metro, not for the entire network. (Irina, 2014 07 18 PM)		

What buying a ticket actually gives access to is more ambiguous than a unitary notion of a network or a service might imply. Depending on the type of ticket, the circumstances, their thought and embodied intentions, what the new metro commuters gained access to on a particular day could cover only a fraction by the metro network, or in other cases, could exceed it.

However, most empirical findings from Sofia showed this perspective to have limitations. Crucially, it oversimplifies the diverse situated practices which urban walking involves, and the multidirectional linkages between the commuter's walking habits, travel budget and cashflow constraints, and the urban environment. Using the conceptual vocabulary of meaning, skill and materials, developed by social practice researchers (Shove, Pantzar, and Watson 2012), the minute interactions between the travelcard, and the kinds of walking practices it enables or precludes, can be grasped.

Walking as part of a public transport commute is generally thought of as happening at either end of a bus/tram/trolleybus/metro journey. A small amount of walking to and from stations or stops is indeed intrinsic to public transport mobilities. In the UK, public health interventions have been implemented which encourage passengers to 'get off the bus a stop early,' in order to boost the physical activity levels of sedentary urbanites (Action Tracker undated). Such an intervention could be effective regardless of the type of travel pass used by passengers.

However, in the Sofia context, the travelcard acquired a different kind of meaning for walking as part of commuting. The importance of the quality of the urban environment to walking should not be underestimated (Townshend and Lake 2009). Considering the local context in terms of meanings and materials, getting off one stop early is not a viable option for the majority of Sofia-based commuters I interviewed. Several of them had a very specific idea about when and where they could walk:

Cycle » Metro+Walk+Tram	⌚ 0	💰 +2.27
When I am stressed, I pick the longer [walking] routes. And they have to		

be in the city centre, not in my ugly neighbourhood. It's a beautiful setting here. I think about nicer things here, it's like a trip. Also, I look at the shops, I think about doing some shopping soon. I know all the shops along this street. (Rumen, 2013 09 13 PM)

Rumen and three other respondents stated that they were reluctant to get off one stop early and walk in their own neighbourhoods. As most Line 2 commuters live in the Socialist-era high-rises in north Sofia, they found the idea of walking the last kilometre or so to their home unappealing. The perceived ugliness of the environment meant that those respondents who wanted to incorporate walking into their commuting wanted to do so in the city centre, which they felt was greener and visually more diverse and pleasing. For these commuters, this meant getting public transport into the city centre, then walking, then getting public transport again. As a result of this, incorporating walking into the commute was only possible for passengers with a travelcard.

Walk+Bus+Bus » Metro+Walk	🕒 0	💰 0
I guess if you don't have a travelcard, it's quite a disadvantage. You have to calculate a lot more, you can't just <i>get off somewhere in the middle</i> and walk and then get on the metro again. You would maybe get off the station before your own, if you wanted to walk." (Raya, 2014 06 17 AM; my emphasis)		

Walk+Bus+Metro » Metro+Walk	🕒 -40	💰 0
That [the travelcard] is what gives me freedom. If I leave my travelcard at home it's like... it's like when I leave my phone. I don't know. I'm lost. (Gregor, 2014 06 9 AM)		

On the other hand, as discussed above, travelcards could pose a cashflow challenge in terms of having to pay for monthly travel upfront. This is an aspect which can elude an economics-centred analysis which may prioritise the lower cost per journey travelcards typically offer compared to single tickets. This difficulty was eased to some extent by a particularity of the SUMC travelcard system, which allowed for travelcards to be renewed before the existing period had expired:

Walk+Bus+Metro » Metro+Walk	🕒 -40	💰 0
The travelcard is the first thing I buy, even in advance of it expiring. So for instance now it's [valid] until 23 July – it was already charged until 23 June, but I still added another month. I keep putting another month, when I remember and when I have a bit of cash. That's what gives me freedom. (Gregor, 2014 6 19 AM)		

However, in several other respects, the ticketing policies of SUMC and Sofia Metropolitan constrained the all-important initial transition from single ticket to travelcard. When first contemplating a travelcard, new metro commuters have a *sense* of the economic implications of different travel documents for their personal mobility practices. This sense was partly based in, but also exceeded, their differentiated prices and costs per journey. As the travelcard offered only a small saving, the economic incentive to search for alternatives to the single ticket – an activity which requires active engagement and sustained effort, as shown the discussion of vending complexities in section 6.2 – was fairly small. While complex multimodal commutes involving multiple transfers could easily be made more cost-effective by a monthly travelcard, a commuter who did not travel much beyond the ‘metro to work and back’ workday journey, stood to gain relatively little. At this stage, commuters only had embodied knowledge of using a single ticket, based in their own direct experiences, but only limited knowledge of what they might gain through the kind of minute affordances of travelcard use discussed above. In the context of a shortage of practical knowledge, the more limited rational-economic knowledge plays an influential role. As a result, accessing the travelcards’ qualitative benefits may be prevented or delayed, due to the Sofia transport authority’s travelcard discouraging pricing policies.

6.4. Tickets as mediating infrastructures



Figure 6-6: Ticket barriers at Sofia metro entrance. 14 September 2012. Photo by author.

Once purchased, the travel document acts as a ‘mediating infrastructure’ (Furlong 2011) on entering the metro: as the key which unlocks particular capacities and configurations of the metro to a passenger, ‘activating’ the metro as an infrastructure for commuting through their material agency (Bennett 2010). In requiring ticket validation on entry, the metro is unique among the public transport modes in Sofia. As Chappells and Shove (1999) have argued in relation to the domestic dustbin, tickets and travelcards come alive through their use at the entry gates, shaping the arrangements they become a part of, and the skills and knowledges they require. In these interactions, the distinction between the social and the technological become blurred (Barry 2001). For the study participants, adopting the metro meant not only a potentially different cost per journey, it also meant using a new type of object, in new ways, since in Sofia, a metro ticket looks and works in a way that differs from ground-level transport tickets (Figure 6-4).

Sofia metro tickets and travelcards are validated on entering the metro system, at the ticket barriers. Having been built over an extended period of time with the involvement of different decision-makers and business stakeholders, the Sofia Metro has ended up with a

large variety of different ticket barriers. Each contractor opted for a different barrier manufacturer, and there had been no discussion of coordination as of early 2015:

Drive » Metro+Walk	🕒 -50	📍 -2.04
<p>What I did find confusing in the beginning was all the different places you have to touch your card, or insert your ticket. My cousin complained how embarrassed she felt when she was standing there struggling! Like a provincial person! (Tanya, 2014 02 14 AM)</p>		

Two examples of ticket barriers on Line 2 are shown in Figure 6-7 below. The design of the turnstiles is significant for the experience of entering the metro. The retractable flap design illustrated in the top photograph is arguably more accommodating to the range of bodies present on public transport (in terms of body shape, but also in terms of height, baggage and agility). As exploration of turnstiles on the NYC subway demonstrated, the more secure ticket gates appear to be, the more likely they are to pose a barrier to many types of passenger body (Molotch and McClain 2012). According to my observations, this insight appeared to apply to the Sofia metro too.

At all types of entrance ticket barriers across the system, the ticket and travelcard reader are always on the left-hand side. The origins of this unusual catering for left-handedness in public space could not be explained by the officials I spoke to:

Walk » Metro+Walk	🕒 -56	📍 +0.32
<p>It is weird that they are left-handed, the barriers. It's not very convenient. I hold my wallet in the right hand, so I end up validating my card across, like that, and entering shoulder first.</p> <p>In the early days, I often got confused, trying to validate on the right and trying to enter through the next barrier along. And also, the barriers are different, so the location of the validator was confusing too. (Maria, 2014 02 11 PM)</p>		

As any technology, travel passes are also rich in ambiguities and contingencies. The same artefacts can produce different outcomes in different situations, enable outcomes, as well as constrain them (Arnold 2003). These ambiguities can have a significant impact on how everyday journeys unfold, what they feel like, and the affordances which the metro system can make available to commuters. An illustration of this are the contactless validators which are installed at ticket barriers, and increasingly, on trams and trolleybuses.

The electronic contactless readers on ground-level transport are generally older and more temperamental than those on the metro. Through trial and error, most respondents discovered that they were often unresponsive to the globally recognised time-saving

practice of the experienced commuter – validating one’s travelcard by touching one’s wallet on the reader, instead of taking out the card itself.

However, the card readers on the second metro line proved more reliable and responsive to this practice. As part of becoming knowledgeable and skilled at the metro commute, 12 of the core respondents were observed to gradually adopt this practice:

Walk » Metro+Walk	🕒 -56	💰 +0.32
I validate my card through the wallet. I have had a travelcard since September, and in October my colleagues from University told me that it can be validated without taking it out, just by touching your wallet. I had seen others do it, but just through the thin plastic cardholders, not wallets. So I started doing it too. (Maria, 2014 02 11 PM)		

The technological interaction between card, wallet and commuters was one of several micro-practices which demonstrated the skilfulness of daily mobility (Edensor 2011; Ingold 2000). A further poignant example could be glimpsed among the stream of commuters exiting metro stations during morning and evening rush hours.

Metro exits are equipped with turnstiles, which ensure (or, as will be discussed shortly, try to ensure) that entrance is only possible through the ticket-validating entry gates nearby. The exit turnstiles do not require ticket validation, but they do create a physical barrier which slows movement and is prone to bottlenecks at busy times:

Drive » Metro+Walk	🕒 0	💰 -3.36
The exit barriers can be irritating. They swing back after the person in front and hit the person walking behind them. It’s not a massive pain, but it can be annoying. Unpleasant. (...) If there was validation on exit, there would be even bigger queues in rush hour. (Anton, 2014 01 10 AM)		

During our ride-alongs, Anton made a point of holding the turnstile as he crossed it, to ensure it does not hit the person entering it after he has passed. Alongside validating travelcards through wallets, this was an example of the many skills commuters gradually developed for navigating the physical artefacts of the metro through which its approach to ticketing was enacted. However, the skilled nature of these practices should not obscure the fact that they add to the frictions of the metro commute which over time can become “annoying,” in Anton’s terms, or stressful, in David Bissell's (2014).

In the future, the Sofia metro could remove the exit barriers and thus do away with the rush hour bottlenecks and embodied annoyances of their presence. However, as exit and entry barriers are adjacent in most stations (Figure 6-7), removing the former would not be viable

without removing the latter. In practice, this would mean introducing an honour-based system to the Sofia metro, which requires the purchase and validation of tickets, but it is up to the service user to validate them, and access to the trains is not physically restricted. A number of European capitals with similar population sizes currently operate such systems on their underground rail networks, including Berlin, Brussels and Prague. This would also bring the metro in line with the approach to ticketing on ground-level transport in Sofia.

The metro's exit turnstiles have a two-way connection with its current ticketing infrastructure seen as a socio-material setup. The metro map in Sofia is not divided into fare zones, and official documents and public discussions as of 2015 have not indicated that such zones are foreseen. On one hand, the absence of validation on exit reflects the metro's established flat fare. On the other hand, the costly material presence and permanence of physical infrastructure such as a particular type of exit turnstile solidifies the existing setup, and makes it more likely to endure. In transport infrastructure research which draws on STS and anthropology theories of technology-in-use, this is known as the obduracy of infrastructure (Latham and Wood 2015). The obduracy of the entrance and exit barriers is one factor which reduces the likelihood of re-imagining, and re-configuring, the Sofia metro as an honour-based system. Another important factor is the current political, cultural, practical and economic dynamics around fare evasion on public transport in Sofia. These are examined in the next section.





Figure 6-7: Different types of ticket barriers in the Sofia Metro. The second photograph shows the entry (left) and exit turnstiles in their typical position next to each other. September 2012. Photos by author.

6.5. Fare evasion and mundane mobilities

While the connection between ticket and ticket barrier mediates the infrastructure that is the metro, in fact it is not something without which the infrastructure cannot be ‘activated’ and mobilised for one’s uses. Many of the study participants initially saw the metro as immune to fare evasion, but gradually, the actions they observed, and sometimes their own actions, proved it to be otherwise. As a result, several participants expressed their worry that non-paying passengers undermined the sense of civility and community they valued in their metro commute. By extension, this had the potential to undermine the perceived value of the new metro infrastructure.

Fare evasion has been widespread on the trams, trolleybuses and buses of post-Socialist Sofia throughout the last two-and-a-half decades (Dnevnik 2009). Non-payment on public transport is a politically charged, and profoundly contentious topic. Authorities have repeatedly blamed fare evasion for underinvestment in the system, and the subsequent rapid decline in the quality of the service. This argument was echoed by Lilly, who is a diligent fare payer:

Walk+Minibus+Trolley » Drive+Metro+Walk	⌚ -30	₪ -0.27
How can the public transport get any better, if no-one is buying tickets? (Lilly, 2013 10 18 AM)		

In turn, many Sofia residents, including the better-off, will bluntly state that such a poor service does not warrant the fare, particularly since no-one else seems to be paying it anyway:

Walk+Bus+Metro » Metro+Walk	🚇 -20	💰 -0.82
<p>On some bus lines there are still old <i>Ikarus</i> buses – especially in peripheral neighbourhoods populated mostly by Roma people. There no one punches a ticket and ticket inspectors never get on, and as a result the bus fleet is never renewed, as some kind of unspoken agreement. The municipality is punishing them, there is a segregational element. But the strongest aspect is the financial one, because these people find it hard to afford tickets, especially when the bus is practically free for them. It’s definitely true that to the Bulgarian, it’s a novelty to have everything regulated and that it is mandatory to pay, in order to get in. Many people say about the bus – why should I pay, if the service is terrible. (Natalia, 2012 09 3 PM)</p>		

Among the core participants and background interviewees, many appeared to single out Sofians of minority Roma origin as the main culprits. The debate on fare evasion thus often moved along existing societal ruptures and impasses, reflecting them as well as aggravating them:

“Compared to people on the buses, it is much better on the metro. Maybe the fact that you can't enter without a ticket plays a role. Because on buses a lot of [Roma] get on and don't pay, and generally, as an atmosphere, it's pretty bad.” (One of the core respondents, in interview conducted in 2014)

The persistence of racist stereotypes in public and private conversation in Bulgaria is beyond the scope of this research project, however far-reaching the damage they cause. In a small way, the following discussion seeks to counter them through the empirical findings it presents. Following Smith, Phillips, and King (2010), it is possible to conceive of rule-breaking behaviours not as a reflection of identities and personal or collective backgrounds, but as emerging through the circumstances, opportunities and constraints, which are specific to situations and interactions. This argument is useful in interpreting the wealth of fare evasion accounts I collected from respondents, none of whom identified themselves as having a Roma ancestry.

When fare evasion is conceptualised as a situated practice rather than a reflection of outlook, disposition or identity, it is possible to account for its variability. While none of my respondents were systematic fare evaders, several were quite capable of applying a selective approach to paying. The method of the ‘not-quite’ evasion was especially likely to be mentioned by people who have a metro-only travelcard, and who occasionally need to use a bus, trolley or tram:

Tram+Walk » Metro+Walk	⌚ -20	₹ +0.41
Usually I have a monthly travelcard for the metro only, as I don't use the other public transport much. If I do, I just buy a separate ticket – or travel without a ticket, if it's just for a stop or two. (Toni, 2014 03 25 AM)		

The above quote highlights a discrepancy between the governing of the ticketing system and the way a passenger might see it through their everyday interactions with it. From Toni's perspective, she had already paid for a monthly card, and could thus allow herself the small disobedience of not buying any additional tickets: overall, she was 'doing her bit.' However, from the perspective of ground-level transport modes, the relative impenetrability of the metro could contribute to a further deepening of their own revenue crisis. From the perspective of the body, fare evasion on the metro is more inconvenient than fare evasion on buses and trams. As a result, partial payers such as Toni would be generally more likely to pay for a metro-only travelcard, topping up their use of the metro with occasional 'free' bus/trolleybus/tram trips as needed. With the persistence of devolved governance of modal networks, the value of metro infrastructure expansion ran the risk of being seen in terms of a zero-sum game: the more popular the metro and the more enforceable its fares, the more visible the erosion of ridership and perceived economic sustainability of other public transport modes. Instead, a growing recognition of the multimodal nature of urban mobility might help highlight the extent to which such an outcome, or indeed framing of the issue of viability, would be undesirable.

I observed another type of 'not-quite-fare-evasion', practiced by commuters travelling with children. As of January 2014, children were allowed to travel on all public transport for free, but required an annual travelcard to be issued which could be validated and shown to ticket inspectors. However, multiple observations at metro entrances showed children crouching through the barriers or slipping in through the exit turnstiles, with the visible consent of parents and metro staff. There appeared to be a consensus around the non-application of the new rule, and the visibility of the consensus contributed towards a particular kind of infrastructural set-up. Increasingly, there was a sense that the extremely supple socio-technical infrastructure of ticketing in ground-level transport had penetrated the metro, despite its greater technological sophistication. It also appeared that this informal arrangement improved convenience and efficiency to service users much more than observing the formal rules would.

As reflected in the anonymous interview quote above, it initially appeared to most Sofians that the metro’s use of ticket barrier technology made it difficult to access the service without paying. In discussions of fare evasion, respondents would often distinguish between ground-level public transport, where fare evasion was pervasive, and the metro, where it was ‘not possible.’ However, even machines with extremely narrowly defined and simple functions tend to manifest various ambiguities once placed in their practical contexts (Hutchins 1995). This became increasingly evident in the case of the Sofia metro ticket barriers, enabling me to observe, and record through participants’ accounts, the diverse skills, technologies and meanings mobilised in the practice of fare evasion.

Several respondents had their first experiences of metro fare evasion when travelling home later than usual. With the ticket office closed, the ticket vending machines often out of service, or only accepting exact change, it was not unusual to find oneself stranded outside the ticket barriers, sometimes with only minutes until the last metro home:

Drive » Metro+Walk	⌚ -40	₺ -2.18
In some cases, you want to buy a ticket for the metro, but there is no way to do it. (Janna, 2013 06 20 PM)		

Of course, this in itself is not a sufficient condition to evade the fare. If in such circumstances the technology was, or continued to appear, impenetrable, one might choose to walk, take a taxi or a bus, call a family member with a car, or turn to other alternatives available to them. Instead, Janna slipped through the exit turnstiles, which are usually immediately adjacent to the ticket-validating entrance barriers (see Figure 6-7). But how did she know to do this?

Earlier, I described the exit turnstiles as a device which is there to ensure that entry was only possible through the ‘correct’ gates. In reality, there were many, and growing in frequency over the course of data collection, observations of people entering through the exit turnstiles. The practice seemed to gradually spread (in ways similar to the practice of validating travelcards from within the wallet, discussed in section 6.4), mainly through talking to others, and by seeing others do it. Like many other metro passengers, I first saw the exit turnstiles being used in this way by none other than the metro staff themselves. Rather than carry their staff cards when they ‘nip out’ of the station, ticket office staff would simply tilt the exit turnstile and sneak back in through it. Having observed this take place dozens of times over the first few months in Sofia, I began hearing about passengers doing it too, and I also witnessed it in action:

“As we go into the station, Janna gets stuck in the entry gate – its bar had not opened fully when she first touched her travelcard on the reader, and it would not accept a second validation of the same card. Janna briefly

looks at the ticket office and seems to consider the option of explaining the situation, but quickly decides against it. Instead, she makes the two steps to the exit turnstiles, tilts the bar of one, and effortlessly sneaks in. There is no reaction from the staff.” (Research diary, 2013 08 13 AM)

As with many of the practices discussed in this chapter, the material and the social proved agile and responsive to each other, instead of stabilising into fixed and routine infrastructural uses. The Sofia metro authority soon recognised this, and responded with increasingly common ticket inspections inside metro trains, visibly acknowledging that a ticket barrier is a flexible and ambiguous, rather than an unyielding, artefact. Thus, commuters started noting that the affordances of the barriers’ design were conducive to this:

Drive » Metro+Walk	🕒 -50	💰 -2.04
Let alone the fact that someone [with a slim figure] like me could pass through the gap in the barriers without even disturbing the turnstiles! (Tanya, 2014 02 14 AM)		

Thus, the combination of its political prominence, relative ease, and relative impunity, resulted in fare evasion becoming a possible solution at the disposal of those stranded outside of, or caught in, the turnstiles of metro stations. No malicious intent, economic need, or political conviction in themselves could account for the resulting rule-breaking behaviour. Instead, generally law-abiding citizens found themselves in specific occasional socio-technical configurations which made fare evasion appear practical, feasible, and justifiable all at the same time. However, as Tanya’s observation also highlights, the current socio-material setup for fare evasion makes it accessible to particular groups: the slim, the agile, and the inconspicuous in the eyes of metro staff. An honour system would remove the physical barriers with their selective permeability and general ‘annoyances’ (section 6.4), but would pose an altogether different set of challenges.

Clearly, fare evasion on the metro had become increasingly widespread, despite technological solutions such as ticket barriers; and common across social categories and mundane uses, rather than the criminally inclined or destitute, or in exceptional circumstances. On the other hand, it could be argued that the presence of the ticket barriers did provide relative reassurance to many metro users that this was a system which was different to the notorious buses, trolleybuses and trams:

Walk+Minibus » Drive+Metro	🕒 -26	💰 +2.09
I was wondering how come there are ticket inspectors on the metro – if you're inside, it is to be expected that you have paid. But it is obvious that over here [in Sofia], there is always a way. (Nell, 2014 08		

Nell's observations echoed Molotch and McClain's (2012:76) research findings on the securitisation of the New York City subway: "system redesign may not end cheating or add to security, but it does alter the way to cheat and the kind of people who do it." Fare evasion is therefore built into every public transport infrastructure, no matter how highly securitised.

Crime and security studies research has often focused on determining whether the likelihood of being caught, or the severity of the punishment, is the most influential variable in the decision to avoid paying one's public transport fare (Clarke, Contre, and Petrossian 2010). Examining the situated nature of fare evasion offers an alternative perspective on the practice, one which attends to the social and technological factors which a focus on rational decision-making omits. In Sofia, the biggest concern for the metro authorities would be the risk of reproducing the downward spiral familiar from ground-level transport in Sofia: fare evasion which reduces revenues – loss of wealthy passengers who can afford them to private modes – further reductions in revenue and deterioration of service. In fact, urban public transport experiences from around the world demonstrate that this challenge presents itself in most cities, regardless of fare evasion and ticketing practices (Walker 2012). Therefore, further restrictions on car commuting would be a precondition for the success of an honour system on public transport, and arguably, for the economic and political sustainability of the metro. The empirical findings on existing practices of barrier use and fare evasion could serve as a strong argument in favour of an honour system, as they demonstrate that multiple ambiguities are already visibly present in the metro's ticketing infrastructure.

6.6. On-going transformations in ticketing infrastructures and practices

Earlier, this chapter talked about the transition from single ticket to travelcard as if it is a linear process. This was a necessary and temporary simplification, which highlighted the importance of the first metro travelcard purchase in the socio-technical links which accumulate between commuter and infrastructure. In this section, I reframe the debate in terms of the on-going renegotiations of which each purchase of a travelcard or ticket forms part.

Instead of being a relatively stable arrangement, many respondents' choice of travel document for their commute changed with surprising frequency. Commuters continuously

rethought, or stumbled upon, different ways to pay for their journey. They trialled alternatives, planned well ahead, or found themselves in circumstances which implied new ways of paying for journeys, or indeed, ways of not paying at all. As I will suggest in Chapter 8, adopting the metro as a transport mode for commuting was only one of many instances when change, whether ‘big’ or ‘small,’ complicated the idea of the commute as the ‘ultimate routine’ (Highmore 2004), by inviting in experimentation, variety and uncertainty of outcome.

The commuters’ on-going negotiations with their tickets and travelcards included, but were not limited to, their work commitments. Both Nadia and Nina reflected on the intricacies of this process in their interviews:

Walk+Bus+Metro » Metro+Walk	🕒 -20	💰 -0.82
<p>At first, I used carnet cards. Then I had a whole-network monthly card. At the time, I was dating someone who lived in [remote neighbourhood], it was about 2 years ago. [At present] at the start of the month, I try to think how much I am going to travel during the month, and choose between 32 lev for metro only, and 50 lev for the entire network. I think about the month ahead and what I will be doing, and decide if I will need the more expensive one. (Natalia, 2013 01 22AM)</p>		

Walk+Minibus » Drive+Metro	🕒 -26	💰 +2.09
<p>Until recently, I used to use a metro-only monthly card. Then, I started using the carnet card. I had realised that I hardly ever need to travel more than twice a day, so a monthly card made no sense. (...) Next week I will switch back to a monthly, as I am travelling a lot more lately and it is worthwhile. Next week I have a work trip, and after this trip I will buy it. I now go to the gym twice a week, so two days a week I use the metro four times per day. (Nell, 2014 01 7 AM)</p>		

It was evident from respondents’ accounts that irregular commuting patterns were especially likely to come with flexible ticketing arrangements. It also became clear that existing policies did not serve well the growing number of commuters who combine part-time work and part-time study, or work flexibly because of other types of commitments:

Metro+Walk » Metro+Walk	🕒 0	💰 +0.41
<p>[Between October and December] I was trying to work from home, so I wasn’t using the metro much. But then 1-2 times a week I needed to go to the office anyway, to pick up documents, files I needed, so on. So I decided not to get a travelcard, but just buy individual tickets. I</p>		

calculated that if I don't go to work and back every day, it is cheaper to get individual tickets.

Ultimately, I'm not sure it worked out as being cheaper. Just then, there was more stuff to do, so I ended up going to the office a lot more often than I had expected. (Assya, 2014 02 12 PM)

Walk+Tram » Metro+Walk	🕒 -30	💰 -0.15
<p>I bought a bicycle, so now I don't use a travel card, I buy individual tickets. I still use the metro once a week, when I need to carry something like an expensive camera, for example. It's not the same day each week, but there's always at least one. Or for instance, recently I had a lot of work, it was very stressful, I was sleeping two hours per night. When I was feeling that way, I couldn't possibly cycle. I just got on the Metro and fell asleep. (Emma, 2013 08 9 AM)</p>		

Both the social and the material arrangements of a public transport infrastructure change all the time. Sometimes, they change in response to each other, either through deliberate decision-making on behalf of human agents, or through the material agencies which emerge through infrastructural interactions (Latour 1991). Similarly, commuters often had to work and mobilise their emerging, both discursive and embodied, knowledges of the metro infrastructure to make the best of it in light of changing circumstance. From the perspective of policy-making for socially and environmentally sustainable mobility, the Sofia transport authorities are limited in the extent to which obdurate infrastructures could respond to the irregular commuting patterns and complex linkages between work and non-work trips discussed above. However, a number of opportunities to orientate the on-going transformations of transport technology closer to the changing practices of its users do exist. This has the potential to increase the convenience, and reduce the frustrations and labours, of public transport use in general, and metro travel in particular. The annual holidays taken by many Sofia commuters, and the cyclical changes in ticketing they encourage, are one such case in point.

Sofia is the kind of city where work activity slows down to a near-stop in the month of August. Long holidays are typical of this time of the year, with most urban residents leaving the city for the seaside, spurred by average high temperatures of 27°C. This was reflected in the cyclical re-arrangement of ticketing practices of the interviewed commuters:

Drive » Metro+Walk	🕒 0	💰 -3.36
<p>I use a monthly travelcard for the entire network. Because I also need to use various kinds of transport when I have to go places during the working day. (...) I sometimes buy a metro-only travelcard, for example in August. I knew that I wouldn't have many trips to</p>		

[business] partners etc, as most people were on holiday. (Anton, 2013
10 01 AM)

The reorganisation of ticketing during the month of August was a concern for 12 of the core respondents. The current technological capacities of the Sofia metro could accommodate this necessity with relative ease. A reform of current pricing policies for annual passes, discussed in section 6.3, could introduce the option for an 11-month public transport travelcard. Provided it is competitively priced to offer a greater saving per month than 11 monthly travelcards, an 11-month 'almost-annual' pass could encourage a long-term commitment to public transport use which accommodates the specificities of Sofia's working year.

Conclusion

Metro tickets are generally thought of as objects which ensure access to a transport network, by providing proof that a transaction has taken place. In this chapter, the relationship between payment (as having both a numerical and a lived expression) and access was examined in more detail. Commuters incorporated different prices and types of access, mobilising them for different uses of the metro network (such as being able to avoid the Serdika transfer, by leaving the station and crossing above ground; or doing less or more walking based on combined considerations around route, weather and type of ticket).

The purchase of a travelcard influences subsequent travel behaviour, and therefore encouraging new metro commuters to purchase travelcards as quickly as possible can be beneficial in a number of ways. Travelcards can contribute a stable environment in which to grow and sustain different metro commuting practices, as well as to experiment with new ones, thus creating more embodied bonds between passenger and the new infrastructure. This process is not equivalent to 'habituation,' as it is not founded on an assumption that repetition in itself is a sufficient force for conditioning future behaviour. Instead, I have aimed to point to the stickiness and possibilities born out of the situated interaction of the human and non-human elements of the commute cost. This highlights the period of time required to develop the embodied skills for navigating travel time and space, and which can in turn open up a wider range of possibilities for making the commute a more valuable and comfortable time.

From the perspective of the passenger, the differences between single tickets and travelcards are both quantitative and qualitative, and the freedoms they afford are similarly better understood in terms of configuration than degree. However, from the perspective of

SUMC and Sofia Metropolitan, more could be done to use clarity of communication and economic incentives to encourage the first transition from ticket to travelcard, and subsequent adoption of longer-period travelcards. The existing disproportionately high cost of the 3-month and 12-month travelcards postponed further steps of long-term commitment to the metro, potentially depriving the transport authority of significant upfront revenue. Well-off passengers who were more likely to turn, or return, to car transport, were not given obvious opportunities to commit to a year of riding the metro to work instead. Some of the steps suggested in this chapter which could positively affect the value of the metro infrastructure for different groups of regular users included a simplification of the fare structure without sacrificing flexibility (i.e. retaining both period-based and carnet-style travelcards); the introduction of an 11-month travelcard; and giving consideration to an honour-based ticketing system.

Exploring the more-than-financial dimensions of cost from a passenger perspective is a necessary part of better understanding the complex connections between price, convenience, stress and habit. The experience of paying for public transport is manifold as well as frictional (for example, through the uncertainties built into barriers, readers and ticket inspections), and therefore has significant implications for the affective qualities of commuting. Thinking of the simple metro ticket as an infrastructure can illuminate the kinds of commuting practices it makes possible, and the kinds of interactions it precludes. In considering how the cost of travel is experienced and performed in commuting on the Sofia Metro, this chapter disaggregated the price of a ticket, situated it in specific daily interactions, and explored the effects it has on the lived experience of commuting.

In 2012, a journalist commented that the current ticketing system in Sofia combines practices from the 19th, 20th and 21st centuries (Todorov 2012). In fact, Sofia Municipality has been planning an overhaul of the ticketing system for some time. It intends to introduce a complete intermodal and integrated approach to ticketing. This approach would be based on distance or time, rather than on buying a new ticket for each mode boarded. This will involve a very different commuting experience on public transport, particularly for those whose everyday journeys involve one or several transfers, as well as for those whose journeys are less predictable in time and route. The introduction of integrated ticketing can be expected to be felt not only during the journey itself, but also in the timespaces where household budgets are planned and implemented, and alternative morning and evening routines considered. Generally, transport planners recognise that estimating the effects of fare integration is an extremely complex task (Sharaby and Shiftan 2012:64), and

introducing an ethnographic perspective on travel cost may appear only to complicate it further. However, there are a number of reasons why this is important. Questionnaires about how commuters would feel about a change in fare structures are likely to yield results of limited utility. This is largely due to the fact that the cost of commuting is an embodied and situated practice: as my interviews showed, commuters can find it difficult to imagine a new system of paying until they have experienced it in the context of their daily interactions. Understanding how pricing and ticketing are currently negotiated, and how change is handled in the domain of travel cost as lived experience, can in fact help make sense of the effects of innovative pricing strategies. As individual commuters already navigate both intermodality and cost variability, insights of how they make sense of them and embody them can widen the view of price beyond notions of elasticity and time/cost trade-offs in commuting.

Smarter ticketing infrastructure is geared towards predictability, stability, and transparency. High-tech solutions are often aimed at removing ambiguity, but different kinds of ambiguities are inherent in the use of every type of technology (Latour 1991). Accordingly, ambiguities are inherent in everyday mobility practices, and from the perspective of service users, they can even be desirable as implied by participants who value the spontaneity embedded in some aspects of their commute. Smarter infrastructure has occasional opportunities and different capacities to accommodate more spontaneity, experimentations, and variability. These three things are at the core of habitual mobilities, as I explore in more detail in Chapter 8. Navigating between predictability and variability is one of the challenges for the Sofia metro, when examined from the perspective of everyday mobility practices.

As discussed in Chapter 3, established cost-benefit analysis practice treats pricing as a separate decision process, which does not form part of the appraisal of the infrastructure. In many studies of transport network design, fares are set aside as an “exogenous” factor (Van Nes and Bovy 2004). When consideration is given to the idea of incorporating the cost to the service user in infrastructure appraisal, it is important to examine what conceptualisation of cost would inform such a step. Perspectives on technology from STS and anthropology can inform an inclusive view of cost, which encompasses not only the ‘How Much?’ of cost, but also the How, Where and When. Rather than running in parallel to ‘big’ decisions in infrastructure planning, pricing strategies mediate what and how commuters will do with new transport provision.

Just like a new metro line becomes meaningful and valuable only insofar as it becomes part of the wider network, so the metro ticket is more than an item to be added to a pre-existing list. The increased complexity of the transport network which came about as a result of the launch of Line 2 of the Sofia metro could have been explored as an occasion to revise and simplify the ticketing system, particularly since ticket and travelcard types had been added over a number of decades, with little consideration for the overall outcome. Particularly in the context of increasingly multimodal and integrated perspectives on mobility, which I will return to in Chapter 8, this could be one possible way of reconfiguring how new metro infrastructure is valued.

Chapter 7. Infrastructures of the rush hour: Sharing comfort, stress and habit

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Introduction: Framing comfort, stress and habit

The previous chapters looked at the new metro commute largely from the perspective of the individual, embodied and mindful, commuter. However, it is being with others that is probably the defining characteristic of travelling on public transport (Bissell 2010:275). Not only is travelling in close proximity to others central to the experience of transit; busy times have caused it to be seen also as one of its most severe drawbacks (Ceapa, Smith, and Capra 2012). Unlike the capsular privacy of the car, or the sense of freedom of the bicycle, public transport use at peak times involves putting up with, competing with, and simply having to listen to, watch, and smell, a large number of proximate strangers. Crowdedness at busy times is one of the main reasons for the stressfulness associated with public transport commutes. Its equivalent, traffic congestion, is a key contributor to stress among car commuters (Evans, Wener, and Phillips 2002); however, the embodied sensations of proximity and crowdedness on public transport have their own unique characteristics. In particular ways, the collectivities of the metro both circumscribe and enable the capacities of commuters to undertake the individual activities discussed in Chapter 5.

This chapter takes as its point of departure the idea that transport infrastructure projects impact on the well-being of those who interact with them. Some aspects of this are reflected in current cost-benefit analysis methods, for example, through indicators such as noise and air pollution (Bristow and Nellthorp 2000). More subjective measures of well-being, such as the perceptions of infrastructure users of comfort, reliability, and safety, have largely remained outside of infrastructure appraisal and in the domain of transport passenger satisfaction surveys (Givoni and Rietveld 2007). This separation reflects the enduring division between the technical and the social in the way infrastructure is conceptualised, which is visible in the tendency to distinguish between its large, physical, sunk elements, and the experiential qualities of infrastructure-in-use (Hansman et al. 2006). However, the appraisal of public transport provision does not have to rely on such rigid distinctions. As indicated in the literature review in Chapter 3, human geography, science and technology studies, and anthropology, have provided the theoretical tools for thinking across such differences to reflect the ways in which the meaning and value of big infrastructure are realised in its everyday uses (Furlong 2011).

At the same time, my aim is to move beyond simply arguing in favour of a greater prominence of passenger satisfaction measures in the appraisal of transport projects. The many disadvantages of a psychological, uni-dimensional measure, typically based on a momentary snapshot, were discussed in the overview of passenger satisfaction literature offered in Chapter 3. Instead, the quality of the interaction between humans and non-humans on the Sofia metro extension is discussed here in terms of two constructs which are simultaneously broader, and more specific, than satisfaction. These constructs are comfort and stress. Comfort and stress reflect, on one hand, the realisation of 'satisfaction' in specific situations, and with the active participation of the body, as well as the mind; on the other hand, they suggest an excess and a longer view compared to satisfaction with different aspects of a service, and thus remind of the ways in which the affects and effects of the commuter's journey 'seep through' the walls of transport spaces and into the other spheres of everyday life (Bissell 2014). Importantly, in the case of new infrastructure, comfort and stress can be seen more clearly as being in a state of flux and negotiation – rather than framing comfort and stress as two conditions which commuters might fall into routinely on boarding a train or a bus. Through these temporal and spatial multiplicities, exploring the comforts and stresses of commuting can tell us something about the otherwise difficult to pin down ambiguous relationship between transport and well-being (Schwanen and Atkinson 2015). Some of the linkages between well-being and metro commuting were explored in discussions of time and cost in Chapters 5 and 6, respectively. However, in light

of the socio-material and distributed view of everyday mobility taken in this study, a further conceptual move is introduced in this chapter. Responding to the call by Schwanen and Atkinson (2015) to complicate the bounded individual as the only possible subject of well-being scholarship (and similar calls in relation to transport research, e.g. Manderscheid 2013), this chapter discusses comfort and stress as two aspects of distributed, rather than individual, well-being. In other words, while the effects of the journey 'stick' to the individual who carries comfort and stress with them out of the metro and into other timespaces of the city, within the space of the metro commute, passengers make comfort and stress collectively, generating, amplifying and reflecting them as shared flows, rather than as individual perceptions (Bissell 2007). In the context of attempting to think qualitatively about value, this conceptualisation of well-being is particularly pertinent to shared forms of mobility such as urban public transport, and in this case, the Sofia metro. As the focus in this chapter is on what happens between individuals, rather than on the changes within an individual's commute, interview quotes are no longer presented in the text boxes used in Chapters 5 and 6.

Importantly, the linkages between collective and individual arrangements are nuanced and multifaceted. Commuting collectivities are not the sum total of individual actions, nor do they simply amount to a lack of individual control over space. From the perspective of planning and managing public transport services, it is particularly important to explore the potential of this type of thinking in relation to peak use times – the rush hour. Stress resulting from overcrowding on public transport is a major cause for concern, and not only for the commuters who experience it. For employers, it can result in reduced productivity in the workplace, both on days of particularly stressful commutes, and in terms of the cumulative, long-term effects (Cox, Houdmont, and Griffiths 2006). Stressful commuting has also been linked to poor health and strained relationships (Evans and Wener 2007; Tirachini, Hensher, and Rose 2013).

There is a certain inevitability to the link between urban commuting and the rush hour, as many work and education commitments require for large numbers of urban dwellers to use transport infrastructures at a similar time (Grimsrud and El-Geneidy 2014). In the case of the core participants in this study, 17 out of 20 travelled during what they themselves considered to be the rush hour on most weekdays. Because of the particular role of peak times in framing and amplifying commuter stress, this chapter focuses on the socialities of the rush hour – the practices of being together on the metro at the busiest and potentially most stressful times.

The rush hour is more than a time interval (cf. Berry and Hamilton 2010). It is a specific socio-technical configuration of the metro infrastructure. At the same time, it is neither a homogenous entity, nor an entirely identifiable one, as a state or stasis. The rhythms and transmutations of the rush hour are multiple, as it unfolds in some directions but not others. For example, it can be more intense around the full hour than at quarter past the hour at the same location; it might not be felt at all if one travels in the opposite direction to the main commuter flows (as I was able to ascertain on my way to respondents' homes around 8am) and rather than defining entire stations, trains or journeys, it is manifested through highly localised peaks and troughs.

Despite its affective intensities, the rush hour is managed skilfully and habitually by experienced commuters. Travel habits both generate ways of coping with the rush hour, and can contribute to its stressfulness and frustration. Furthermore, the relationship between habit and comfort/stress is a dynamic one. In this discussion, I seek to challenge the view that commuter stress is solely attributable to either a disruption of a pre-existing routine, or conversely, to a gradual accumulation of routine-ness which eventually begins to grind (Wener et al. 2003; Bissell 2014). Instead, comfort and stress are seen as fluid and co-present across various minute socio-material interactions within a single journey. For example, picture a scene that can be witnessed on public transport in cities across the world. On a busy carriage, a person drops a glove, but does not notice and continues to look at their phone. The person sitting across the aisle notices the glove, and rises from their seat to return it to the owner. The owner is surprised and grateful, smiling. Several of the people nearby smile a little bit too, in approval of the scene. A more relaxed atmosphere spreads in this part of the carriage, despite the fact that it is crowded, packed full of people who are in a hurry, and replete with possibilities for other kinds of atmospheres to spread, including irritation, stress and anger. While the launch of Line 2 of the Sofia metro has reconfigured some skills and sensations of the public transport rush hour, it cannot, and should not, be read as a milestone which made commuting more or less stressful in anything like a straightforward manner.

Stress and comfort are rarely studied together in transport research. When the stress or comfort of the commute is the object of study, this is mainly done through conceiving of them as mutually exclusive states. While comfort can increase the sense of time spent commuting being valuable and meaningful, commuter stress is found to be detrimental to health and general well-being (Wener et al. 2003). In this chapter, I present data on the fluidity and co-constitution of comfort and stress in the commute, across individual bodies,

and through technological as well as social devices. In this sense, comfort is not about an absence of stress, but rather about a sense of being relatively well-accommodated, and enabled to engage in activities and states of being, in a particular environment (Hitchings 2009). Furthermore, comfort and stress are often framed as if they are *done to* a receptive commuting body, rather than made through the thoughts, actions and affects of the mindful body (Cox, Houdmont, and Griffiths 2006). Thus, studies based on salivary cortisol levels data tell us nothing about the activities the commuters engage in during the journey, the interactions they become a part of, the cost of their commute, and so on (Evans, Wener, and Phillips 2002b). However, public transport passengers are active participants in the making of comfort and stress in the commute, both for themselves and for others. Rather than acting as receptors for external stimuli, by performing particular travel habits they co-produce the flows of comfort and stress which have as much to do with shared affective atmospheres, as with individual physiological states (Bissell 2010; 2014). From the perspective of valuing public transport infrastructure, it is therefore important to continue tracing stress, as well as comfort, to the minute socio-material arrangements in which they emerge. Discussing comfort and stress separately from the value of travel time and the cost of travel, is a matter of text organisation, rather than a conceptually significant decision. In practice, collective comfort and stress shape the ability to make meaningful travel time, just like the arrangements of payment can be comfortable and stressful. Transport infrastructure which is worth building creates comfortable spaces in which passengers have the ability to spend their journey time in what they consider to be valuable ways. In this sense, the discussion in this chapter builds on the data presented earlier.

7.1. Noise and temperature

When part of their journey moved underground, Sofia's new metro commuters were faced with a very different sensory environment compared to their above-ground journey. Temperature and noise featured prominently in ride-along discussions of how comfort was made differently on the metro, and in some cases, temperature and noise also played a prominent role in the making of metro-commuting stress.

In general, urban transport is considered a major cause of noise pollution in cities, with urban commutes increasingly associated with exposure to high levels of noise (MVV Consulting and Tractebel Development Engineering 2007). Although the construction of Line 2 of the Sofia metro exposed the neighbourhoods it was laid through to high levels of construction noise for several years (as will be discussed in more detail in Chapter 8), its

position largely underground once completed meant an overall positive impact on the aural landscape. The increase in metro commuting did not contribute to noise on Sofia's streets, instead potentially reducing noise levels for ground-level street users. However, the metro's new spaces came with their own set of sounds, many of which had the potential to contribute to experiences of comfort and stress during the journey. For example, as I repeatedly experienced while interviewing, conversations on the platform often had to be interrupted, to wait for screeching trains to come to a stop or to depart. Managing noise on the Sofia metro thus became an important skill to learn as a new metro commuter, and commuters discussed it in some detail. Several participants commented on noticing, especially during the first few months, whether they ended up on a newer or older train, particularly because the latter often had open windows, as well as fewer noise-cancelling features:

*"I notice if it's an older or newer train, as the older ones are a lot noisier."
(Bella, 2014 01 7 AM)*

However, this also had unexpected benefits in terms of comfort. In practice, the aural environment of the metro commute is always being re-negotiated in various socio-material interactions, and thus is much more complex than the simple absence or presence of unpleasant noises. Thus, once mobile coverage was introduced, the louder older carriages became spaces of potentially greater peacefulness, since the noise of the moving train discouraged fellow commuters from making phone calls:

"Especially if you are on one of the old trains, it takes a lot of shouting, so not too many people can be bothered to have that kind of conversation. 'Where?... What?... On the metroooooo!' [Laughs]" (Janna, 2014 01 15 PM)

Paradoxically, the louder carriage produced a type of noise which was more comfortable, possibly as a result of being easier to ignore than a mobile phone conversation, despite being more likely to cause hearing damage over the long term.

Another source of potentially unpleasant sounds were the screens installed at many station platforms along Line 2, broadcasting announcements, news and quite often, advertising reels. Initially largely unnoticed, or commended for helping to pass the time while waiting for a train, these screens came to add to the stresses of the commute for some passengers:

"Lately, I'm developing a concern about the noise which exists on the metro. It seems to me that it is often too loud. I have told you before, both the content and the sound level of those adverts are really annoying me. Although, I have noticed, as our station [Mladost 3] is becoming more popular and busier in the mornings, there is a growing number of people in the station, and the sound no longer seems as loud. It is a bit more muffled than before. (...) When there are two trains arriving at the station, the sound is really loud. Two trains, plus the noise from the TVs, plus the conversations

of the people, it makes for a really noisy space. (...) I no longer listen to music inside the metro so as not to add to it, but I do leave the headphones in, in order to shield me.” (Natalia, 2013 03 17PM)

Natalia was the only respondent who used her headphones as ear plugs against the noise of the metro. For most commuters, it was listening to music through headphones that was the obvious way of managing the different sources of ambient noise. Of 20 core respondents, 14 incorporated headphones into their commute at some point during the research period. As discussed in Chapter 5, the headphones of a music player or mobile phone perform a number of other functions in making the timespace of the commute valuable, by enabling a sense of doing something, or indeed, a sense of doing nothing. Headphones can thus be a multifaceted and ambiguous technology, when the range of socio-technical interactions they participate in within the commute are considered (Arnold 2003). In relation to noise, too, headphones can play an equivocal role. Two commuters expressed concerns that the frequent use of headphones might be damaging their hearing. One highlighted the need to occasionally opt to not wear them, in order to “just listen to normal sounds, have a break, listen to the sounds of the city” (Janna, 2013 08 13 AM).

Some of the steps new Sofia metro commuters took in arranging their journeys suggested that the absence of people is not always equivalent to greater comfort. Thus, Janna explained that she actively sought out the busy carriages when returning home late from work (Janna, 2013 06 20 AM). The absence of crowdedness could mean freedom or privacy, or could result in more, instead of less, stress and anxiety.

Similarly, in Natalia’s experience presented in the longer quote above, the busyness of the rush hour came to provide aural comfort. Although increasing station crowdedness is undoubtedly a stressful development, the growing morning crowd of commuters served to dampen the many loud sounds in the underground space, while the bare tiled walls of the station would generally amplify them. This was especially the case during the unusually chilly March of 2013 when the ride-along interview took place: still wrapped in winter clothes, the bodies of metro passengers were particularly well-suited to cancelling noise. When considered from the perspective of collective arrangements, then, one of the rhythms that can be detected in the role of metro noise in making comfort and stress, was seasonality. This seasonal rhythm is one aspect that aural environments and the temperatures of metro commuting have in common.

When I began collecting data for this study, one of the first things that struck me in conducting ride-along interviews was the frequency with which new metro commuters

commented on how comfortable the metro's temperature was. Unlike ground-level public transport, I was told repeatedly, the metro is warm in winter, and cool in summer. "Warm in winter, cool in summer" became a mantra which several respondents repeated again and again, forgetting they had used it already when we had met a few months prior. Eventually, it seemed that initial enthusiasm made way for more cautious evaluations of thermal comfort on the metro:

"Well, not that the metro is perfect. I guess sometimes it's actually cold in winter and warm in summer." (Nell, 2014 01 7 AM)

In practice, perceptions of warmth and coolness probably varied significantly, depending on the commuter, their mind and body states on the day (e.g. mood, clothes, pace), the different designs of trains and stations across the city. A more qualified view of thermal comfort could instead be read as a sign of the changing perceptions of the metro, which were themselves becoming more qualified over time. However, this study does not assume that the change in perceptions and attitudes would necessarily translate into a change in commuting behaviours (Shove 2010).

Furthermore, the peak times of metro use can qualify this allegedly optimal thermal infrastructure. In winter, there is even less room in the crowded metro rush hour. Commuters' bodies are wrapped in layers of bulky winter clothes:

"I wear a hat and gloves in winter. There is a contrast with the metro temperature, it's busy, and I'm sweating, I'm hot. I undo my jacket, and take off my scarf, but it's difficult [in the crowd]. I then have to hold all the stuff in my hand." (Janna, 2014 01 15 PM)

As crowdedness shapes thermal comfort, so does thermal comfort determine some of the spatial arrangements of busy metro carriages:

"I guess I sometimes try to be near the doors because of that [when it feels hot on the carriage]. Because you want to get a bit of a breeze near the doors." (Raya, 2014 06 17 AM)

While this position can potentially ease thermal discomfort, it can make crowdedness near the doors worse, potentially increasing the frustrations and stress of boarding and getting off. I will return to the topic of managing the metro carriage crowdedness through one's body and orientation in section 7.3.

While the close proximity of other human bodies increases one's temperature all year round, this can reach uncomfortable levels in winter when combined with wearing warm outdoor clothing. Thus, on one hand, underground space can provide a safe haven from the outdoor elements. Over the long term, this can have problematic effects for people's ability

to cope with, and be comfortable with, the variability of weather (Hitchings 2010). This argument is pertinent in the case of Sofia, with its four distinctive, contrasting seasons requiring a lot of adaptation in everyday comfort-making practices. However, through the winter clothes which become part of the 'augmented' commuting body, the experience of temperature in the rush hour commute is modified. The accounts of new metro commuters in Sofia on the ways in which they managed and perceived warmth and cold pointed to the limitations of a narrow definition of thermal comfort. In their conceptualisations of thermal comfort and aural stress (as well as thermal stress and aural comfort), comfort/stress was a multi-sensory and socio-technical construct. No single dimension of this construct could be easily separated out. Thus, while the multitasking infrastructure of the escalator can permit for coats, scarves and gloves to be taken off and then put back on (Chapter 5), the relatively short durations of the journey make the usefulness of this undertaking seem ambiguous to many commuters. In another example, Emma's high-end headphones were a source of favourite music, as well as the cause of uncomfortable heat during the summer months. The ways in which 'sources' of stress and comfort (although, as argued above, comfort and stress are not 'done' to a recipient by an external stimulus) complement and contradict each other in the single sensing body make it important to consider their circulation between bodies. To do so, the next sections draw on cultural geography's work on atmospheres (McCormack 2008; Anderson 2009, Ash 2013; Shaw 2014) but move to examine their utility in the context of applied transport infrastructure research agendas focusing on comfort, stress, well-being and value.

Noise and temperature thus highlight the ways in which what can appear to be objective characteristics of the environment registered by an individual's human senses, are in fact made and experienced together in highly situation-specific ways (Hitchings 2009). On one hand, the comments of the Sofia respondents echo the discussion of affective atmospheres of travelling together discussed by Bissell (2010). From this perspective, noise and temperature can be thought of as intangible and ephemeral, non-representational circulations between human and non-human bodies. However, the intensities of the metro rush hour are quite different from the long-distance train travel collectivities discussed by Bissell. They highlight the need to attend to the subjectivities of aural and thermal comfort and stress, but also the need to manage and adapt them as part of comfortable and useful infrastructural arrangements. While highly context-specific, and bound up in the minute interactions in which they take place, the shared making of sound and warmth demands once more that they are not treated simply as individual subjective experiences. Thus, such shared comfort and stress on the metro point to the fact that the ephemeral properties of

affective atmospheres are bound up in aspects of transport infrastructure which are more concrete, detectable and even measurable. Temperature and noise are two themes which connect the elusive and the quantifiable dimensions of rush hour comfort/stress in palpable ways. On one hand, noise and temperature are subjective sensations, perceived through the commuting body, and simultaneously through the collectivity of commuting bodies. On the other hand, they have long been treated as quantifiable and objective, with an extensive body of academic and design research aimed at identifying measures of temperature and noise, and comfortable levels of both (Shove 2003). These two sets of approaches need not be treated as mutually exclusive paradigms. An account of the situated and embodied nature of noise and temperature, as atmospheres which are made as well as sensed by each of the bodies sharing the metro rush hour, can also reflect the practical concerns of designing public transport infrastructure in ways which make it more valuable by creating opportunities for generating comfort, and reducing opportunities for circulating stress. Rather than a compromise with the situated and subjective nature of sound and warmth, this is a necessary move in seeking to re-connect qualitative accounts of micro-practices with the needs of infrastructure planning and appraisal. Because they speak to both qualitative and quantitative research agendas on transport and mobility, and can be related both to individual sensation and collective atmosphere-making, noise and temperature can serve as a productive conceptual bridge in thinking about the experiences of useful infrastructure.

7.2. Collective habits for managing crowdedness

In quantitative studies, a long-established rule-of-thumb is often used to measure density, which places the threshold of uncomfortable crowding around four-five people per square metre (Tirachini, Hensher, and Rose 2013:37). The subjective quality of how crowding is actually experienced is partially captured in transport studies which develop differentiated subjective and objective measures of crowding (Cox, Houdmont, and Griffiths 2006; Evans and Wener 2007). Overall, crowdedness has acquired its status as a notoriously unpleasant experience for two main reasons: the need to compete for space, on one hand, and the rude behaviour of others as they do the same, on the other (Smith, Phillips, and King 2010:10).

During busy times, commuters develop habits for managing the space between themselves and others. These habits are not 'strategies,' as they cannot always be equated to goal-directed decisions. Instead, I conceptualise public transport travel habits as socio-material orientations involving other people – and thus orientations which are more unpredictable,

fluid and fickle than definitions of habits which frame them as pre-cognitive shortcuts adopted in familiar situations (Spears, Houston, and Boarnet 2013). The travel habits observed in the rush hour are collective socio-material arrangements in relation to each other; they are mindful, embodied and distributed, and which are orientated towards creating situations that have the potential to become comfortable. The travel habits of metro commuters might be traceable to individuals, but they are only realised in the entanglement of activity that is the collective space of the rush hour. Habits are collective not because they are driven by shared intentions, or result in similar practices being performed. Rather, activities and sensations are stabilised into travel habits because of the affordances and restrictions produced within a collective space. Travel habits are of course also present outside of the rush hour, but the peak times of the day inject habits with a particular intensity, giving them new capacities to free up or constrain oneself, as well as others – in other words, regardless of intentions, to generate comfort and stress for oneself, as well as for others.

These rush hour habits are orientations of the body, which can also be mindful, but are equally stumbled-upon, and only then considered for their comfort-making capacity within the constraints that other bodies place; and then retained, or modified. This is illustrated by the habit of holding a smartphone while standing on a busy metro carriage.

In Chapter 5, I discussed the capacity of smartphones to make time-for-doing out of standing time: as they are small enough to hold with one hand, commuters could read long or short texts online, or send messages, while comfortably holding on to the handrails. However, smartphones also have another function.

“A standing commuter holds their smartphone in an arm which is outstretched, only a little, at an angle comfortable for looking at the screen. This creates a small distance in front of them which is inaccessible to others. By looking at their phone, the commuter can preserve these few precious centimetres of floor space for themselves. And this is important, because having someone stand directly in front of you, blocking your line of sight, is especially frustrating. Notably, the others respect this distance – within limits, of course; if it gets REALLY busy, the commuter usually gives up, and puts the phone away. But at almost-very-full, this seems to be an established way of claiming space.” (Research diary, January 2015)

The handheld device thus became an instrument for slightly extending one’s commuting body, and making stationary space more comfortable. Although some participants disliked the ubiquitous presence of digital devices in the carriage (see Chapter 5), this view was not universally shared. Some research participants did not interpret the boundary-making use

of phones as a negative or selfish act. In fact, two of them saw it as a pacifying force in the busy carriage:

"In fact, it's a positive development. People are less likely to push and shove, they are nicer when they are focused on their phones." (Assya, 2014 02 12 AM)

"Lately people are so absorbed in their phones, that they don't have time to argue with each other! (laughs)" (Lilly, 2014 07 1 AM)

Combined with creating activities suitable for the short journey times typical of the Sofia metro, smartphones proved to be very effective devices for making the space of the commute more comfortable. These findings have implications for understanding the range of experiences of collective urban life on transit. That greater mobile phone use should result in greater rudeness, through pushing other commuters, or blocking their way, or not giving up a seat for a pregnant woman, was a view supported by several respondents, and one which has been evidenced in sociological research (see Smith, Phillips, and King 2010 on rudeness generated by people being 'in their bubbles'). In transport research, mobile devices have almost universally been interpreted as devices for making 'cocoon' – private spaces within public ones, suited to greater individual productivity (Berry and Hamilton 2010; Lyons and Urry 2005). However, the utility of a small handheld device in alleviating the collective embodied and mindful stresses of crowded commuting, appears to be at least as significant as its nuisances. Because these dynamics are different on a long train journey as opposed to a morning metro ride, researching the impact of handheld devices in the making of comfort/stress around transport infrastructure should reflect the specificities of each infrastructure's situated uses.

The habits for organising crowdedness extend beyond the stationary space of the carriage, and beyond electronic devices. As highlighted in the discussion of the metro transfer in Chapter 5, while transport ethnographies often focus on in-vehicle spaces, many important negotiations happen outside of them. Thus, rush hour commuters had ways of reducing the stress associated with moving in a crowd of people, for example, when disembarking a train at the busy Serdika station:

"Something I really dislike is to have someone "in my feet" [at the Serdika transfer], walking slowly, being in the way. So I try to be the first one off the train. I walk fast, even if I'm not in a hurry." (Gregor, 2014 11 13 AM)

"I think most people look for the ends of the train somehow, whereas I don't care about the minute of walking I will have to do when I get off. In any case, in rush hour people hurry and block the escalators and the exits, which irritates me, so I'd rather not be amid the first people who get off and end up in the bottleneck." (Lilly, 2013 10 18 AM)

In one case, a respondent took this arrangement to the extreme:

“Serdika, that’s the critical point. But I have managed to find a way around that too. The point is, you have to have an unlimited travel card – not single tickets, and not a carnet card with 10 journeys. I get off at Serdika-1, exit the station, walk across, re-enter Serdika 2, and then go down the escalator⁷. It may seem longer, but you avoid the crowd. The transfer tunnel is so frustrating, you’re just stuck there.” (Janna, 2014 01 15 PM)

While a rush hour metro station might look like a sea of hurrying bodies from afar, in practice, commuters’ habits can, to some extent, manage the rhythms and speeds through which they interact with their surroundings. Being slower, being quicker, or taking the longer route around, represent ways of navigating the rush hour flow with an orientation towards comfort. The range of experiences of crowdedness demonstrate the many micro-habits which commuters adopt in order to manage it for themselves, while not causing disruption to the overall running of the infrastructure and the flow of people through it. In this discussion, crowdedness is not *done to* the commuting body, but is made up of co-passenger bodies skilfully oriented towards each other. Alongside quantitative measures of acceptable crowdedness, such ethnographic insights can help identify infrastructure designs which facilitate comfort and alleviate stress during the rush hour. Some suggestions to that effect are made in the next sections of this chapter.

7.3. Placing the body in the metro carriage space

This section focuses on how commuters manage their bodies within the metro train space, during rush hour. As before, I suggest that the travel habits which can be observed in that space reflect an orientation (a vague, subtle, and embodied intention) towards comfort, which can in fact result in both comfortable and stressful arrangements for oneself, as well as for others.

11 of the 20 core participants in the study expressed specific preferences about positioning themselves in the train at busy times. Their strategies for managing their bodies in the space of the carriage involved entanglements of mindfulness and embodied sensation, and they were often attuned to the effects on others, as well as to the way the strategies of others affected them in turn. In the case of Gregor, minute negotiations were involved:

“I have a favourite place, near the bendy part of the new trains. I lean with one shoulder on the wall, and read my book. I’m not sure why this is my favourite place – I realised at a particular moment I tend to stand there and

⁷ In London, this would be the equivalent of exiting the Circle line at St Pancras station, walking along Euston Road, and re-entering the Underground station to transfer to the Victoria or Piccadilly lines.

it feels comfortable. I like to have a view down the carriage. Also, I am near the door on the other side, on the left, which is where I will be getting off. Also, people avoid standing around here, in the middle, because they feel they are too far from the doors. People think they won't be able to get off, they always stand crowded at the doors, and don't let you through when you are getting on and off (...)

Before Serdika station, I start moving towards the door where I am going to get off. That's because loads of people will board at Serdika, and it will become difficult to move through them to get to the door for the next station. I am very disappointed that I'm not the one who discovered this. I started doing this a few months ago, and realised there is a whole bunch of us doing that." (Gregor, 2013 11 13 AM)

Over time, Gregor came to adjust his habits, in response to the changing behaviour of those around him, which meant his chosen strategy was no longer producing the desired results. By March 2014, he was unlikely to time his move towards the doors so precisely.

While Gregor did not pursue a seat during his commute, the majority of respondents were inclined to sit down if a seat was available. It is a widely recognisable truism that sitting down during the metro journey is more comfortable than standing up. However, as the growing body of public health research has demonstrated, there is not much that is intrinsically positive for well-being and comfort in the seated body, especially for the growing number of urban dwellers whose lifestyles are defined by sedentariness (Latham 2015). In the case of the commuters I interviewed, 15 out of 20 spent many hours per day sitting at a desk in their workplace. In this context, sitting as part of a commute may not in itself, be comfortable. However, it did play an important role in specific circumstances, related to the overall health of the participant, or because they were carrying many shopping bags on a particular day. It is therefore important to qualify the connection between sitting down and comfort, by examining the specific interactions which may intensify aspects of comfort and stress. For instance, sitting down was recognised as the ability to shelter from the moving mass of bodies in the crowded train:

"Sitting in itself is not important to me. Sitting is more about... [hesitates] it is more relaxed when you're sitting down, because when it is crowded, standing up is not comfortable. The other line is very busy, and when it's so crowded, it's difficult, it's like the trams used to be." (Nell, 2014 01 7 AM)

"In the mornings, if there are free seats, I do sit down, but it's no problem not to sit down, it's a short journey. Sitting down is better because you're not being pushed around." (Janna, 2013 06 20 AM)

On one hand, this mechanism of improving comfort through separating oneself from others through the act of sitting was recognised by several respondents. On the other hand, getting a seat during rush hour could be a hectic affair, and some commuters preferred to avoid it for that reason:

*"I don't even try to sit down. I don't want to push and be pushed [in pursuit of a seat]. I prefer to stand up. And the space I choose creates comfort for me, because I don't usually face the others, I am not in direct contact with them."
(Natalia 2013 01 22 AM)*

As I will discuss in the next chapter, some participants reflected on the contribution of metro commuting to their sedentariness, and identified opportunities to introduce a different type of bodily comfort into their journey. A different source of stress from choosing to sit during busy times was described by Nikolay. He focused not on the complexity of moving towards a seat in competition with others, but on a need to eventually navigate back to the doors:

"I prefer not to sit. I have noticed that if I sit down, it gets really complicated to get off when the train is full." (Nikolay, 2014 06 13 PM)

By deciding to stand near the doors, Nikolay probably creates a different kind of shared stress for himself and others: if he sits down, he will have to zig-zag through the crowd back to the doors; if he lingers near the doors, he will be in the way of those getting on and off. Nikolay, and the other 7 participants who I asked to rate the stress level in both scenarios, and compare them, were perplexed. It appeared that not only was stress difficult to quantify when it was linked to such minute, situated and fleeting configurations; but also they did not appreciate the implication of helplessness that seemed to linger in that question: as if I was telling them that whatever they chose to do, they would feel stressed either way.

An important connection to make here is to place Nikolay's comments alongside Raya's observations on the cool breeze she could enjoy if she remained near the doors (section 7.1). While the outcome in the two cases was the same, and both respondents probably frequently contributed to the stress of other commuters trying to board or get off the train, Nikolay and Raya were not being rude or inconsiderate to others in a straightforward sense. The various tensions between perceptions of rudeness and the spatial arrangements of stress/comfort on the rush hour metro are discussed further in section 7.5.

A different version of the anxiety generated by the choice to sit down was experienced by Janna and Gregor. They felt that when they did opt to sit down, there was pressure on them not to relax fully, but to remain aware of others, and especially of those fellow passengers who might need their seat:

*"Sitting down means you then have to stand up when someone vulnerable gets on. So I just don't bother sitting down on most occasions, or I might try not to sit right next to, or opposite, the doors." (Rumen, 2014 01 6 PM)
"Yesterday, I was sitting listening to music and suddenly I noticed the woman next to me is offering her seat to a pregnant woman. I would have got up too, but I totally didn't notice her. I think one becomes more isolated*

in order to deal with the fact that it is so crowded in rush hour.” (Janna, 2014 03 12 AM; this episode was on Janna’s mind for a long time, and she repeatedly referred to how unpleasant it made her feel in later interviews)

Notably, albeit in different configurations, these situations are familiar across all public transport modes in Sofia – the new infrastructure could be framed as a ‘disruption,’ i.e. a moment when they are more likely to be consciously rethought (Marsden and Docherty 2013), but the on-going changes which defined the commutes I documented in Sofia both before and after the launch of Line 2 implied that the metro might be only one technical adjustment in the longer-term modulations of certain collective habits of sharing space.

Finally, as discussed in Chapter 5, with devices such as the smartphone which can be held in one hand, freeing the other to hold the handrail, it was increasingly possible to spend time in what feels to be a meaningful or enjoyable way, without having to sit down. This contributed to a stable and comfortable arrangement in space.

For a few participants, the matter of arranging themselves comfortably in relation to others in the carriage bore darker overtones. Unwanted bodily contact is an important aspect and potential risk of public transport use, but remains a fairly under-researched area in mobilities scholarship (Chui and Ong 2008). With the research design adopted in this study, collecting data on unwanted sexual behaviour was a challenging task, although studies based on questionnaires, or police report data, similarly describe significant data collection difficulties (Chockalingam and Vijaya 2008). Nevertheless, some respondents revealed that they had experienced it, and/or that awareness of such encounters played a role in their rush hour habits:

“It hasn’t happened to me, but friends have told me about such experiences, and I guess it is on my mind, somehow. For example, if the train is crowded, I will move inside the carriage and stand between the rows of seats, rather than crowd at the doors. [The aisle] is generally wider in the metro, we see each other well. The advantage is that we sit there and we look at each other.” (Janna, 2014 03 17 PM)

The matter of unwanted sexualised contact with strangers’ bodies is a serious issue, and one particularly important in relation to conceptualisations of comfort and stress on public transport modes. The limited empirical evidence available suggests such experiences are highly gendered, although age is likely to play a significant role too, with adolescents more likely to be targeted than adults (Chockalingam and Vijaya 2008; Chui and Ong 2008). Unwanted proximity should form part of any qualitative explorations of comfort, stress and value of public transport infrastructure. It is a concern that this phenomenon has generally been studied from a criminological perspective, rather than from an ethnographic one

(Loukaitou-Sideris and Fink 2008; Horii and Burgess 2012). Further data collection would be needed to understand its dynamics, and to identify routes for reducing the discomfort and distress it can cause to rush hour travellers in particular. At the start of data collection, I speculated that women might occasionally be inclined to sit down also because of the risk of unwanted sexualised behaviours, which seems particularly associated with standing up, with others close behind one's back. While commuters might not necessarily consciously think about such issues much of the time, I thought they might be, in Janna's words, "on their mind, somehow." The importance of collecting further ethnographic data before considering such assumptions to be reflective of actual interactions, was highlighted by an unpleasant episode which happened to Toni during her metro commute. Relevant to the discussion of placing oneself in the carriage space, it demonstrated that unwanted sexual behaviours are not inherent in standing up, once again making the distinction of the relative comforts of sitting and standing more ambiguous:

"Once, I remember, I was sitting on a single seat like this. The people standing in front of me were a couple, around 30-40. They were kissing very passionately, it was very unpleasant, I am trying to look away but there is nowhere for me to go. They are not intimidated at all. And then the guy got an erection and even drew the attention of the woman to it, speaking in a loud voice! He said it as if he was embarrassed to have a hard-on in the metro, but also made sure to express that in a loud voice for everyone to hear! It made me feel really uncomfortable, as it was right in front of the level of my eyes." (Toni, 2014 03 26 PM)

Despite variations over the course of the data collection period, and the many adaptations undertaken or encountered by metro passengers in relation to their commuting practices, a recognisable 'rush-hour-ness' persisted for each participant, and they repeatedly drew upon it to describe the atmosphere of the busy carriage. This leads me to argue that, because of the distributed nature of comfort and stress, which flow through and across co-present bodies, in the packed rush hour metro carriage, comfort and stress are fairly equally distributed. This might sound pessimistic and disempowering: whatever commuters might choose to do, everyone remains equally uncomfortable. But it can also be read in a different way: despite the many frictions and constraints, on most days, most people, will be fairly comfortable. Within the many negotiations which take place in the packed carriage, a capacity to 'tick along' and sustain an overall capacity to get on with everyday life, endures. In this sense, the Sofia metro rush hour remained for these respondents a fairly well-functioning and reliable infrastructure for fulfilling flexible yet predictable commuting routines.

This distributed view of comfort has implications for carriage design. At present, most metro trains worldwide are designed to maximise the number of seats, with rows of seats

installed along both long sides of metro carriages. The study of ergonomics has devoted extensive research to the possibilities to modify public transport seats in ways which maximise the sense of control and personal space, and thus reduce crowdedness-related stress. Thus, Evans and Wener (2007) discuss options such as avoiding designing trains with three-seat rows, as middle seats are seen as particularly aversive by passengers. Another measure proposed by the authors is the greater use of territorial props between seats (Evans and Wener 2007:93). However, at peak times, being seated cannot be directly equated to being comfortable, as data presented in this section demonstrate. Unpleasant episodes can happen regardless of one's bodily position, and similarly, comfortable arrangements such as reading the news on a smartphone, can be realised by both sitting and standing commuters. In this context, a reduction of the number of seats can be considered a possible step towards increasing train capacity without sacrificing comfort. Leaving several seats throughout the carriage for less mobile passengers, and removing the rest, would free up more standing room, creating more space to stand in comfortably, or allowing more passengers to board at the busiest times. Particularly on a relatively small network with relatively short travel times, such as the Sofia metro, this would be an inexpensive way of creating comfort while also maximising the utility of the metro's scarce capacity, while countering sedentariness for some of the urban dwellers for whom it has come to signify an erosion of well-being.

7.4. The behaviour of others

In the close proximities of the metro rush hour, the ways in which others behave are both extremely visible, and also critical to the possibility for collective experiences of stress and comfort. Inconsiderate acts, like standing on the left on the escalator, or talking loudly on a mobile phone, often generated strong reactions in the commuting timespace, particularly during the first few months of metro commuting:

"This morning I travelled with my mum and this other woman we travel with. I was irritated with some people, but this is every morning. I don't get angry, like properly angry, but in the specific moment I can get quite irritated. Yesterday the reason was a woman who was holding on to the central handrail between the doors. We arrive at Serdika, everyone moves to get off, and everyone expects that she will either get off too, or move out of the way. She was looking everyone in the eye defiantly, and refused to move. I just don't understand people like that." (Toni, 2014 03 26 PM)

All participants recognised that the behaviour of others was a significant aspect to their commute, although the extent to which it affected them varied markedly (and, for most people, also changed over time). Half of the 20 core respondents seemed to agree that

specific aspects of the metro infrastructure reduced the capacity for behaviours which broke formal and informal norms, and as a result, limited public transit-related stress. To them, this was particularly visible when contrasting it with ground-level public transport:

“Overall, I see that people interact differently in the metro. In the bus, no-one minds talking loudly to each other. But in the metro, it seems less acceptable to be loud. As if there is a kind of culture setting in, the same you would encounter in the West – not to talk loudly, not to shout. Sometimes, even if someone is on the phone, people turn around to them and give them these looks. Something that really surprises me, because this is something new – it is brand new, it never existed in Bulgaria before, and it is as if it is emerging all by itself. (...) It’s influenced by the physical environment. You show the passengers some respect, they show respect back. By contrast when you get people into an old Ikarus⁸ bus – it’s old, it’s dirty, the exhaust pipe is damaged and it’s full of fumes inside – well, if I am being shown this kind of attitude, how can I show a different one? This is maybe subconscious even.”
(Maria, 2014 06 13 PM)

However, the idea that, at least, the metro is not as bad as the bus was not sufficient in itself to prevent everyone from becoming stressed by the behaviour of co-passengers on the metro. Three commuters in particular, Janna, Gregor, and Toni, had very strong feelings about this:

“Look at them! [Points at the people waiting at the foot of the escalator angrily] Especially in the morning, I can get so annoyed with people. They don’t stand on the right (see Figure 7-1). They look like a group from kindergarten. I have had to argue with people so many times. When I am running down the escalator and someone is standing on the left, I point it out that you should stand on the right. They stare at me in a weird way. Or they say: Well, I am standing on the right, aren’t I? Or they say: There are the stairs for those who are in a hurry! What kind of logic is that?! If you’re in a hurry, you’ll pick the thing that is moving, obviously!” (Toni, 2014 03 25 AM)

⁸ A Hungarian bus manufacturer, whose older model buses were omnipresent in Bulgarian cities until recently. The name has become a metaphor for old, decrepit buses.



Figure 7-1: Not standing on the right on escalators at Serdika station. 13 September 2012. Photo: author.

"I still find it so annoying that people won't stand on the right of the escalator. Yes, it still irritates me. Always." (Janna, 2014 01 17 AM)

Whether large numbers of rush hour commuters on the Sofia metro were indeed rude and inconsiderate, and how these numbers compare across transport modes and to other cities, is not the focus of this discussion. What interests me is that to Janna, Gregor and Toni, being annoyed with others became a travel habit in its own right. Within the context of a mundane journey, an element of what felt like a 'mission' emerged – to notice, point out, and react to, the failures of others to keep up with what was perceived to be the metro etiquette:

"A friend and I, are planning a little intervention to do something about it. We are going to put stickers on all of the escalators. I also emailed the Sofia Metropolitan authority to ask them to play videos, or have signs, to ask people to stand on the right. I never got a reply. (...) So I do understand it, but it still irritates me. It affects me, the fact that people are so inconsiderate! In the beginning, I noticed it even more. So I walked up the escalator even when I wasn't in a hurry, and tapped my foot behind people, and asked in an annoyed voice 'Excuse me, can you move to the right?'" (Gregor, 2013 11 27 PM)

Toying with the idea of educating others, and on occasions, really pursuing it, appeared to provide a sense of comfort, at least for some time. By focusing intensely on inconsiderate

interactions, these participants seemed to feel empowered, reclaiming a sense of control over what they perceived to be a chaotic environment:

I generally try to resist the temptation to educate people though, as it always comes out confrontational, I can't seem to manage to do it in a friendly way. Our environment isn't friendly, so you don't manage to be friendly and polite. It's a Balkan thing. When someone tells you "You should do this," you don't think "There's a good idea," you think "Who are you to tell me what to do?". (Janna, 2013 06 20 PM)

For Toni and the neighbours she travelled with, the annoyances generated by others created a bonding opportunity among the group. Through a collective moan, they could distance themselves from others, pass the time, and seemingly, reduce the stress of the experience:

"Yesterday, there was nothing special about the journey. It was full of people, as usual. The topic of conversation between the four of us was the fact that the smell of BO was so intense yesterday after they changed at Serdika, that they basically didn't breathe until the next station. And [Raya], who needs to travel all the way to Joliot-Curie, actually got off and waited for the next train. That's how bad it was. We chatted about that." (Toni, 2014 06 11 AM)

But more often than not, the sensations of frustration generated by others' rudeness were not articulated, and were instead experienced through the body, as surges of stress. As Toni and I travelled together again and again, it became clear that it was stress, and not comfort, that was being cultivated in these processes of recognising and condemning incivility:

"People crowd near the doors, and don't move in. Or, getting out of the train, they stop just outside and start digging through their handbag, blocking the way for everyone else. So the biggest problem, to me, of the metro, are the people who use it. [Discusses standing on the right on escalators] At the very least, that's how cars move, on the right, according to these same rules! So I find myself shouting at people almost every morning! I arrive at work all worked up." (Toni, 2014 03 25 AM)

It appeared that such sentiments were especially likely to emerge in the pleasant surroundings of new metro spaces, as these participants felt the positive role of the metro was being undermined and eroded by rude behaviours. It is important to acknowledge that new infrastructures can have such sensitising effects and thus, indirectly and paradoxically, contribute to commuters reacting with stress to each other's presence:

What was detrimental to the way these commuters experienced their journeys was not the physical obstructions created by the unthoughtful behaviour of others, but rather the feelings of frustration and irritation that it generated in them which over the longer term had the potential to erode well-being. As Toni's account above demonstrates, focusing on others' inconsiderate behaviours could create intense stress, which would linger beyond the timespace of the commute itself. Needless to say, efforts to educate fellow commuters did not seem to produce visible results either.

Over time, it appeared that the most effective strategy for handling the stress of sharing space with inconsiderate others was to decide to focus on it less:

“Why I stopped staging these interventions is an important question. I always felt uncomfortable doing them, but always thought it was worth overcoming it and doing it, for the greater good. Why one stops doing stuff like that is like asking why people stop going to the [anti-government protests]. But I realise it’s better for me personally, I don’t stress out as much.” (Gregor, 2013 11 27 PM)

“I don’t pay so much attention to other people’s behaviour these days. I don’t know. It just becomes routine, doesn’t it.” (Janna, 2014 03 12 AM)

Tanya summarised this approach (which she maintained throughout the research period), thus:

“I think for me the key to enjoying the metro and my every day journey is not having expectations that are too high.” (Tanya, 2014 07 29 AM)

Through my own autoethnographic commutes, I was able to reflect upon, and eventually apply Tanya’s advice, and thus witness the effect of choosing not to get irritated with others. As I moved from initial openness and enthusiasm, through feelings of frustration as aspects of my commute began to grind, to actively stopping myself from dwelling on them, it was this latter phase that appeared the most comfortable. Stress in the form of annoyance with others could therefore surge in what should have been more comfortable new surroundings, and reduce as they become older and less lustrous. Here, something subtler is at play than commuter stress as a response to either disruption or excessive repetition. A non-atomised view of the commuter reveals how the physical settings, and many human and non-human presences, can make stress together. The implications of accepting a degree of incivility as an unavoidable feature of the rush hour are discussed further in the next section.

7.5. Breaking rules

The previous section discussed how some commuters make a habit of getting annoyed with the behaviour of others, especially those actions of fellow commuters which they perceive as breaking the formal and informal rules of the metro rush hour. The ways in which one’s response to observing such instances can contribute to commuting stress was also highlighted. However, several of the participants were themselves likely to contravene norms which create a sense of orderliness within the rush hour. One aspect of occasional rule-breaking was discussed in Chapter 6 in relation to fare evasion: some of the participants readily admitted taking infrequent unpaid trips on public transport. Overall, rule-breakers did not contravene norms out of ignorance – they recognised the rules they were breaking as rules, and in some cases, saw no conflict between their actions and

demanding that other commuters should follow the rules. Thus, Toni, a fervent defender of civility introduced in section 7.4, described her habit of jumping the queue at the exit escalator:

“What I do, I have to admit, is that when people are crowding at the foot of the escalator, I just walk to the front of the queue. I know it’s not nice, but I just can’t wait for them to figure out how to get on the escalator. I just walk past the swarm of people and get on the escalator. Even though they stand in two rows, it takes them forever to arrange themselves. No-one’s ever said anything.” (Toni, 2014 06 11 AM)

However, in no case did rule-breaking (defined as such by the participants themselves) come with stated ill intentions, or with any recognisable pleasure from being disruptive or rude. Instead, when I was accompanying a commuter who was not acting by the rules, it seemed that this in itself became a comfort-seeking strategy. Occasionally, participants perceived the need to contravene a norm, in order to improve the overall flow and comfort – often for themselves, but as I will discuss shortly, also for others. An example of this was referred to in Chapter 6, where staff and passengers colluded to let children pass under the ticket barriers, thus improving passenger flow. While I did not challenge them to explain or justify these actions, participants were generally keen to give a rationale for their behaviour:

*“Every time we have travelled together, Bella has stood on the left of the escalator, blocking people trying to walk down or up. Today is no exception. Two people try to walk down past us, and ask to pass in a tone of voice which says more than the polite language they use. Bella steps aside, but further to the left, letting the two pass between us, which is also unusual, and I think baffles them briefly. Bella is unyielding:
- These are people who will push people out of the way when it is really busy, just to win 5 or 10 seconds. If you want to run, run up the stairs, no one is stopping you.” (Research diary and Bella, 2014 03 27 PM)*

Bella was aware of (what is often perceived as) the universal rule of standing on the right, and walking on the left, on public transport escalators. However, she argued, counterintuitively for some, that passengers who are in a hurry should use the stairs instead, because their temporal gain was not worth the inconvenience caused to others. This issue is less straightforward than it may seem, with recent research on London suggesting that standing on both sides might prove to be a speedier way of moving a large number of people through a busy station (Bland 2016). However, whether these insights apply to Sofia’s emerging metro commuting culture, and the relatively shorter escalators typically found in its stations, remains to be seen.

Most often, the rationale to break a rule, for example the ban on consuming food inside the metro, was framed around the fact that the participants would only contravene the rules occasionally:

“On rare occasions, if I'm very hungry, I have taken a piece of whatever food item I happened to be carrying with me with the groceries. For instance, if I was very hungry, I might eat a piece of baguette. But generally, I wouldn't eat food on the metro. I have seen others eat on the metro and I don't like it. But for me it's an exceptional thing.” (Nell, 2014 08 5 PM)

On the other hand, when getting frustrated with others' eating, loud phone conversations, or standing on the left of the escalator, participants were less likely to recognise that fellow passengers, too, only did such things occasionally. As discussed by Smith, Phillips, and King (2010), this is a common misconception, which attributes the behaviour of others to a disposition, attitude or belonging to social groups, while recognising one's own actions as the product of unrepresentative, situation-specific interactions. The metro rush hour and the participants' discussion of it demonstrates that even the most considerate person can act in a rude way on a day when they are in a hurry, or stressed, or absent-minded. At the same time, it appears that there are large numbers of commuters who are likely to get annoyed from witnessing such situations, as demonstrated by the data in the previous section. Presently, the metro authority's public communications seek to educate passengers in the rules and norms of the rush hour. However memorable and persuasive these messages are, the chances are that on any given day, a few people will act in ways which would be deemed inconsiderate according to this officially communicated etiquette. While this cannot be prevented, it is possible for the metro authority to do more in addressing the stress which these acts generate for others. In his work on public transport atmospheres, David Bissell (2010) argued that a certain amount of incivility will always be present in spaces of mobility, and that planners should seek strategies to facilitate the quick dissipation of negative affects, instead of trying to prevent them altogether. I suggest that one possible way of doing this is to remind passengers about the nature of rule-breaking as both unavoidable overall and, when taken separately, occasional to every individual metro service user, including those prone to getting annoyed with others. For example, public announcements could draw attention not only to the rules themselves, but also to the fact that a small amount of rule-breaking and rudeness will always be present on the metro: “Even the kindest person – Even You! – can forget to stand on the right sometimes. Don't get annoyed.” Instead of focusing on eradicating inconsiderate behaviours, such a message could help ease the atmosphere of stress which rule-breaking adds to.

However, when discussing rule-breaking, it is important to recognise that not complying with the rules can sometimes have a direct beneficial effect on the functioning of transport infrastructure. Up until now, I have discussed rule-breaking on the assumption that following perceived rules and norms generally maximizes comfort and safety for the

greatest number of service users, improving the collective capacity for comfort, if not one's individual one. However, the rules and norms of commuting are always in flux, and this was especially visible in the first three years of the life of a new metro line. In one specific case, rule-breaking evolved into a practice which was capable of eventually reconfiguring the physical metro infrastructure in a way which accommodated the rush hour commuters better.

When Line 2 was launched in August 2012, Serdika became a transfer station. At the end of the Serdika-1 platform (a central concourse from which both the east- and west-bound trains are accessed), two subways were opened, providing access to Serdika-2. Between them were the escalators and stairs leading to the station exit (see Figure 7-2). The two transfer subways, each approximately 25m in length, then merge into one, at the top of the stairs and escalators which lead to the Line 2 concourse.



Figure 7-2. Serdika Line 1 platform, with the two transfer subways to Line 2 visible, and the escalators and stairs to the station exit, 13 September 2012. See also Figure 5-4 for a diagram of the Serdika transfer layout. Photo: Author.

Immediately after the launch of Line 2, the two subways were designated one-way: the one on the right was for people going from Serdika-1 to Serdika-2, and the one on the left served the opposite direction. During the first month of Line 2 operations, a staff member was

always present outside them, to turn those people away who tried to walk through the wrong subway.

However, because the two links merged into the same space after only a short distance, it did not take long before several people were walking down the 'wrong' subway:

"I always take the wrong one, in both directions. Once a young guy told me off, but I just laughed at the naivety of this. Why can't I go through the tunnel which is in front of me?" (Assya, 2014 02 12 AM)

During the same time, Sofia Metropolitan gradually gave up on trying to regulate this, although the signage and designation remained. By 2013, the number of people getting off a rush hour Line 1 train and going into the correct tunnel, was approximately equal to those who went into the wrong one. For several respondents, the growing number of rule-breakers caused frustration to begin with:

"These tunnels are supposed to be one-way. I notice that a lot of people are going the wrong way. I don't like it. I prefer the division, the way it is done, it's one-way and you don't have to zig-zag between people coming towards you." (Anton, 2013 10 11 PM) "...people should observe the rules. That's what they are there for, so we don't get in each other's way. Imagine this tunnel rule not being observed if we were all in cars! You couldn't break the rules like this." (Anton 2014 01 10 AM)

However, using both subways as two-way links proved to work better during busy times. My repeated observations suggested that the two tunnels were wide enough to accommodate two-way flows of people, and in this way, the crowd from and to each of the two trains at Serdika 1 could proceed through the nearest tunnel, without having to cross the entire platform, slaloming through the crowd of people in the middle, who were trying to exit or enter the station:

"I too break the rules at the Serdika transfer. It makes no sense if I'm coming from Line 2 and want to board in the direction of Sofia University at Serdika 1. If I observe the tunnels, and there are people getting off a train from Mladost, there is no way to get across the crowd of people going out. Same as the people who are trying to get on a train at the platform, when a crowd of people are getting off. It's not well-organised. If only they would put signs that people should keep to the right, and it would work fine as two-way tunnels." (Janna, 2014 01 17 AM)

Over the course of my fieldwork, the number of people who broke the one-way rule grew, and even Anton started doing it occasionally: "But only late in the evening, when there aren't any people!" The original rule was broken and not enforced on so many occasions, that it seemed to lose its power as a recognised rule:

"At the transfer, I took the escalator up, walked through the "wrong" tunnel, as I do – and I am noticing that more and more people are doing it, and

from Line 1 to Line 2 people are also accommodating them, moving to the right, and it is becoming a two-lane tunnel.” (Assya, 2013 10 10 PM)

In the rush hour, people do not just share, and compete for, the physical transport infrastructure – they also become each other’s infrastructure (Bella calculating the number of minutes to the next train according to the number of people exiting the station provided an example of this described in Chapter 5). Although metro systems are often seen as sterile, regimented and disciplining spaces (Ziegler 2004; cf. Amin 2008), the overhaul of the transfer subways at Serdika by the collective rule-breaking of commuters demonstrates that such accounts have a limited ability to interpret the socialities of metro spaces. In this case, it also seemed that the approach commuters took resulted in a more usable and convenient infrastructure than the original design. While Sofia Metropolitan has not formally acknowledged this, observations confirm the collective hunch that the stressfulness of the metro transfer has been ameliorated as a result. However, until the formal rules are officially revised to reflect practical use, some commuters will continue to feel an underlying anxiety about going the wrong way:

“I go through the ‘correct’ tunnel here. I like rules. Although, when the two streams of people meet out here, it is just awful.” (Tanya, 2014 07 29 AM)

7.6. Travelling together, morning and evening

In a larger metropolis, ending up travelling with people one knows during the commute is unlikely to be a frequent occurrence, and thus is not a significant aspect of comfort-making transport practices. However, in relatively small Sofia, 12 of 20 core respondents discussed the habits they had developed to handle encounters with neighbours, friends and colleagues.

The trend which emerged from their accounts was that commuters were more open to sharing their journey with acquaintances during their return journey, rather than in the morning:

“I am a bit lazy in the morning; not sleepy, just not really keen to have conversations. It’s not a tragedy if I meet a colleague or a friend, but I would rather just be on my own, have it as own time.” (Anton 2014 01 10 AM)

The constraints on interacting during the time when most people felt like Anton did, was articulated by Tanya thus:

“I do meet acquaintances on the metro sometimes, but like I told you last time, I don’t like talking on the metro. So meeting someone I know is not great. In the morning, it’s just too quiet to have a conversation. It’s an uneasy situation. You need to talk, but what do you talk about? Especially if you haven’t seen each other in a long time. You need to share personal things, but it’s so uncomfortable. Or if you meet a colleague, and they start

talking about work things, in that wholly inappropriate setting!” (Tanya, 2014 02 14 AM)

There was one notable exception to this general consensus around comfort in solitude. Having bumped into each other on one of the first mornings after the launch of Line 2 in 2012, a group of four neighbours started organising to meet outside of their apartment building on most days, travelling together to Serdika where they departed in different directions:

“The group that we travel with in the morning... They are all neighbours. We have been travelling together for a while. At first, it happened, we just coincided at the platform. Then we started arranging to meet outside of our apartment building. So it became a ‘date.’” (Raya, 2014 06 17 AM)

Arguably, there was an element of lack of choice in this decision to ‘formalise’ the shared journey. Since they travelled from the same station at the same time, and knew each other fairly well, repeatedly encountering each other on the train without acknowledging it with an arrangement, could have generated a degree of social awkwardness. Toni, part of the same group, saw a number of benefits in the fact that an arrangement was indeed in place, and explained how it makes her commute more comfortable:

“It helps me manage time. I like leaving with them, because it makes me leave at 8.40, which means I’m at Serdika for 8.55. Just in time for the working day. It’s comfortable, just right.” (Toni, 2014 03 25 AM)
“I like the fact that there is a group of us travelling together in the morning. It is a more pleasant journey like this. The conversation is very light, we just keep each other company. You wake up.” (Toni, 2014 06 11 AM)

I was expecting that this large group’s shared commutes would require complex negotiations of space inside the full metro carriage. However, Toni’s accounts demonstrated that a group of four people who want to chat is no different to an individual in that they develop certain habits as ways for increasing the comfort of the [collective] commuting body:

“We were standing in the aisle between the seats when a man stood up from a seat directly behind me, and got off. Now, normally I wouldn’t be the one to sit down, since I’m the youngest by far! [laughs] But it would have taken a lot of manoeuvring for any of the others to take the seat. So I got the seat, and it was something we didn’t even have to discuss, it’s just clear. The others then gathered around me, so we could then face each other and talk. As the one sitting down, I also got to hold everyone’s handbags – that’s also something that doesn’t even need discussing [laughs].” (Toni, 2014 06 11 PM)

Thus, with relative ease, or rather the embodied skill of orientating oneself and each other in response to various constraints and needs, four commuters could maintain a level of interaction which mostly felt comfortable and appropriate to the early morning rush hour

commute. But for most of the other research participants, the sanctity of morning solitude was too powerful, and its sleepy comfort too valuable, to maintain a conversation. Even people who could easily travel together, such as two colleagues in a design agency who also live near to each other – both participating in the research – chose to avoid each other, relying on a simple argument:

“I rarely see people I know on my commute. I do see Emma occasionally, but we just see each other at European Union station, when we arrive. She takes the back of the train, I take the front. She thinks there it’s less crowded. For me, there isn’t a rational explanation. I guess it started with wanting to be towards the front of the train when I travel late in the evening, feels more safe. (...) In the morning, I really just want to be on my own, play my Sudoku, snooze.” (Janna, 2013 06 20 AM)

“When taking the metro, this is time for me, I can just be a sociopath [laughs]. There can be definite disadvantages of having to socialise so early in the morning. I can understand why people would even avoid the eyes of acquaintances on the metro, just to have it as me-time.” (Emma, 2014 02 4 AM)

Emma and Janna’s takes on morning interactions seemed not to be unique. During observations on the metro I witnessed people who were sitting opposite each other for the entire journey, who would only acknowledge each other at the carriage doors as they got off, their conversation revealing that they were colleagues, and replete with explanations why acknowledgement did not happen earlier “... The crossword... I’m so sleepy today, I was basically still asleep...” This was reflected in the overall atmosphere, typically one of silence and unapproachability, which made any conversations that did occur feel disruptive and out of place (see Tania’s comment above).

However, the disposition towards chatting was greater in the evening, and palpable in the atmosphere of the metro carriages and platforms. In quantitative transport research, Gonzales and Daganzo (2013) emphasised that the evening rush hour is more than a mirror image of the morning one. While in quantitative analyses this is generally taken to refer to the more dispersed peak of the return journey compared to the outward one, which is more concentrated (Ceapa, Smith, and Capra 2012), it is also true of the subjective experiences of morning and evening comfort-making. In this sense, the findings presented here confirm and expand upon the conclusions drawn by Ettema et al. (2012) from a survey of Swedish commuters’ stress and satisfaction levels.

Six participants claimed that they were more ‘open’ to the presence of known others in the evening, and less likely to seek to create a private cocoon (see Section 7.2) than in the morning. As in the case of Raya and Toni’s commuting group of neighbours, this was often a reflection of the situations participants found themselves in, rather than an outcome of

making a specific choice. Thus, six respondents discussed the fact that they often found themselves leaving with colleagues and traveling with them, particularly in workplaces with fixed office hours:

"Two or three of us usually leave the office together, around 10 past six. In the evening I'm more likely to travel with colleagues. It's nice. We talk to each other. In the morning I'm more likely to browse [the internet on phone] or text [boyfriend]." (Assya, 2013 10 10 PM)

From the presence of groups, the sound of conversation, and a general buzz in the air, it was possible to detect that this contrast between morning and evening applied to many other metro commuters apart from Assya. While conducting observations, I perceived the big difference in the resulting atmosphere, reminiscent of the Friday nights on the Edinburgh-London train, described by Bissell (2010) in the context of his ethnographic work. However, the liveliness of the groups of people who had just left their workplace was generally quite a muted one in comparison. This was an important feature of the post-work rush hour buzz. Unlike the energy of the metro at 11pm, when people set off from bars and pubs (an energy which can be very sociable, but also potentially quite unpleasant or even threatening to some, who find themselves immersed in it out of necessity), the moderate 6pm buzz generally created a comfortable atmosphere even for those who did not actively participate in interactions themselves:

"I think in the morning people are a bit sleepier. In the evening they are tired, but they seem happier, they look forward to having their own time at their disposal. I enjoy seeing all these different people in the evening." (Anton, 2013 10 11 PM)

"In the afternoon, the atmosphere is calmer. People are in less of a hurry. There is a lot of conversation. The whole place is slower." (Janna, 2013 06 20 PM)

Overall, the expectations of those commuters who were especially sensitive to rudeness and rule-breaking appeared to be more relaxed then, as they calibrated their sensitivities to the evening metro, maybe recognising it a little bit more as a leisure space, than a purely functional one. The aggregation of small groups, of gossip and giggles, across the network, changed what could and could not be done during the commute, and all of a sudden, loud conversation, laughter, and getting in the way, felt less grating than in the sleepy and charged silence of the morning carriage:

"The people's conversations don't bother me in the evening. I still read. It's different in the morning of course, people are alone, they are not talking to each other, so I can be fully absorbed in my book. But the evening commute is also nice." (Lilly, 2014 01 20 AM)

Although the human and non-human bodies present in the morning and evening rush hours are largely the same, the possibilities to create comfort through interaction differ

significantly between the two. There have been some calls in research and practice to make the commute a more sociable space (Talk to Me Global 2014), in order to counter the increasing effects of urban alienation and the breakdown of a sense of community which has been argued to define urban life (cf. Koch and Latham 2013). It is important to recognise that simply encouraging more interaction is in itself not a viable objective from the perspective of improving comfort, because of the particularities of each commuter's subjective experiences. At the very least, the planning of such interventions could take into account that what is perceived as pleasant or comfortable differs with the rhythms of the day. In the case of the Sofia metro, it appears that interventions seeking to promote greater interaction would be more easily accommodated in the habits of the evening commute, and seen to be disruptive in the quiet morning journey.

Conclusion

In considering commuter behaviour during peak times, there is often an underlying assumption that the rush hour is an aggregation of individual actions, motivated by self-interest (cf. Moloney, Horne, and Fien, 2010). Altruistic choices are considered as a separate category. However, certain behaviours in the rush hour demonstrate that there are a lot of actions which are neither, in that they are beneficial to both self and others, sustaining the socio-material infrastructure of everyday mobility and ensuring the ability to repeatedly travel together in fairly stable and comfortable ways. The affective infrastructure of public transport consists of a multitude of situations which present opportunities to act in ways which are neither selfish nor selfless. These encounters are usually resolved through acting in ways which sustain the system's functioning and delivery of desired outcomes both for oneself and for others. This collective movement is not easily conceptualised in terms of acts of kindness, or any kind of intentionality of incivility and conviviality. This focus on the collective habits which sustain commuting infrastructure as a socio-technical arrangement of relative collective comfort aimed to contribute to challenging the ontological dominance of the solitary, bounded mobile subject, in transport research and appraisal practice (Manderscheid 2013). Instead, the value of new transport infrastructure such as the Sofia metro extension often reflects comfort and stress which are actively generated with infrastructure, and collectively shared. This approach to conceptualising comfort and stress which the metro can offer for commuters reflects local specificities, minute socio-technical arrangements, and the capacities of commuters themselves to act as each other's infrastructure during busy times.

Comfort and stress in commuting have major implications for urban well-being, and thus for the value, defined broadly beyond economic return-on-investment as worth and utility, which new transport infrastructure can contribute to it. This chapter examined the collective habits through which commuters organise themselves during busy times, in pursuit of comfort. Some of these habits were orientated towards managing the distance between oneself and others; others had to do with selecting a comfortable space in the carriage. The behaviour of others, and their greater propensity to being rude, compared to one's own, were found to be key aspects of the rush hour. To cope with inconsiderate behaviours, commuters educated others, got into arguments, resigned themselves to the metro's rush hour incivility, or broke rules themselves. Finally, the atmosphere of the rush hour was found to be different between morning and evening, which in turn framed different daily rhythms of expectations and interactions.

Public transport infrastructure is often thought about in terms of trade-offs: sustainability at the cost of speed, comfort at the cost of additional spending. Research suggests that opting for public transport commuting can often be thought about as a sacrifice of the comfort of driving (Gatersleben and Uzzell 2007). At the same time, drivers appear to pay the price of greater stress levels when they choose the car over buses, metros and trams (LaJeunesse and Rodríguez 2012).

Thus, the metro is not simply a compromise with privacy and private space, because of financial and temporal pressures. As suggested in previous chapters, most of the Sofia commuters I interviewed did not present their adoption of the metro in terms of such concessions. On one hand, sharing with more people than in a private car does not automatically equal more stress and less comfort, as other people can also be a source of entertainment, safety, and predictability. The chapter also suggested that the opposite applies, too: while public transport may contribute to urban sociability and conviviality through its spaces of proximity and co-presence (Wilson 2011), the atmospheres which circulate in such spaces are too multifaceted and subtle to assume that the more interaction takes place, the more valuable the metro is to urban life.

In this chapter, I drew attention to some of the shortcomings of conceiving of commuting comfort and stress as inherent in transport modes, and quantifiable in terms of levels which can be compared. As an alternative, a framework for studying comfort and stress through minute, shared travel habits was proposed. Applying this type of micro-level data to various aspects of rush hour organisation, by both transport planners and users, I argued that it can

contribute to designing for, and valuing, different kinds of comfortable infrastructures for commuting with others.

The chapter aimed to consider comfort and stress related to commuting from a novel perspective. In the analysis of longitudinal data, a logical route to pursue might be to trace the aggregated effect of the commute on longer-term well-being (Olsson et al. 2013). However, a more distributed view of the self of each commuter puts into doubt the assumption of accumulation of affects to form 'overall' well-being (Hutchins 1995; Bissell 2011). Instead, the chapter discussed comfort and stress as belonging to situations, and circulating among the human and non-human bodies in specific settings. While the analysis aimed to examine those aspects of the metro infrastructure which contribute to comfortable or stressful commuting, it did not assume that singular, bounded bodies can be identified as causes or receptors of comfort/stress. In terms of application of these results, there are two related aspects to the well-being and commuter stress/comfort discussion, which can be taken from this.

First, the rationale for designing public transport commutes which are comfortable and less stressful could be productively re-thought. Such commutes are important, but their importance might not be measurable in terms of increases or decreases in the commuter-subject's level of overall well-being. In terms of collecting evidence on the effectiveness of a particular measure to address commuter comfort or stress, framing the issue in such terms might never yield the statistically significant regression a decision-maker might be hoping for. For transport planners, designing networks, pricing systems and timetables which ensure the optimal levels of occupancy throughout the peak and off-peak periods, is a major challenge (Niu and Zhou 2013). However, the methods usually used in transport planning do not easily capture the complex socialities which take place on busy metro platforms and trains. Thus, Niu and Zhou (2013) build their model for optimising the network timetable based on the traditional first-in-first-out principle. Although practical for planning purposes, the notion that the order of boarding a train is solely determined by the order of entering a station does not reflect the dynamics of a station.

Which brings me to the second point identified through the discussion of results in this chapter. As comfort and stress percolate through specific situated interactions between people and things, making these interactions more comfortable and less stressful remains a worthwhile pursuit. Reflecting the over-arching argument of this study, this is justifiable not only because it contributes to individual commuters' subjective well-being, but because it

adds to the value of the infrastructure in question. As the comfortable and valued situations on the metro increase, so does its capacity to create worthwhile time-use, value for money, and appreciation for the patterns of the city's everyday life. While measuring the effect of a stressful commute on happiness might present insurmountable challenges, a qualitative engagement with the effect of stress and comfort on the usefulness of public transport infrastructures can be more fruitful. This reframing of well-being away from a public health or psychology-based paradigm of transport use might not change the specific design and organisation features of a system such as the Sofia metro (although the reduction of the number of seats per carriage might be a viable possibility to consider); but it might provide a more meaningful rationale for continually investing in improving these features. In terms of future research, rather than seeking to measure the contribution of commuting affects to overall well-being, a possible novel direction would be the combining of different affects in a given commuting situation, or the ways in which comforts and stresses are sequenced during different stages of the journey.

Furthermore, and relatedly, the chapter took as its point of departure the idea that rules and norms are not simply the social processes which occur against the technical backdrop of material infrastructure, but are instead part of transport infrastructure's socio-technical arrangements themselves (Vannini 2011). However, my goal was to move beyond the familiar claim that rules and human interaction are part of the intricate infrastructure which make the metro commute possible. To do this, the chapter looked at the ways in which various rules and norms around behaviour in the rush hour become part of what is done and said as part of the commute, both when they are observed, and when they are broken. While demonstrating empirically the intricacies and skills involved in these processes was part of the chapter's narrative, its main pursuit was to explore their significance for planning commuting infrastructures which are accommodating to comfortable bodies and atmospheres.

Chapter 8. Change, infrastructure and sustainable mobility transitions in the urban everyday

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Introduction: tracing infrastructures of change

New transport infrastructure is often expected to trigger a break with old routines and spur on new ways of travelling, which over time, become routines themselves. In this conceptualisation, daily travel is seen as a stable arrangement of repeatedly performed actions, shaped by fully formed attitudes, as suggested by the widely used in transport research categories of driver, cyclist, pedestrian, and so on (see Lavery, Páez, and Kanaroglou, 2013 for a recent critique). It is generally agreed that infrastructural change such as public transport expansion, represents one step in transitions to greater sustainability of urban travel. However, as the sustainability transitions literature focuses on society-level change and technological innovation, it has a limited conceptual vocabulary when it comes to the dynamics through which socio-technical transitions play out in individuals' mobility routines (Geels and Schot 2007). This chapter's aims are twofold. First, it seeks to revisit, systematise and expand upon the empirical material on change in everyday travel behaviours which has been presented so far. Second, it aims to configure the distinctively scalar notion of transition, in a way which accommodates both micro-level practices and city-level transformations, and sees them through entanglements rather than hierarchies. Before presenting the empirical material which speaks to these two aims, I

briefly introduce what can be deemed a more conventional view of the environmental impact of the launch of the second metro line in Sofia.

What follows is a brief quantitative overview of CO₂ emissions from participants' commutes before and after adopting the metro. It provides context for the discussion that follows in the rest of the chapter. Assessing the effects of a transport scheme on the environment has become an increasingly important part of appraisal practice. A further reason to examine this issue is its local significance in the Sofia context. Air pollution in particular is a major concern for Sofia's residents and decision-makers, as the city has repeatedly ranked as having the most polluted air in the European Union (Eurostat 2016a). The potential positive effect of the metro on air quality has been central to the public discourse around it ever since the 1960s (see Chapter 3 for a detailed discussion). Comparing the political and scientific rhetoric around the environmental benefits of the new extension to the practical reality, and the comments and experiences of the respondents, could be the basis for a research project in its own right. Environmental impacts are traditionally seen as externalities, the impact of which is calculated at societal, rather than individual level. The latter is the approach I have taken here. I aim to offer a simple summary of the impact on commuting CO₂ emissions of each of the core respondent's adoption of the metro as an everyday mobility mode. An overview of the change in emissions across the entire core sample is presented in Figure 8-1 below. The analysis presented here is quite limited, in that it only covers CO₂ emissions, and does not discuss other aspects of transport's environmental impact, including noise pollution, small particle air pollution, the visual and experiential effects on the urban environment of traffic, to name a few. However, CO₂ emissions can be considered a relatively good proxy for overall environmental effects (Jia, Carling, and Håkansson 2013). Furthermore, this simple example can be taken to illustrate the difference new infrastructure might make to personal sustainable mobility transitions, while at the same time making visible the assumptions which need to be made when quantifying change and difference (Satterthwaite 2008). As with cost and time, the emissions for the entire journey are presented, including both metro and any other modes used. Distance data are based on GIS data collected using a GPS tracker during ride-along interviews with project participants. Estimates of CO₂ emissions for distance covered by each mode were then calculated using the conversion ratios offered by Carbon Independent (2015) for bus and metro, and The Resurgence Trust (2015) for driving and train. The workings behind the data presented here are included in Appendix 3.

	New commute modes	Daily CO2 emissions from new commute (g)	Old commute modes	Daily CO2 emissions from old commute (g)	Change in CO2 emissions
Anton	walk, metro	1,456	drive	6,552	-5,096
Assya	walk, metro	1,072	walk, metro	832	240
Bella	walk, metro	496	walk, tram	640	-144
Maria	walk, metro	496	walk	-	496
Nikolay	walk, metro	1,920	walk	-	1,920
Emma	walk, metro	1,168	walk, tram	1,232	-64
Stella	drive, train, metro	3,240	drive	6,480	-3,240
Rumen	walk, metro, tram	656	cycle	-	656
Gregor	walk, metro	1,120	walk, bus, metro	3,856	-2,736
Irina	walk, tram, metro	1,792	walk, tram	1,392	400
Janna	walk, metro	1,008	drive	6,912	-5,904
Vladimir	walk, metro	720	walk, tram	960	-240
Maya	walk, metro	320	walk, bus	1,054	-734
Christo	walk, metro	1,488	drive	4,824	-3,336
Natalia	walk, metro	1,120	walk, bus, metro	1,270	-150
Nell	drive, metro	8,248	walk, minibus	4,928	3,320
Raya	walk, metro	1,328	walk, bus	2,890	-1,562
Toni	walk, metro	656	walk, tram	688	-32
Tanya	walk, metro	832	drive	4,104	-3,272
Lilly	walk, drive, metro	10,288	walk, minibus, trolleybus	9,152	1,136
Total		39,424		57,766	-18,342
Average		1,971		2,888	-917

Figure 8-1. CO2 emissions from commuting before and after switch to the metro. Note: Calculations are based on: driving=360 grams of CO2 per passenger=km, train=96g, bus and trolleybus=170g, metro and tram=80g. Source: carbonindependent.org and resurgence.org.

The average CO2 saving from switching to the metro across the sample was 0.9kg per day. In total, the CO2 emissions of the 20 respondents were reduced by 18.3kg per day.

13 out of 20 respondents saw their CO2 emissions decrease. Four people who had previously had carbon-free commutes through walking and cycling, started contributing to CO2 emissions. Lilly and Nell, the participants with the longest commutes by distance and duration, also had the most carbon intensive commutes after switching to the metro. Both Lilly's and Nell's CO2 emissions actually increased as a result of the switch. This was due to the fact that they started driving to a metro station, having previously used a minibus and a trolleybus to get to work. While both of those modes have higher emissions per passenger per kilometre than the metro, the huge carbon footprint of the single-occupant car meant Lilly's and Nell's commutes became less environmentally sustainable overall.

A related conclusion which can be drawn from this overview is the dubious applicability of the notion of trade-offs, also discussed in relation to cost and time, which much sustainable transport research is implicitly based on (Van Nes and Bovy 2004). It is often assumed that a transition to more environmentally sustainable everyday behaviours involves sacrificing some combination of time, cost and comfort (Lyons and Chatterjee 2008). This was not the case for the research participants in Sofia. In the case of the core sample, no such relationship could be observed. Of the 13 commuters who cut their CO2 emissions, seven also reduced their spending on commuting, and eight reduced their travel time (Figure 8-2). A total of five participants saw improvements in all three aspects of their commute. These findings suggest that the idea of trade-offs is not only conceptually problematic, but also possibly empirically unfounded.

	Duration	Cost	CO2
<i>Anton</i>	0	+	+
<i>Assya</i>	0	-	-
<i>Bella</i>	+	0	+
<i>Maria</i>	+	-	-
<i>Nikolay</i>	-	-	-
<i>Emma</i>	+	+	+
<i>Stella</i>	+	+	+
<i>Rumen</i>	0	-	-
<i>Gregor</i>	+	0	+
<i>Irina</i>	+	0	-
<i>Janna</i>	+	+	+
<i>Vladimir</i>	0	0	+
<i>Maya</i>	0	0	+
<i>Christo</i>	-	+	+
<i>Natalia</i>	+	+	+
<i>Nell</i>	+	-	-
<i>Raya</i>	0	0	+
<i>Toni</i>	+	-	+
<i>Tanya</i>	+	+	+
<i>Lilly</i>	+	+	-

Figure 8-2. Summary of changes in duration, cost and CO2 emissions. (+) indicates a gain: reduced duration, reduced cost, or reduced emissions. (-) indicates a loss: increased duration, increased cost, or increased emissions.

This analysis is pertinent in light of the participants' absence of stated environmental concerns and environmentally-driven behavioural change in adopting the metro as a mode. Arguably, in not prioritising environmental impacts, this group of commuters have a lot in common with millions of others in cities worldwide. The prevalence of environmental

sustainability concerns in a population might not be meaningful as a singled-out motivational driver in travel behaviour, but can be more helpfully understood as one force of many in the socio-material arrangements of everyday mobility. The rest of the chapter delves in more depth into these on-going reconfigurations.

Mobilities scholars have argued for greater attention to the situated and long-term dynamics which make up overarching lifestyle and modal categories in the lived experience of getting around. Thus, mobility biographies research has demonstrated how preferred modes change over time, particularly in relation to life course events such as becoming a parent, or graduating from university (Lanzendorf 2010). For scholars of mobility biographies, everyday mobility follows a trajectory of relative stability, which is disrupted by key life events, and then re-stabilised. For example, Grimsrud and El-Geneidy (2014) refer to a 'mode-stable' stage of life when discussing different transport arrangements over the lifecourse. However, the assumption that mobility biographies map a linear and relatively consistent progression through transport modes, within which 'small' variations are nested, has not been sufficiently scrutinised. While this chapter takes inspiration from mobility biographies research, it attempts to complicate its linearity.

Similarly, the many minute practices which are performed as part of being in a car, train carriage, or on a sidewalk, have been given extensive attention in mobilities scholarship (Cass and Faulconbridge 2015). Thus, the dominance of 'lifestyle' categories research, based on singular modal identities, such as cyclist, bus user, and pedestrian, have been complicated (Barr, Gilg, and Shaw 2011). However, the dynamics between the minute and the transformative changes which occur as part of everyday travel, both on a daily basis and in the long-term, are poorly understood. There is limited research on the ways in which the small variations in dispersed practices such as listening to music, or travelling with co-workers, relate to the broader reorganisations of mobility practices which have important implications for sustainability transitions research and policy (cf. Cass and Faulconbridge, 2015).

Thus, this chapter builds conceptual bridges between minute variability and major transformation, in order to bring closer together the geographies of large infrastructural change and minute dynamics of everyday mobility. Doing away with any presumption of scale is a necessary precondition here. Even though mobilities research has gone a long way in demonstrating the importance and richness of daily practices, relatively little has been done in relating the subtleties and complexities of minute ethnographic data back to the

challenges of making decisions about infrastructure and sustainability. The sense that more and less significant disruptions to everyday routines are separate categories is profoundly embedded, not least because of the strong influence of a psychological conception of habit in transport behaviour research (Bamberg, Rölle, and Weber 2003). However, impactful disruptions in fact unfold through, with and alongside small adaptations (Graham and Thrift 2007). As social practice theorists have argued, small and big change are connected in ways which complicate the idea of shifts from one paradigm to another, and one way of doing things to another (van Vliet, Chappells, and Shove 2005; Shove, Pantzar, and Watson 2012). In order to think empirically about these connections, this chapter begins by proposing an analytical framework, which maps the ways in which small and big change are linked in the performance of daily mobility and infrastructure use. The framework is derived inductively from the longitudinal data gathered through repeatedly interviewing in-situ the same group of 20 metro users. The framework takes a matrix form, thus 'flattening' scalar hierarchies and withholding inferences about the kinds of change which might be more or less significant from a sustainable mobility perspective (Figure 8-3). The purpose of the matrix is not to study the processes of change in each category as a separate set of phenomena, but instead to trace the way in which the categories are connected, shaping each other, disrupting each other, or functioning alongside and through each other.

Firstly, in conceptualising the mobility transitions of commuters, it is possible to prioritise a change in travel mode over other types of change, or even to focus exclusively on such a 'shift' from one mode to another. This is undoubtedly an important process, however, it can be overly reliant on the idea that one relatively stable and repetitive use of a mode is disrupted and then replaced with another 'stable' modal 'choice.' By contrast, taking a non-scalar and longitudinal view of change can help make such assumptions behind the modal shift notion explicit. This also reflects a long-standing tradition of travel behaviour research, where changes in the mode of travel is only one of an interrelated set of possible changes commuters make in continuously adapting their journeys (Salomon and Mokhtarian 1997; Garling et al 2002; Choo and Mokhtarian 2008). Thus, in Figure 8-3, such shifts are positioned as only one of the possible types of change (upper left quadrant). To reflect this further, the textboxes used in Chapters 5 and 6 to illustrate a simple 'before and after' view of cost and travel time, are not used here. From the perspective of on-going change and sameness, choosing one watershed (i.e. the launch of Line 2) over any other, would seem entirely arbitrary. Instead, several of the participant accounts presented in this chapter are made up of comments made over the course of a number of interviews, highlighting both continuities and contrasts in how the commute is discussed. Where such compound quotes

are given, this is clearly indicated. I suggest that to grasp at the role of daily practices in sustainable mobility transitions, and the place of new infrastructure in this relationship, every direction of interdependence within the framework needs to be attended to. When a longitudinal approach is used, what previously might have seemed to be a 'shift', may turn out to be part of the on-going variability of travel behaviour.

The distinction between modal and non-modal change is self-evident; starting to commute by metro falls in the former category, and stopping reading books during the commute – in the latter. The distinction between variability and shift, however, warrants a more detailed justification. In order to offer one, I once again reflect back on the role of the subject in everyday mobility.

As detailed in previous chapters, the approach I have taken in this project relies on a notion of the mobile subject as both embodied and mindful, both situated in affective and material entanglements, and endowed with memories, intentions and reflections (Hitchings 2012). This view informs also the application of the variability/shift distinction to the empirical data. In an inductive approach, the reflections research participants offered on what seemed and felt to them as either one or the other, combined with my own observations collected during ride-along interviews, were sufficient basis for my own use of the terms. In situations where the distinction between the two seemed ambiguous for either or both of us, I aimed to revisit the topic in subsequent ride-along interviews, whereby it was often obvious whether, for example, a new walking route could be seen as a relatively stable and one-off shift, or as one modification to a wider repertoire of walking routes which was always in the process of changing.

As pointed out above, the distinction between variability and shift is inevitably contingent on the timeframe of the study. What appears to be a one-off shift in the context of 12 months of ride-along interviewing may well prove to be about cyclical repetition, or occasional variability. This is an inherent limitation of this approach. However, what is more significant in this process than labelling events with the 'correct' categories of change, is the emphasis it places on the connection and co-constitution of different types of changes and stabilities, which together paint the picture of what makes up mobility transitions from a commuter's perspective.

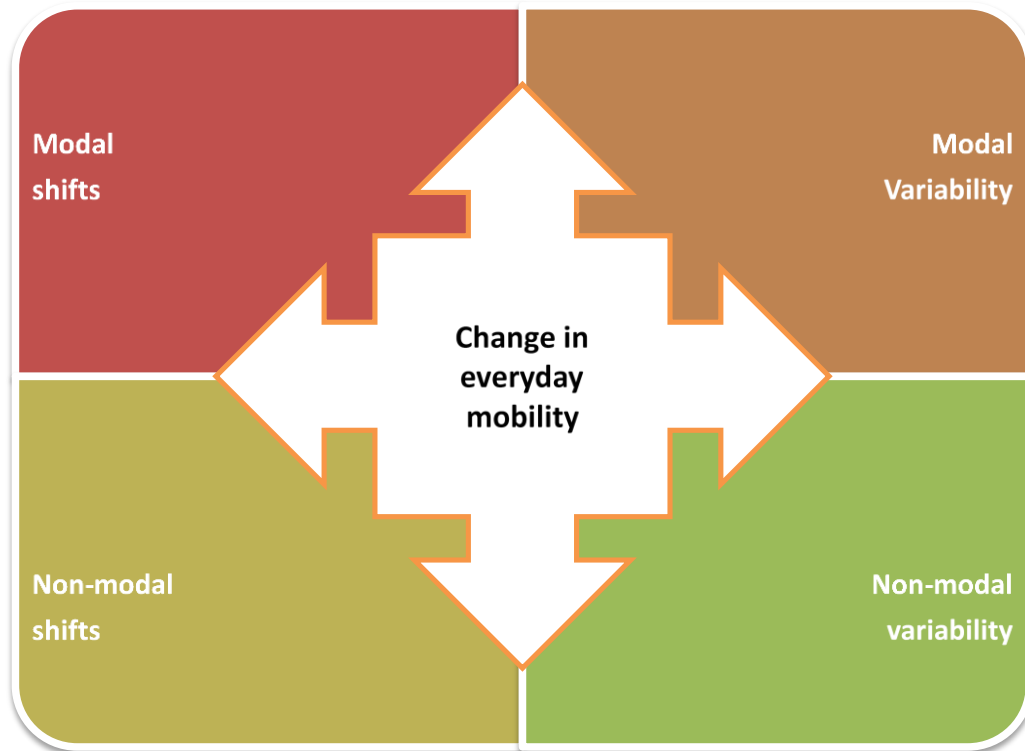


Figure 8-3. A framework for studying change in everyday mobility

Therefore, the modal shift that guides the focus of this entire research project, the ‘switch’ to commuting by metro, is not a singular major transformation, nor one which happens overnight. It is both linked to other types of change, and is itself made up of a number of different processes of reconfiguration and adjustment. While this study does not aim to give a blueprint for qualitative evaluations of transport infrastructure projects, I suggest that a framework such as this one could be a useful tool for gauging the place of a project in its users’ mobility biographies; tracing how utility might be enacted in the small and big adjustments which make them up; and most importantly, suspending the assumption that a big infrastructure equals a big change in mobility systems – an assumption which arguably comes to undermine many existing approaches to appraisal (Richmond 2005).

The empirical material presented in this chapter is not an exhaustive account of the many modal and non-modal changes the commutes of the core respondents underwent. Firstly, because this would be too much ground to cover in one chapter, but also because some of these on-going changes, such as switches between tickets and travelcards, have been discussed in some detail in previous chapters. Although my focus is on the connections between the different kinds of change rather than the categorisations itself, the chapter is organised around four sections, each corresponding to one quadrant in Figure 8-3. Each section brings a set of transformations to the fore, and continuously relates micro-level

qualitative data back to key urban transport challenges, focusing particularly on those faced by the city of Sofia. To make the most of the longitudinal, repeated interview data and observations, the discussion incorporates slightly longer empirical vignettes, which highlight the many layers and perspectives involved in even the smallest of everyday mobility changes.

8.1. Line 2 of the Sofia metro as modal shift

The delivery of new public transport infrastructure is often contingent upon, and evaluated in terms of, its capacity to generate modal shift (Altshuler and Luberoff 2003). A new public transport line such as the Sofia metro Line 2 would only be deemed successful if it attracts sufficiently high levels of ridership. 'Attracting' users is a key preoccupation of transport planners, and the extent to which it is achieved is the criterion on which all other aspects of appraisal – economic, environmental and social – are contingent (Richmond 2005). In the context of Sofia's automobile dominance and the resulting detrimental effects on society and the built environment, the key shift implied in discussions of the metro extension's success was often the one from the private car to the metro.

By taking a longitudinal ethnographic approach to the Line 2 project of the Sofia metro, it is possible to examine the notion of a modal shift, and the assumption of a specific identifiable object of infrastructure causing the shift, which is implicit in it. Attending to the ways in which the connectedness of infrastructure unfolds in both space and time can help address a fundamental limitation of the ontology underlying the cost-benefit analysis of infrastructure (Van Wee and Roeser 2013). Although an infrastructure project is conceived, costed and built as a singular, bounded object, it is in practice part of complex networks and circulations. An approach which prioritises the connectedness of transport infrastructure can enrich current appraisal methodologies by challenging the idea that straightforward causal links (a structure is built – a behavioural shift (i.e. from driving to riding the metro) is caused – an amount of benefit can be quantified) can be established.

The first way to expand the focus of cost-benefit analysis, therefore, would be to scrutinise its temporalities. The idea of the launch of a public transport infrastructure as a moment which separates the before and the after of a modal shift, is the first one which invites critique. As demonstrated by the experiences of Sofia-based commuters, the multidirectional social and technological links which bind the second metro line to the city, pre-date its launch. The framing of the ways in which it is valued and experienced goes back even further, but one temporal segment which could be given greater consideration with

relative ease is that of the construction period. From the moment roads were closed off, tram lines disrupted, and car traffic redirected to accommodate the construction of the large new infrastructure, the metro line became part of the city's human and non-human flows. Throughout the construction period, which extended over several years in each part of the city, the presence of the metro, despite it being work-in-progress, started playing a role in the daily mobilities of urban dwellers:

"I have vivid memories from when they were building the metro here [in Nadezhda]. It was actually quite nasty. It was a lot like a civil war. The small street outside our apartment was basically used as an alternative route to the main road which was closed. You can imagine how unpleasant it was. The options for transport were very limited. It was very difficult to reach the city centre. I don't think the neighbourhood has changed dramatically because of the metro. The dramatic difference is between the construction period and the time after it was completed." (Toni, 2014 06 11 PM)

"During the construction of this part of the Metro, at Mladost-3, we weren't affected much. Only it caused us to give up on my son's swimming lessons. We had to walk all the way around to the swimming pool, big loop all around the neighbourhood, no transport, and it just wasn't feasible. (...) What I remember of the first days on commuting from Mladost-3 was that I was quite happy with it. But the contrast was unsatisfactory between the lovely metro and the mud and ruins around it. Inside, all new and clean and lovely, outside, clearly not yet completed properly, not yet organised as it should be." (Natalia, 2013 01 22 AM)

Given the protracted and significant impact which the construction phase has on daily mobilities, it warrants a more prominent place in attempts to qualitatively analyse the costs and benefits of the new infrastructure being appraised. In terms of lived experience, Line 2 became part of the commute of Sofia residents years before it was completed and launched. Therefore, the new line's role in shaping commuting cost, time, comfort and stress, spans the period preceding 31 August 2012, not just the years that follow:

"For four years, they built the metro in our neighbourhood. It seemed really long. The whole place was dirty, dusty, and then they did all these additional works around the metro construction too, so it went on forever. There was a replacement bus while the tram wasn't running. (...) Originally, I was a bit of a sceptic on the subject of the metro. Because these four years of construction were really bad for the neighbourhood, I was very negative about the metro at the time. I always used to say, I have lived without metro for 50 years, I will happily continue living without it." (Bella 2014 01 7 AM and PM)

Disruption is often framed in transport research as an opportunity to enact positive change towards sustainability (Marsden and Docherty 2013). In the currently prevalent conceptualisation, when pre-existing infrastructural set-ups are unsettled, the entrenched travel habits such as the car commute, often problematic from a sustainability point of view, can be reconfigured. However, Bella's comments serve as a reminder that an infrastructural

disruption is also a source of stress, uncertainty and discontent. As discussed in Chapter 7, a normative view of habit as an obstacle to 'desirable' forms of urban mobility, can place large expectations on disruption as opportunity, which show little consideration for the lived experience that disruption is and those who experienced it. From the perspective of the potential users of the service, this is a key cost against which the benefit of the new infrastructure is evaluated. In appraising the significance of the modal shift, therefore, it is not just how people travel before and after the new infrastructure as a historical 'moment' that is significant, but also how they travel *during*. The embodied experiences of dust and noise, the uncertainty and delays, and the conversations which take place around them, persist after the infrastructure's launch. These situated interactions then shape the potential for the 'modal shift' from the perspective of those considering it, and can make a difference to the mindful and embodied negotiations with which commuters consider the possibility of the metro journey.

The other reason to scrutinise the assumption of boundedness and causality implicit in cost-benefit analysis are the changes in a city's mobility system which are on-going before, during, and after the introduction of a specific infrastructural object. Although the metro's planners and managers, and those like myself dedicating much time to researching it, might be tempted to assign its pull great importance, modal shifts do not occur in a bilateral link between user and an object of infrastructure. While comfort, travel time use, duration, and journey cost, may be hugely important to the making of Sofia metro commutes, they should not be the basis of hasty attributions of causality. Their role in how commutes are continuously put together and reconfigured, unfolds in the context of a number of other changes. In the case of Sofia, two of the most important ones were the changes in parking regulations in the city centre, with the establishment of a Blue Zone,⁹ and the discontinuation of tram, bus and trolley lines which would have duplicated the route of the second metro line:

"If it wasn't for the parking restrictions near the office, I would probably still be driving. It is more relaxed, quieter, you are just driving. But it is noticeably more expensive. (...) Parking and petrol prices are both expensive and are the main reason why I don't drive to work anymore. If it was just the metro, without the parking restrictions, I think I maybe would drive every

⁹ The Blue zone is a regulated area of restricted parking, which covers the central part of Sofia. It came into force in 2012 and had a profound impact on transport in Sofia at the same time as the launch of the metro's second line. Except for a limited number of annual permit holders, The Blue zone restricts parking to designated metred parking spots, the use of which costs 2 levs per hour, and is limited to two hours per day.

other day. Because the metro does have advantages, for example, when we decide to have a drink in the office at the end of the working day. (...) I doubt that my friends who work in the Business Park [on the outskirts of town] would switch to the metro when it reaches the Business Park, if there aren't also parking restrictions." (Anton, various interviews, 2013-2014)

"In terms of journey time, not much has changed. It takes 15 minutes now, but it also used to take 15 minutes with the tram. Maybe 20 minutes. So no big difference. But they discontinued the tram when they started building the metro." (Raya, 2014 06 17 PM)

The future social and environmental sustainability of cities is likely to be contingent on large-scale modal shifts in everyday mobility (Banister 2008). The shift from private car journeys to public transport journeys is considered by many transport scholars and practitioners as central to this process (Hensher et al. 2013). However, in appraising the role which a new public transport project can play in these transitions, it can be productive to move away from compartmentalised views of the individual modal parts of the urban mobility infrastructure network, and thus from an exclusive focus on modal shift. This is especially relevant in the Sofia context, where modal divisions are deeply entrenched, through governance structures, funding models, and popular culture. This idea is developed further in the next section.

8.2. Modal variability: the metro's role in a modal polyculture

Sustainable urban transport is increasingly recognised to be linked to multimodality (Lavery, Páez, and Kanaroglou 2013). Urban automobility is problematic for cities not only because of its own, extensively evidenced in research, effects on human health, equality, and the environment, but also because of the way it, as a socio-technical system, restricts the possibility for any other transport modes to thrive alongside it (Urry 2004). In the words of Lavery, Páez, and Kanaroglou (2013), infrastructures for car travel facilitate the creation of 'modal monocultures,' which restrict the possibility to choose any mode other than the dominant transport mode.

This section makes a further contribution to a more nuanced view of attributable switches and behaviour changes, by focusing on multimodality. In this discussion, multimodality is defined as the *possibility* for modal variability in commuting: having access to alternative transport modes in completing one's everyday journeys, which the user themselves sees as feasible and satisfactory, regardless of whether they are used more or less frequently, or not at all (Lavery, Páez, and Kanaroglou 2013).

Following the launch of Line 2, the metro became part of the daily mobility repertoire of the 20 participants in the core sample. However, the adoption of the metro as a transport mode is much more than a 'switch to' the metro. In practice, commuters' journeys can vary significantly by mode, from day to day, from week to week, and from season to season. This variability characterised all 20 commutes at different stages of the study, and was part of participants' everyday mobility arrangements both before and after the launch of the new metro line.

As discussed in Chapter 6, the infrastructure of Line 2 enabled a particular mode of occasional walking for many commuters, whereby they could get off in the pleasant surroundings of the city centre, walk, and then get back on the metro to travel home. A further example of modal variability was provided by Emma's experience of occasional cycling:

"I bought a bicycle – so now I don't use a travel card, I buy individual tickets. I still use the metro once a week, when I need to carry something like an expensive camera. It's not the same day each week, but there's always at least one. Or for instance, recently I had a lot of work, it was very stressful, I was sleeping two hours per night. When I was feeling that way, I couldn't cycle. I just got on the metro and fell asleep. (...) One time I travelled home after dark, so I wasn't sure if to go home by bike, as I was not feeling very confident. But I remembered you told me I could take it on the metro after 9pm, so I did, and then got off at Han Kubrat station [one stop early]. I got off there because there's a cycle lane from there to my place, so it would be safe to cycle the last part of the journey. But it was very difficult to take the bike on the escalator in the metro. (...) During winter, I'll have to see, I'll probably have to take the metro if the streets are all icy and it's cold."
(Emma, 2013 08 9 AM)

As demonstrated by Emma's account, the new metro infrastructure becomes part of intricate multimodal arrangements, with complex negotiations of transport modes both within a single journey, and across weekly and monthly cycles. As all 20 participants experienced more multimodal variability in their commutes following the launch of the second metro line, from their perspective at least, the new infrastructure contributed to Sofia's modal polyculture. However, this link is not a straightforward one. For instance, the promising, from a transport policy point of view, combination of cycling and public transport commuting discussed by Emma, is one which faces many frictions when the minute interactions of putting it together are considered. In fact, this late journey home was the first and only time Emma attempted to take her bike on the metro:

"I don't think there's been a second occasion when I've taken the bike on the metro. I have thought about it, but it hasn't happened. It just feels like hassle. Stairs, lifts, trains." (Emma, 2013 11 7 PM)

This experience was reflected in the additional interviews I carried out with cyclists in Sofia:

"I have boarded the metro with the bicycle, no problem, I just wait until 9pm and pay the ticket and it is fine. However, it's not very convenient if it's a station without a wide entrance barrier: I have to carry it over my head which can be pretty heavy. There's no sign in the last car that that's where bicycles are allowed, so often someone is standing in the exact place allocated for bikes, so I have to enter into a discussion. Also, this rule is problematic when there's more than one bike on the train." (Pavel, 2013 05 17 AM)

Overall, without the introduction of a bike-sharing scheme, it seems unlikely that the particular form of everyday multimodality enacted through combining bicycle and metro, will have a significant impact on Sofia's transport. While with the additional intermediation of small infrastructures such as unlimited monthly travelcards the metro has the potential to unlock an increase in walking, the socio-material specificities of multimodal cycling require an entirely different set of arrangements. Thus, it would be an oversimplification to suggest that a new metro line opens the doors for more cycling. While public transport is often framed as the backbone which makes non-motorised mobility possible (Banister 2008), a closer examination of what this entails in practice is needed.

As the challenges of urban mobility intensify in most cities worldwide, transport research is increasingly turning towards multimodality as a useful way of thinking about the work performed by transport infrastructures (Spickermann, Grienitz, and von der Gracht 2013). Multimodality and public transport are inextricably linked, as most transit journeys are completed by at least two modes (i.e. they involve walking), and most multimodal journeys involve some form of public transport (Van Nes and Bovy 2004). As Spickermann et al (2013) argue, multimodal perspectives complicate the old dichotomy of private versus public modes, recognising instead that these are interlocked both at the macro level of the transport network, and the micro level of an individual's routine journeys. Instead of differentiating mobility by types of technology used for locomotion, multimodal perspectives recognise that movement in cities is as diverse, complementary and contradictory as cities themselves. Sustainability strategies, then, in both environmental and social terms, should reflect and accommodate diverse mobility repertoires, instead of 'solving' mobility questions with mode-based agendas.

If the creation of transport polycultures is important for the social and environmental sustainability of cities, then new infrastructures should be planned with that goal in mind. Thus, the capacity for multimodality, or modal variability, should form part of the appraisal of new transport infrastructures. In the case of Sofia, this would mean reflecting not only on the capacity of the second metro line to attract ridership in itself, but also examining the

differences it makes, if any, to a polyculture of urban mobility. This approach shifts the focus away from the new metro line as an identifiable, bounded object, and highlights that the always on-going changes which happen in a city's mobility networks are linked in ways which cannot be separated out, particularly by mode:

“The metro has really changed the traffic here on [a central boulevard]. It’s so much nicer and less stressful. Look how cars are driving by, it used to be the case that you could spend 10-15mins sat in traffic here. (...) I did save time by switching from car to metro, but to be honest, the metro has cut the driving time too. I can drive to the city centre in 20 minutes, exactly because of the metro.” (Anton, 2013 10 01 AM and 2014 01 10 AM)

One outcome of the construction of the second metro line, then, is that it frees up additional road capacity. As research has repeatedly demonstrated, new road capacity almost inevitably unlocks latent demand for driving, and the temporarily freer streets become filled with cars once more (Mackett and Edwards 1998). In considering the wider costs and benefits of new public transport infrastructure, this anticipated effect on mobility cannot be ignored. Accordingly, the possible roles for automobility in modal polycultures should continue to be scrutinised. Park-and-ride journeys have been one of the goals Sofia Municipality and Sofia Metropolitan have pursued with the Line 2 project, as discussed in Chapter 2. Park-and-ride commuting has far-reaching implications at both ends of the journey's car leg: for the low-density suburban areas where they typically originate, as well as for the predominantly high-rise residential areas where drivers leave their cars and get the metro. At Obelya station, where no park-and-ride facilities were provided, suburban drivers like Nell spent an increasing amount of time circling the surrounding streets looking for a good parking spot:

“It has happened to me several times since November that I arrive and I can’t park straight away, I have to drive around for a bit. I had found a nice spot previously, but I guess other people find it too.” (Nell, 2015 01 7 AM)

On the other hand, if Nell could not drive to the metro, she would not use the metro at all. She would have continued taking a crowded mini-bus into the city centre, or driven there and paid for parking. From Nell's perspective, there was no feasible public transport link between her suburb and the metro, and she became a regular driver specifically in order to become a metro commuter:

“I have not been a driver for a very long time at all. As soon as I was able to organise myself to buy a little car, I did it, as this is the only way to commute. There is no other way to get here. Before that, I used to take a minibus taxi [from the suburb where she lives to her office in the city centre]. I did that for a very long time. (...) When I got my car, I bought a few additional driving lessons, to get used to the car, and drove here with the instructor. I had already heard about this place at Obelya where you could leave your car. I even showed it to him, we did a few rounds of the neighbourhood so I can be

confident I can do it on my own. So this is how it started.” (Nell, 2014 08 5 AM and PM)

From Nell’s perspective, the multimodal journey had the potential to gradually erode the time savings and conveniences generated by the metro, as she would travel earlier and earlier, and spend longer and longer looking for a place to park.

From the perspective of the local residents near Obelya, the multimodal commute of Nell and many others was part of the impact of the metro project as much as the improved transport links it provided. Mladost-3 station faced a similar situation to Obelya, and Natalia, a local resident, discussed the impact on the neighbourhood:

“Obviously, not everyone is within walking distance of the [new metro station]. So people drive. You will see now; the traffic gets busier with every minute at this hour. But there are no parking facilities, so people just park everywhere. It’s such a small street, but there are no other options for the drivers, so it gets very busy!” (Natalia, 2013 01 22 AM)

While Nell and other commuters were competing for parking spots in the residential streets around some stations, park-and-ride facilities at other stations lay empty, attracting a lot of media criticism as a wasted investment. The mismatch between provision and demand demonstrated that some amount of park-and-ride commuting would happen regardless of whether dedicated facilities were constructed or not. Even where covered park-and-ride facilities are provided, car traffic through surrounding streets can affect the health and well-being of those local residents who are otherwise seen as the beneficiaries of a brand new metro station.

These observations raise questions around the kind of multimodality which might be desirable or not in different areas, and the different ways of enabling or restricting them. The experiences of the residents of Mladost-3 and Obelya demonstrate that while the metro is an inherently multimodal transport infrastructure, multimodality in itself is neither inherently positive, nor inherently sustainable. At different scales, therefore, the ambiguities of how both the costs and the benefits of the metro accrue, can be traced. Multimodality can be a useful analytical lens for evaluating the role of the new infrastructure to the city’s mobility, while its potential as a policy goal in itself should be examined from a range of scales and perspectives.

8.3. Non-modal variability: Variation and trip-chaining in the metro journey

This section considers the type of changes in commuting practices which do not concern the mode of transport, and which occur often enough in everyday life to not be deemed a shift.

At the same time, I posit that these ‘small’ variabilities are not only significant from the point of view of the kinds of utilities and meanings the metro infrastructure can participate in, but also because non-modal variability can both enable and preclude changes in travel mode. As Huff and Hanson (1986) point out, abrupt changes (i.e. shifts) cannot account for the lived experiences of mobility, which in everyday life is defined predominantly by various small and gradual changes. For the authors, while activities, taken individually, may remain fairly constant, the patterns into which journeys and actions are arranged can vary significantly (Huff and Hanson 1986:100). Thus, in a study of daily mobility based on five-week travel diaries, they found that even the most ‘typical’ day is in fact similar to only about a third of each respondent’s days. One important lesson from this work is the need to examine variability in travel behaviour using longitudinal research methodologies. The currently prevalent approach in transport studies, of single-day data, is overly reliant on the potentially problematic assumption that if aggregated, the intrapersonal variability of each person’s journeys adds up to the interpersonal variability observed in a large sample (Hanson and Huff 1988). However, while Hanson and Huff’s work accounts for variability in mode, time and destination, it is rare for studies in this vein to address the more ‘experiential’ aspects of travel, such as comfort and stress.

Two aspects of non-modal variability will be discussed here: first, variations within the practices of the metro commute timespace itself, and second, the role of the metro in connecting commute and non-commute trips, or trip-chaining.

Non-modal variability in a range of different guises was discussed in some detail in the preceding chapters. Without necessarily changing their mode of travel, each of the commuters varied how and when they paid for their metro journeys; when they travelled and what they did with their travel time; and how they created comfortable and stressful experiences as part of the commute. Non-modal variability can be considered to provide important benefits to transport users. While unforeseen exogenous disruptions can be stressful and undesirable, the sense of being able to make occasional small changes to mundane journeys can be pleasant and even empowering:

“Now I realise that from time to time I do get a bit twitchy in relation to the metro as well, restless, because of how repetitive the routine is. But I guess there is a bit more diversity, I go out somewhere after work, or I go to play tennis, or sometimes I get off a stop early, at [Han] Kubrat, to buy something from a shop there on the way home. It’s a little shop where I buy my hair dye, that’s my little dose of diversity! [laughs]” (Tanya, 2014 02 14 AM)

Predictability and consistency are valued by commuters, but so is the sense of having some freedom, of not being ‘stuck with’ a particular mobility arrangement. Small variations in the

spaces of the metro can make this sense more prominent and visible, without going as far as generating a sense of uncertainty and disruption. A range of such variations can be initiated by the metro commuters themselves, but are also dependant on the affordances of the objects and infrastructures which surround them in the metro commute:

“By January 2014, Bella was feeling the impact of travelling underground. She had been able to see a lot more of the city when she used to travel to work by tram. Yes, it had been exhausting and stressful: she would often lose patience with the tram, and get off and walk; or she would delay leaving the house, so she has an excuse to call a taxi. In many ways, the metro was great. But now, when the weekend came, she often felt like she had forgotten what the city looks like! She would even consider taking the tram to work every now and again, just for the scenic trip. However, this plan didn’t materialise. Although she had been in the same job, Bella was never especially concerned about her sedentary lifestyle. But, somehow, the structured nature of her new metro commute, the way she always got a seat and never had to jump out a stop early because of feeling frustrated, had made the realisation about spending many hours sitting down, a lot starker. In spring 2014, Bella started contemplating walking some of the distance to the office. Her neighbourhood is uphill from the city centre, so she wouldn’t do it on the way home. Occasional morning walks to the next metro stop would be nice though. Several months later, Bella was still contemplating the morning walk. But she has never done it. She lamented her sedentary lifestyle but couldn’t get ready early enough to have time for walking. As a small remedy, she usually chose not to sit down during her evening metro journey.”
(Research diary based on Bella’s various ride-along interviews in 2014)

In the case of Bella, the capacity to occasionally stand on the metro, which was quite empty by the time she travelled home around 8pm, partly remedied the discomfort of her sedentary routines. As a result, there was less urgency in the perceived need to incorporate modal variability in her commute. Bella often stood in the metro carriage, resting her shopping bags on an empty seat, and thus continued to avoid walking. In her case, the particular type of non-modal variability which is possible on an empty metro train prevented her from introducing another type of change in her commuting routines. This particular type of embodied non-modal variability would not be accessible, for example, to a car driver, or a car passenger.

While the metro’s affordances for variability may make some switching to a different transport mode less appealing, urgent or feasible, other aspects of it can seem to limit non-modal variability in the metro commute. Despite the richness of everyday mobility experiences which has been emphasised throughout this analysis, metro systems have also often been described as disciplining and restricting spaces, defined by structured flows with minimal room for improvisation (Tomic, Trumper, and Dattwyler 2006; Butcher 2011). While most of the data presented so far has problematized the view of the metro, and metro commuting, as sterile and regimented, it can be expected that their organisation and

predictability, often a source of comfort, can also trigger surges of exasperation. In Chapter 7, the minimalist, predictable landscapes of the metro transfer were shown to highlight, for example, the inconsiderate behaviour of other passengers for some of the commuters, causing rudeness to seem especially grating. As the core participants in the study had only been using the metro for a short time, such feelings were rare. Nonetheless, they could be glimpsed in the later stages of the fieldwork, in comments such as this one:

"[Participating in this research] has made me realise how mechanically I do most of the things in my everyday life. It's horrible. Nothing happens in the everyday, everything is just usual things." (Janna, 17 Mar 2014 PM)

Because of the interconnectedness of modal and non-modal shifts and variabilities, these small encounters and sensations can be connected to significant and mode-relevant transformation. The capacity for non-modal variability, such as travelling at different times of the day, or working from home, is important in reducing the sense of being stuck in a regimented routine, with which any mode of transport can become associated (Bissell 2014).

Apart from varying different non-modal aspects of the journey while taking the metro between home and work, the users of the Sofia metro Line 2 frequently incorporated other destinations and purposes into their 'regular' trip. This multi-destination journeying within everyday mobility is referred to as trip-chaining (Timmermans, Arentze, and Joh 2002). Much research into travel behaviour has not paid sufficient attention to chained trips, opting instead for a somewhat rigid distinction between non-discretionary trips such as the commute, and journeys undertaken for purposes such as leisure or shopping. A notable exception is the work of Susan Hanson (1980; see also Hanson and Schwab 1987), who examined among others, the perceived incompatibility of public transport use and carpooling with the possibility for trip chaining. The limited existing research has demonstrated that trip chains nevertheless play an important part in many people's commutes, as people juggle education, work, care, and leisure. For modelling purposes, trip chains are often assumed to be a combination of work- and non-work-related journeys (Primerano et al. 2007). Trip-chaining has been demonstrated to have a strong gender dimension, as overall, women continue to be more likely to take on most responsibilities around food shopping and childcare (Kwan 1999; Schwanen 2015). In the context of Sofia, Kwan and Kotsev (2014) did find significant gender differences in commuting time and access to urban amenities, but their work did not explicitly address the role of gender in trip-chaining. However, the significance of gender cannot be meaningfully explored in a small sample such as the one adopted in this project. The data discussed in the following

paragraphs reflect the experiences of a mix of male and female respondents. Finally, increasingly complex trip chains are associated with the growing hurriedness of contemporary urban life (Currie and Delbosc 2011). While the ability of public transport to accommodate the kind of flexibility necessitated by trip chains has been questioned, there has been limited research in this direction, and the potential of trip-chains as a specific evaluation criterion and policy goal for transport projects remains underexplored.

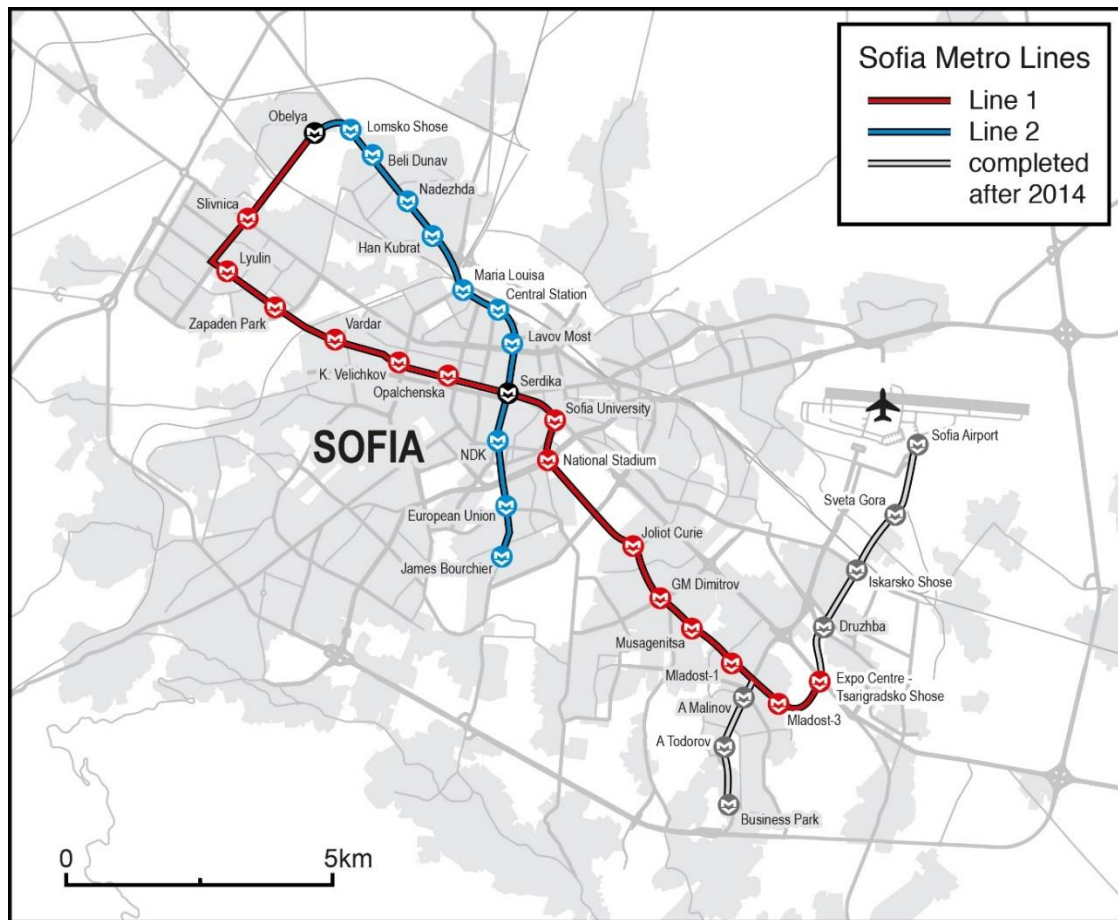
Gregor combined full-time study with part-time work throughout the eight months of our repeat ride-along interviews in 2013-14. He also went out with friends after work most evenings, but he always made sure the locations were accessible by metro. In 2014, he also signed up for evening dance lessons. Despite his many daily destinations, the metro, and walking, remained Gregor's exclusive modes of getting around:

"Most days it's first to the office, then to lectures, then go out. If I have to go somewhere, I first think whether I can get there by metro. The places we go to vary massively, but almost always, I go home on the last metro, at midnight. (...) Since mid-January, I have also been going to dance classes, twice a week. After they finish at 20.45, I get the metro at Sofia University, and go for drinks." (Gregor, various interviews, 2013-2014)

Gregor was not the only participant whose commute cannot be captured in a simple A-to-B framework. Trip-chaining was characteristic of each of the 20 core commutes at least some of the time. Trip chains demonstrate the ways in which journeys to work are entangled in mindful, embodied, financial, temporal and spatial ways with journeys for education, maintenance, leisure, and care. Among the affordances for trip-chaining created by the metro, one of the most important ones was the metro planners' decision to connect the two lines at the northernmost station, Obelya. As a result of this decision, all ten participants who started their journeys along the northern part of Line 2 (in Nadezhda and Obelya neighbourhoods, see Figure 8-4) in practice gained seamless access to two metro lines, with all the destinations and conveniences this generated:

"Nell started driving to Obelya station and taking the metro from there in early 2012. For about half a year, Line 1 was the only available metro route between Obelya and Serdika. Since August 2012, she has been able to choose between Line 1 and Line 2 – both go through Obelya and on to Serdika, with Line 2 taking a few minutes less. Overall, the 2012 launch of Line 2 was not a big shift in her commute, at least not a modal one. However, the line which Nell uses for her trip varies. She can choose one based on the train which will arrive first, or simply go for Line 2, since she sees it as more pleasant, shorter, and less crowded. However, she sometimes wants to get things done on the way to work, such as drop something off at the drycleaners, or go to the bank, and on those days, and she can choose a route accordingly, dip out of the metro, and get back on again. While Line 2 did not cause a shift in modes in her commute, it expanded the potential utility and convenience of

her journey.” (Research diary based on Nell’s various ride-along interviews in 2014)



Map data © OpenStreetMap contributors, CC-BY-SA, opendatacommons.org
 Figure 8-4. The shape of the Sofia metro network in early 2015. Map courtesy of Miles Irving, UCL Geography Drawing office.

The ability to get either metro line through Obelya had utility for commuters which was sometimes about less tangible accessibility benefits than those described by Nell. As discussed in Chapter 5, the connection of the two lines afforded the possibility of avoiding the frictions and frustrations of the busy transfer station at Serdika. Like Bella’s ability to occasionally comfortably stand in the train carriage, the shape of the metro map meant non-modal variability could be mobilised for small pleasures and meaningful travel time-making:

“I take the metro again, from work to Uni. On the way back, I can just travel through Obelya. Sometimes, I just want to sit and read. (...) Or if I’m travelling with [colleague], we can chat. It also depends on whether I’m too tired and can’t be bothered with the transfer at Serdika. (...) But I also continue transferring at Serdika, if I’m in a hurry.” (Toni, 2014 03 25 AM and 2014 06 11 AM)

Overall, trip-chaining is a key aspect of mobility in large urban areas (Primerano et al. 2007). In many cases, it can be beneficial to passengers, as it can cut time spent travelling and maximise its utility. As a result, trip-chaining is also desirable from the perspective of

sustainable urban mobility, as it can help reduce emissions and traffic congestion. When appraising new transport infrastructure qualitatively, its capacity to contribute to trip chaining could be considered, combined with specific insights into the kinds of trip chains it becomes part of, and the groups who make these chains part of their everyday mobility. In the case of the Sofia metro, the value of the ribbon-shape of the network is a meaningful contribution to this end.

8.4. Non-modal shifts: Sustaining sustainable commutes

“Janna is now doing a part-time Master’s degree, alongside her full-time job. She was hoping the classes would be in the evenings, but it proved much more complicated than that. She often has to go to work, then travel to Sofia University, then travel back to the office, then travel home. Each of these journeys is completed by metro. Although Janna used to commute by car up until the launch of Line 2, she is not even considering switching back to driving, despite the complexities of juggling work and study.” (Research diary based on Janna’s various ride-along interviews in 2013-14)

“Rumen went from part-time self-employment, to full-time job in an IT firm, to full-time job in an NGO, in the 10 months of ride-along interviewing. Both of his full-time jobs required him to take the metro outside his flat, then transfer to a tram for a long ride. He was an avid cyclist, and always held a monthly travelcard for the entire public transport network. While in his first job, he also started taking driving lessons. But Rumen never cycled to work, never switched from the metro to another public transport mode, and took his time booking his driving test. He just stayed with the metro.” (Research diary based on Rumen’s various ride-along interviews in 2013-14)

Unlike in the situations discussed in section 8.3, sometimes non-modal shifts do become modal shifts. These processes are documented in some detail in the work of mobility biographies researchers (Scheiner and Holz-Rau 2013). Although this was not the case for Janna and Rumen, staying with a public transport mode across big life course transitions such as moving house or entering education can be too complicated. For example, becoming a parent, or children starting school, are some of the moments which have been identified as requiring too complex trip chains, or too much carrying of stuff, or too much punctuality, compared to what public transport infrastructure can accommodate (Schwanen 2015).

When Emma moved house from near Nadezhda station to near one of the northern stations of Line 1 approximately six months after our first ride-along interview, she did not stop regularly commuting by metro. However, now faced with the need to transfer at Serdika station during the rush hour, Emma’s earlier enthusiasm for the metro began to dwindle:

I definitely think I have reduced enthusiasm for the metro. I think at first it seems more convenient. I had never used a metro before that, and at first I was just comparing it to the other kinds of public transport in Sofia, and I just loved it, it seemed so convenient and fast. Now, using it more and more

often, it is beginning to seem a bit frustrating. Like with everything. The people, I think, are the most frustrating part. There are so many people, such a crowd. Also, the transfer. That's where the people are – the transfer. (Emma, 2014 02 4 PM)

While Emma continued to travel by metro, her growing frustration demonstrated that her reliance on the metro mode was increasingly fraught with the possibility of becoming undone. Towards the end of the data collection period, she had started experimenting with arranging lifts with a colleague who drove to work. Emma's experience demonstrated the ways in which change in housing and household arrangements can generate new tensions with a modal arrangement, and the potential for greater variability, if not shift. In the minute, practical and situated socio-material interactions through which 'big' lifecourse change plays out, it is possible to glimpse how some metro commutes remain sustained, and others do not. This is further illustrated in the case of Stella. A woman in her early 50s, she had been living with poor health for several years when we met, which made it difficult and tiring for her to walk. This was already the case in 2013, yet, for quite a long time, she maintained one of the more complicated commutes of all participants. But in 2014, a change occurred: one of her best friends moved back to the neighbourhood. This non-modal shift in her life 'tipped' the balance, and eventually substantially reconfigured her commute:

"When parking restrictions were introduced in early 2012, Stella began commuting by bus. The journey used to take over an hour, and it was difficult to do anything during that time, as the ride was bumpy and the bus too crowded. When Line 2 of the metro opened in August 2012, Stella changed her commute again. It now entailed three modes: driving from the house to Gorna Banya train station, then taking the suburban train to Sofia central station, then taking the metro for two stops to Serdika. Stella had problems with her legs and had been experiencing mobility problems for a few years. For journeys to anywhere other than work, she always took the car.

In August 2013, [Friend] moved back to Gorna Banya after separating from her husband and living for a while with her mother. Stella's fragile health was either the same or had deteriorated, and she had difficulties walking and standing. She switched back to driving to work. Stella now waited for [Friend] after work, who took the metro from her own office to Stella's, and they shared the ride back to Gorna Banya. They had been travelling in this way years ago, and both enjoyed the journey very much." (Research diary based on Stella's various ride-along interviews in 2013-14)

The ability to sustain a metro commute is predicated both on the capacity of bodies to sustain particular practices, and on the multitude of considerations and commitments which connect the individual commuter to others. While Stella's case focuses on the entanglements of friendship, the household has often been proposed as a useful analytical unit for complicating the limited vocabulary of the solitary mobile subject (Jarvis 2005). Everyday mobilities as collective household arrangements can offer one useful approach to appraising

the 'staying' potential of new public transport infrastructure ridership. This discussion extends the findings of Ye, Mokhtarian, and Circella (2012), whose research in Sacramento, California, found that persuading existing public transport users to continue using public transport is often easier than encouraging non-users to switch. Future research in this vein could examine transport infrastructure's specific socio-material affordances in order to address the question of 'How *sustainable* are sustainable commutes, and how can they be made easier to sustain?' A focus on households rather than individuals would constitute a useful contribution to the framework for studying infrastructure-driven change in everyday travel (Figure 8-3 above), while also opening up possibilities for future research to address the problematic 'solitude' of the mobile subject discussed in Chapter 7.

Sustainable mobility research has historically focused on the 'switching potential' of different lifestyle categories (Anable 2005). In focusing on 'transitions' for those who currently do not fall into categories labelled 'sustainable,' sustainability scholars have often neglected those who do, and their capacity to *sustain* sustainable behaviours over time (Moloney, Horne, and Fien 2010). However, the 'staying potential' of particular modal configurations has remained underexplored.

The preference for one mode over another is often linked in research to a range of physical, cultural, economic and lifecourse factors (Kuhnimhof, Chlond, and von der Ruhren 2006). However, the capacity of any single factor to determine mobility practices should not be overestimated. Taking multimodal mobility as a starting point, it is important to explore habits that persist, at least as much as it is valuable to identify behaviours which can be changed.

It is widely recognised that the number of people not staying with public transport is as much a problem from a social and environmental sustainability point of view, as the number of people who do not 'switch' to public transport (Walker 2012). This is critical in the case of the Sofia metro, and public transport more broadly, as public transport use is often seen, by researchers, policy-makers and users alike, as a temporary stage which precedes the 'stable' adult arrangement centred on private car ownership (Grimsrud and El-Geneidy 2014). Such opinions continue to be widespread in Sofia. However, recent transport research demonstrates that the taken-for-granted-ness of these stages might be coming under some pressure from the shifting mobilities of young adults in a number of countries worldwide, leading some researchers to talk of 'peak car' (Kuhnimhof, Chlond, and von der Ruhren

2006; Goodwin 2012). In this context, longitudinal qualitative studies of household mobility can make a useful contribution to evaluating infrastructure.

Conclusion

This chapter has aimed to bring together the empirical material related to change and commuting routines, in order to demonstrate how variable and fluid the commute as a socio-material arrangement is. To date, sustainability scholarship has often argued against small tweaks to everyday behaviours, because of their negligible consequences on the environments of cities and beyond (Thøgersen and Crompton 2009). From this perspective, a small change in everyone's commuting practices is not sufficient, and can only achieve very little. However, the data presented here demonstrates the various ways in which small tweaks and transformative shifts are related and co-constitutive. Transformative societal change, when considered at the level of the body and the situation, is often enacted through a series of seemingly insignificant and routine doings and sayings. In advocating change in environmentally significant practices such as everyday travel, it is important to recognise that habitual behaviours are variable and diverse, and change is often ambiguous and incremental. In this light, a rigid distinction between small change and a radical break with old behaviours and adoption of new ones, may prove unhelpful (Barr, Gilg, and Shaw 2011). Policies which do not acknowledge the on-going transformations, at different scales, of everyday mobility, may restrict the capacity of commuters for experimentation, gradual change, and 'significant' transition. Undoubtedly, the urgency of urban and global environmental problems requires quick and far-reaching measures. Apart from the global threats posed by environmental change, Sofia faces a particularly polluted and unhealthy urban environment, in which transport plays a major role (European Commission 2015). At the same time, lack of appreciation of the ways in which behaviour change happens as a situated, on-going, and asynchronous practice, which exceeds the individual mind-body, can foreclose, rather than encourage, possibilities for change. Globally, a number of sustainable mobility policies have come to embody a more incremental view of change, such as bike and electric car sharing schemes. Rather than setting up model – and modal – behavioural categories such as 'cyclist' or 'transit user,' these infrastructural provisions acknowledge, and accommodate, incremental, occasional, and non-linear mobility transitions.

In the case of public transport, including the metro, in Sofia, provision for occasional metro use remains insufficient. The first experiences of the new metro commuters in August 2012 demonstrated that public transport maps and signage was often confusing, and there was

often a need to rely on word-of-mouth in navigating the system. For example, even relatively regular metro passengers were unsure about what the connection of the two lines at Serdika meant in practice:

"I hadn't thought of this option through Obelya, my mum told me about it soon after Line 2 opened, though. I knew that the two lines were connected, but I didn't know exactly how it works. (...) So I decided to try. Since then, I have told many people. They ask me if you need a new ticket, if the train stops and waits there, that sort of thing." (Toni, 2014 03 26 PM)

There were many such examples, including confusion around metro station entrances and exits, faulty station clocks and count-down indicators, and absence of announcements during disruption. While all of these can be thought more broadly as quality of service attributes (Pauley et al. 2006), in practice they play out differently for regular and occasional service users. On the other hand, the carnet ticket of 10 reduced-price single journeys over an unlimited period of time, proved to be a valuable provision; one which occasional public transport users would likely continue to draw on, should it be retained amid the move to integrated smart ticketing. Service design decisions which reduce frictions for one group without intensifying them for others (as was shown to be the case, for example, with excessive visual or aural information), could reduce the psychological and material barriers faced by the once-a-week public transport commuter.

In this chapter, I suggested that both the definition of sustainable commuting, and the definition of valuable infrastructure, should better reflect the on-going reconfigurations of modal and non-modal aspects of everyday mobility. Before and after calculations of CO2 emissions, while offering some useful insights, provided an extremely limited view of these interlinked processes. The changes amid which the metro was situated were then organised in four related categories: modal shift, non-modal shift, modal variability, and non-modal variability. I suggested that this framework could contribute to understanding the value of transport infrastructure qualitatively, by doing away with the assumption of exceptionality which often comes with large projects (Flyvbjerg, Bruzelius, and Rothengatter 2003). The accounts of the new Sofia metro commuters demonstrate the multitude of inter-relationships in the ways these changes are practiced and lived. In applying these to cost-benefit analysis, several suggestions were made. First, the idea that the impact of the extended period of disruption which precedes a metro line's launch should feature more prominently in appraisal, especially since it is the construction phase that many users will evaluate the finished product against. Second, I argued that the contribution of a single object of infrastructure to urban modal polycultures should be appraised. Third, I suggested that trip-chaining is not beyond what public transport can accommodate, but the specific

affordances for trip-chaining made by infrastructure must be examined. Finally, the ability of individual commuters to continue using the infrastructure, across key life course stages and collective commitments, could inform more nuanced views of the sustainability of sustainable commutes over the long term.

This chapter situated the launch of Sofia's new metro infrastructure in on-going temporal and spatial transformations, across a variety of scales. However, the discussion does not aim to simply reduce the expectations placed upon, and importance assigned to, public transport projects such as the Sofia metro. Instead, it is founded on the profound conviction that public transport can work hard for the environmental and social sustainability of cities. Public transport has the potential to reduce the detrimental effects of societies' demand to move, both locally and globally. It is generally more affordable than private motorised modes, and can thus contribute to the potential of cities to be socially just and inclusive places (Stanley and Lucas 2008). Public transport can also contribute to urban public life and conviviality, through its function as a space for mixing and co-presence (Wilson 2011). All of these potential benefits of public transport projects have generally been weighed against a number of difficult decisions around allocating scarce space and scarce economic resources; making difficult choices between available technologies; and finding ways to attract and retain an appropriate number of users. Thus, I have aimed not to undermine the extent of our infrastructural expectations, but rather to question the way they are framed. By interrogating the kinds of change infrastructure projects play a part in, this chapter explored the kinds of questions which can be productively asked when infrastructure is planned and evaluated.

Chapter 9. Conclusion

This study has endeavoured to strengthen the links between transport geography and planning on one hand, and mobilities research on the other. Its ambitions extended to connecting what are often seen as different epistemological paradigms, in order to then examine the new theoretical and practical paths such connections can draw. Rather than dismissing pillars of quantitative transport research such as travel time savings, journey cost, passenger satisfaction, and infrastructure appraisal, the study has aimed to engage with them qualitatively. However, the goals of the project have remained strongly aligned with those familiar from quantitative planning research and practice: the problem of appraising the value of transport infrastructure, and planning and building transport infrastructure which is valued, and meaningful to the social and environmental sustainability of cities, and the well-being of their inhabitants. These challenges remain as pressing as ever in terms of the conceptual, practical, ethical, political and economic complexities they embody (Altshuler and Luberoff 2003; Van Wee and Roeser 2013). The study argued that qualitative data on everyday mobilities has a greater role to play in this pursuit than as a story-telling aside, providing context or colour, and enlivening reports through 'rich' vignettes. Instead, I have aimed to probe the potential of mobilities research to generate practicable insights for infrastructure appraisal.

More broadly, the key preoccupation of this research project lay with understanding change – the many dimensions and scales of change as it unfolds within the routine activity of the urban commute, and not outside of it, or in contrast to it. The basic worldview I have adopted, and sought to test, is that of the mutual shaping between physical infrastructure, and social and embodied beings that are the users of that infrastructure (Latour 1991; Carse 2012). In other words, the study sought to explore the process of getting used to something new, and the ways in which those performing the 'getting used to' changed the new object in turn. To do this, the thesis aimed to examine qualitatively the ways in which the value of the 2012 expansion of the Sofia metro is being constructed in everyday urban life, focusing specifically on the place of the new metro infrastructure in commuting. In this sense, the thesis connected the minute socio-technical practices of everyday mobility, and the practical and theoretical issues around planning useful transport infrastructure, and thus worked across two approaches to urban transportation which are often framed as mutually exclusive, namely mobilities research and transport planning. To the interdisciplinary field of mobilities research, the study has aimed to contribute a stronger sense of, and conceptual

engagement with, socio-technical change. Mobilities scholars have made huge headway in enriching our understandings of commuting cultures, the skilled nature of the practices through which commuting is accomplished, and the more-than-instrumentalist nature of mundane travel, while often overemphasising somewhat its stability and sameness (Bissell 2010; Vannini 2011; cf. Cass and Faulconbridge 2015). Drawing on the conceptual vocabulary of mobilities research, this study further relied on social practice theory, anthropology of infrastructure, and science and technology studies, to think about change in and through commuting routines.

In this concluding chapter, I summarise the findings of the study, and their implications for research and practice, as well as their limitations. The conclusions of the study are presented in themes which cut across the chapter organisation of the thesis, returning to the wider issues which motivated the research, and suggesting ways in which it can inform future work on infrastructure, everyday mobility, and change.

The longitudinal research design I adopted revealed change in everyday mobility as always on-going, in spite of the routine the notion of commuting usually implies (Edensor 2011). As a reflection of this, the aim of the thesis has been to provide a qualitative transport research contribution to infrastructure appraisal which does not hastily reach for causality. Evaluation without causality is not impossible, but it is certainly a challenging balance to achieve. One of the key limitations which result from this approach is that qualitatively appraising infrastructure is a labour-intensive process: while its overall logic and methodology can be applied to a range of projects and cases, deriving a list of criteria or themes which the present study can put forward as a tested blueprint, would go against its core logic. As this type of applied qualitative transport research is exploratory and inductive by definition, it sits in tension with current approaches to project appraisal, selection and planning. Future research can explore its utility in other geographical contexts, and its applicability to other transport modes and societal dynamics, in order to provide further insights on how productive this tension can be. Translated into a larger-scale study, this approach would ideally inform qualitative research which is integrated into existing formal appraisal processes, in continuous dialogue with officials and publics able to scrutinise its practical benefits, and in a participatory manner, drive its continued development. Methodologically and conceptually, further studies in this vein would benefit from larger sample sizes; the inclusion in the research design of non-commuting trips, with their very different dynamics of travel time value, cost, comfort and stress; and from adopting the household rather than the individual passenger as their unit of analysis. In addition, it

should be noted than any exploratory study of change is predicated on the timeframe it adopts. In this sense, it is no different from quantitative cost-benefit analysis, since the outcomes of the latter largely depend on the assumption of a transport infrastructure's useful lifespan adopted, which in different European Union countries can vary from 20 years to infinity (Thomopoulos, Grant-Muller, and Tight 2009). Thus, future research could seek to revisit the Sofia metro extension, providing a more nuanced view of valuing infrastructure over a longer period of time than the 30 months covered here. Finally, it is important to note that all of the core respondents in the present study enjoyed relatively stable incomes and housing arrangements, even if there was substantial diversity in how their economic situation was actually experienced. Some of this bias is unavoidable in a study which, from the outset, focused on work-related travel. Future research would present a fuller view of the role of new public transport infrastructure in cities, if it includes experiences of everyday mobilities which are more precarious, risky and/or unpredictable.

While this PhD project has relied on the notions of time and cost, familiar key characteristics of journeys in most transport research, the approach taken in this study differs in a number of important ways. First, time and cost are not conceptualised as aspects of the journey which can be traded off against each other, but as separate if related sets of practices, having both qualitative and quantitative dimensions. Although the trade-off between time and cost is something of a truism in how transport use is thought about in both research and planning (Lyons and Chatterjee 2008), a trade-off conceptualisation did not reflect the experience of adopting a metro commute for the majority of Sofia respondents. In practice, the temporal and financial changes which commuters experienced moved in the same direction for most respondents, changed continuously both before and after Line 2 became part of their commute, and were not seen to be commensurable. These findings complicated the idea of a 'switch' between travel modes, particularly between private car and public transport, as necessarily linked to a process of trading a longer duration for a lower cost, or vice versa. This conceptualisation can have important implications for the ways in which public transport provision, in particular, is evaluated by practitioners and framed in public debate around speeds and prices in mobility.

As a result, a qualitative engagement with time-savings demonstrated the value of the time cut from commutes as the metro was adopted: not in terms of a monetised number of minutes, but in most cases, through the improved well-being brought about in less stressful, slower, more enjoyable starts to the working day, as morning routines became less hurried. Relatedly, a qualitative appraisal of both time saved and travel time made and inhabited,

should still reflect the clock durations of journey segments and total journeys. Thus, local factors such as urban population size, density and spatial organisation, the size of the network and its integration with other modes, shaped the situated and embodied nature of everyday journey time-making, and placed constraints on it. In the case of the Sofia metro, the relatively small size of the city and relatively short commuting times meant few opportunities were created for being fully absorbed in activities during commuting; however, the provision of 3G infrastructure improved the capacity of short journey legs, which have the potential to feel frustrating and tedious, to accommodate enjoyable or meaningful activities and spatial arrangements.

In exploring travel time and cost, I have suggested that these two core characteristics of the commute are to a great extent predicated on the small everyday practices through which they are realised. I have sought to move away from notions of optimal durations and pricing, and explore the temporal and financial dimensions of the commute specifically in relation to the Sofia metro. In this respect, I have aimed to demonstrate the role played by a variety of interactions – with the Serdika station transfer, clocks, mobile devices, rude strangers, among others – in how different aspects of the Sofia metro commute come to be valued, or not. Importantly, detailed empirical accounts of the everyday experiences of paying for transport have to date been largely absent not only from cost-benefit analysis, but also in mobilities studies. Chapter 6 was dedicated to filling this gap. Based on these data, a number of relatively small modifications were considered, which acting as mediating (socio-technical) infrastructures (Furlong 2011) could have unexpectedly far-reaching consequences for the ways in which commuters experience the entire metro network as infrastructure for everyday mobility. These included introducing new types of travelcard (11-month travelcards), while retaining some ‘old-fashioned’ ones (carnet tickets); reducing the number of seats on metro carriages given the relatively short journeys in Sofia; and in evaluating the worth of the metro to different types of journey (as opposed to different groups of users), recognising that a number of perspectives are possible on cost and the value of travel time. Furthermore, some initial thoughts on the implications of an honour-based ticketing system were presented, against the background of growing political backing for smart and integrated approaches to ticketing. Further research would be needed in order to examine the effects of different technologies on how the metro is valued, and importantly, in order to determine whether low- and high-tech approaches to ticketing need to be mutually exclusive, or can be complimentary. In sum, not only could the monolithic idea of the ticket price be expanded to reflect payment as an inhabited and situated practice, but also both the financial and embodied aspects of paying for the metro should be reflected

more prominently in the appraisal of new infrastructure, because of their important implications for who uses public transport, how, and for how long.

A further aim of this study was to gauge the impact of the new metro infrastructure in terms of commuter well-being. As demonstrated in the case study history presented in Chapter 2, concerns around worker well-being have been central to the plans for a Sofia metro since their inception in the 1960s, recognising the role of infrastructure in linking commuting needs to environmental and mental health. As with cost and time, my aim here was to take the concept of passenger satisfaction, which transport research has adopted from psychology somewhat uncritically (Ettema et al. 2012; Olsson et al. 2013), and think through the implications of deploying it in a qualitative framework, but with the practical challenge of appraisal in mind. This approach does away with the idea that appraisal should focus on the physical structures of transit, and treat them as separate from the 'experiential' aspects of mobility which come later on. Instead, building on ideas from science and technology studies and theories of affect and distributed cognition, the study developed a situated and embodied view of commuter well-being as something that exceeds the accumulation of 'satisfying' mobility experiences (Cox, Houdmont, and Griffiths 2006). In contrast, qualitative transport research is especially well-placed to evaluate infrastructure in terms of subjective well-being. From the analysis of empirical material presented above, however, it seems clear that at least three conceptual interventions should be made in the presumption of causality which informs existing framings of commuter well-being. First, from the perspective of the commuter-subject, the new metro line is not a spatio-temporal container with its own causes and effects in a pre-existing 'context.' Any meaningful articulation of commuter well-being should therefore recognise the multimodality of public transport commutes, and thus should take as its point of departure the subject and the journey, rather than a bounded notion of an item of infrastructure. For example, the walk to and from public transport stations and stops could have important public health implications for what has been termed active travel (Sallis et al. 2004).

Second, in socio-technical interactions of commuter comfort and stress, the commuting body is not simply a recipient of experiences, caused by external stimuli such as crowdedness, train lateness, or seat design. Comfort and stress are thus not done to commuters, but made together, co-created through the close proximity, extended co-presence and interactions with unknown others, which characterise many public transport commutes.

Third, and relatedly, it became clear in the course of this research project that well-being does not accrue to the individual passenger, nor is it the product of a simple summation of 'positive' and 'negative' experiences. Taking two concepts which easily traverse disciplinary boundaries to speak to designers, planners, health researchers and ethnographers – comfort and stress – a different perspective on the metro commute and subjective well-being was offered. Rather than applying a logic of the two being mutually exclusive and accumulating over time in a linear fashion, comfort and stress were interpreted as inter-related and non-linear, made through situated socio-material interactions, and circulating among commuters as collective habits.

The themes of comfort and stress have similarly presented an opportunity to cut across the division into four empirical chapters used to organise this thesis. For example, flexible working hours can be thought of as something more than a convenience for the individual commuter who has access to such an arrangement. Taking a socio-technical perspective of how comfort, stress and well-being are made collectively in the metro commute, flexible hours can change the utility of the entire metro infrastructure, by reconfiguring the minute but significant details of what it can do for commuters. Thus, well-being can be adopted in future applications of qualitative approaches to infrastructure value as an over-arching concept, connecting cost, comfort, stress and travel time in multifaceted ways.

Data on the role of time of day, interactions with others and crowdedness were examined, on the assumption that the value of public transport infrastructure is not predicated on complete comfort, or on the eradication of commuter stress. However, this does not imply that the notion of well-being is not a meaningful and important device for appraising infrastructure. Instead, studying the use of infrastructure can itself inform more nuanced understandings of commuter well-being, in turn generating productive accounts of the place of public transport in supporting convivial, accommodating and healthy urban cultures.

As discussed above, the timeframe of a study of changing infrastructural arrangements and commuting habits plays an important role in the processes it can hope to uncover. Thus, the theme of sustaining the new metro commute over the long term emerged from the empirical material presented, although the 30-month research period could offer little more than a glimpse of its importance. This is a critical point in the Bulgarian context, where car ownership continues to be seen by many as a signifier of a transition into adulthood and economic accomplishment (Hirt 2007). This is also reflected in the devastating effects of air pollution on public health, with Sofia repeatedly ranked bottom among European Union

cities in terms of air quality (European Environment Agency 2015). The extent to which changes in public transport provision such as the Sofia metro expansion, in interaction with other trends such as growing environmental advocacy, can complicate unsustainable post-socialist urban mobility cultures, remains to be seen.

The discussion of the capacity to *sustain* a public transport commute over the long term, across changing circumstances and lifecourse stages, was the first contribution of this study to debates around sustainable urban mobility. While sustainability research has often focused on the pressing need for behaviour change, the pressing need for staying with less environmentally damaging forms of transport has received relatively less attention (Barr, Gilg, and Shaw 2011). The findings presented above suggest that the various connections between commuter and metro do not solidify, more or less quickly, into a permanent arrangement, but are in fact always in tension. Thus, sustainable urban mobility transitions are not about linear processes of transformation from one stable state to another. With public transport still seen as associated with particular stages of the lifecourse, before and after the 'stable' arrangements of private mobility, this is an important avenue to explore further in research, planning and policy (Buehler and Hamre 2014b).

The sustainability and longevity of the metro commute could be incorporated into the qualitative appraisal of new infrastructure drawing on approaches developed in mobility biographies and related fields (Lanzendorf 2003). Contextualising the 'big change' of a new metro line by thinking beyond a modal switch and attending to the many on-going negotiations any big change is intertwined with, offers a different perspective on its value and usefulness to a city. As suggested in Chapter 8, a possible application of this approach would be to make the impact of transport infrastructure projects on multimodal journeys and trip-chaining an explicit feature of qualitative appraisal. This perspective also informed the second contribution of the study to sustainable mobility debates, speaking in particular to calls for sustainability researchers and activists to be ambitious in their pursuit of transformative change (Moriarty and Honnery 2008). While acknowledging the urgency of the need to address and reverse the degradation of the global environment, the data presented above suggested that some distinctions between incremental and transformative change may not stand up to empirical scrutiny. In tracing the fluidity and co-constitution of modal and non-modal change, and variability and shifts in travel behaviour, the study sought to demonstrate the ways in which even 'big' change in mobility practices is realised through micro-level interactions, and through small, situated and embodied reorientations.

Thus, this thesis demonstrated the various important roles that public transport infrastructure can play in shaping the social and environmental sustainability of urban living. More broadly, it contributed to an inter-disciplinary tradition of understanding urban infrastructure as more than a set of physical structures. Drawing on the work of Star (1999) and other scholars from socio-technical studies and the anthropology of infrastructure (see section 3.4 for a full review), the study took as its point of departure the view of infrastructure as enacted through the interactions of human and non-human actors. This proposition was developed with specific reference to public transport, to emphasise the ways in which the metro is enacted not simply through individual users' interactions with material objects, but *collectively*, through the co-presence of bodies orientated by both habitual and mindful actions. Thus, for commuters, the metro infrastructure was continuously assembled in the performance of habits, which in this context can be understood as collective and circulating, rather than belonging to an individual body's interactions with the environment. Echoing Bissell's work on the virtual infrastructures of habit (Bissell 2013), the analysis drew attention to the ways in which habit and change as experienced by each individual commuter, became an intrinsic part of infrastructure, of sustaining and modifying it as a collective endeavour. At the same time, the notion of metro and the metro commute as socio-technical infrastructure does not imply that the experiences of infrastructure use were consistent or universal. At least since Graham and Marvin's (2001) seminal work on networked urban infrastructure, it has been evident that infrastructure, including public transport, can hardly ever make claims to universality of provision. That is to say, despite the rhetoric which may surround large infrastructure projects, they inevitably prove accessible and accommodating to some users, while excluding others. The present study demonstrated that when looking closely at the routines of those who do get access to the new metro service, it becomes evident that the ways in which they use and enact the infrastructure is anything but universal. While the properties of public transport infrastructure, such as train frequencies, or ticket prices, along with the fixed structures of its stations and rail tracks, could be taken to imply a certain stability, solidity and predictability to the encounters between the metro and its users, the preceding chapters demonstrated that infrastructure is a human-material entanglement contingent on a myriad of specificities of situated and embodied experience. This interplay between the collective, the habitual and the contingent not only define some of the key characteristics of public transport infrastructure, but also point to the critical interactions which can make it accessible or exclusionary, valuable or costly.

Finally, this study placed the Sofia metro project in the context of the state socialist system under which it was first conceived, and the post-socialist history of its operation. As discussed in Chapter 2 and Chapter 6 in particular, the metro cannot be understood simply as a material expression of Sofia's socio-political post-socialist trajectory, but it is nonetheless profoundly linked to it. While to some officials and users the metro appeared as an orderly and reliable counterbalance to what they saw as the chaotic and exasperating daily realities of the post-socialist urban transition 'above,' the metro has always been an inextricable part of these realities. On the other hand, through boosting the availability and feasibility of public transport-based everyday mobility, the metro may gradually come to offer an important socio-cultural and environmental alternative to the individualism of the private car in post-socialist Sofia. In terms of both politics and engineering, both commuting practices and public discourses, the Sofia metro echoes experiences from elsewhere: from other post-socialist Central and Eastern European cities such as Prague, but from cities further afield, such as Delhi or Santiago (Gibas 2013; Butcher 2011; Jirón 2010). At the same time, the Sofia metro extends and modulates the specific challenges and joys of cohabiting in Sofia – a city which is changing rapidly, while also, paradoxically, always remaining a recognisable version of its past selves. In this sense, the metro is a valuable conceptual tool for studying urbanisms as intricate interplays between the locally specific and the instantly recognisable (Robinson 2006).

As transport and mobilities research seems to move towards an increasingly prominent role for 'big data,' it is important not to lose from view the conceptual innovations and provocations developed in qualitative transport research over the last two decades. Many of the contributions of 'big data' in terms of computational capacity, GIScience and data visualisation have been hailed as 'unprecedented' (Wilson 2013), and have probably played an important role in the resurgence of interest in transport geography, long considered one of geography's less-than-dynamic sub-disciplines (Goetz 2006; Schwanen 2015; Schwanen 2016). However, 'big data' transport research can often suffer from the same conceptual limitations as those inherent in 1960s transport models, i.e. the reduction of travel behaviours to rational intentionality, an instrumentalist views of mobility, and an overly individualistic perspective on moving subjects (Schwanen 2016). Against the pitfalls of the resurgence, partly driven by 'big data,' of biological and machinic metaphors of urban mobility arrangements, I have aimed to highlight the importance of small interactions and mundane practices to the future development and continued refinement of transport planning and infrastructure delivery. Rather than placing questions like 'How do different people travel? How do they feel about their journeys?' in opposition to questions such as

‘What makes good public transport infrastructure? How can it be delivered?’ I suggest productive dialogues across these distinctions are not only possible, but necessary.

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Appendix 1. Sample interview guide

Below is a list of some of the questions which were included in the first ride-along interview with each of the research participants. In practice, the interview guide was adapted to reflect the individual's commute: the specific route, transport modes, time of the year, week and day, and any travel companions. Similarly, the interview questions for subsequent interviews were planned so as to follow up the key themes identified in the initial ride-along interview.

Did you travel in rush hour yesterday? And on the way back? When is rush hour? When is rush hour along your route?

Was there any effect of weather and the season- rain, sunshine - on your route, and the items you wore and carried?

Was your commute pleasant? Was it boring? Comfortable? Stressful? Is it usually? Can you retrace your steps for me, in as many details as you can remember? What time did you leave, what did you do, was it warm/cold/noisy? Did you sit or stand?

Did you use your phone? Do you often? Did other people around you? What were they doing?

What was the transfer like?

Did you go home directly from work? Would you often? If not, where might you go? How do you organise getting there and then home?

When did you buy your latest travelcard? Where did you buy it, and what was the experience like? If you have a travel card, where, when and how do you check how long you have left on it? Where do you keep it?

Did you enjoy seeing these colleagues during your commute? What would you have done otherwise during your commute? How did this make you feel?

Why are we walking on this side of the street? Are there other routes?

Does your commute change between different days of the week? Between weeks, seasons?

Have your clothes or what you carry changed in recent months? Does the fact that you now use the metro affect the way you dress for going to work? Or what you carry?

Can you recall any significant disruptions, incidents, changes on the metro network, since you started travelling via this route? What happened?

Do you have to leave at a specific time to catch transport? Did you leave at that time yesterday? What time did you leave home and what time were you at work? If it wasn't your usual time, why not? Were you in a hurry? Would you often be in a hurry? And on your way back? When you are in a hurry, how does your commute differ from when you are not?

How predictable is the arrival of your transport and the duration of your trip? Would you be happy for it to be longer, if it could be more predictable?

What was your commute like before the metro opened?

What was your commute like immediately after the launch of Line 2?

Do you have a driver's licence? Do you drive? Do you own a car? Does anyone in your household? Do you use the car for commuting?

Do you cycle as a way of getting around? Does anyone in your household?

What has changed in the neighbourhood as a result of the opening of the metro station? How do you feel about it? How do other people in the neighbourhood feel about it?

Тема на проекта

Пътуването до работа или училище често бива сравнявано с движение в коловоз, като на автопилот. В същото време, тези всекидневни пътувания подлежат на чести промени, както малки, така и големи - от откриване на нова линия на метрото, до сезонната необходимост от чадър. Тези пътувания имат определяща роля за екологичната, социална и психологическа среда в града.

Изследването, в което Ви каня да участвате, изучава всекидневното пътуване. Работя с група хора, които ми позволяват от време на време да "надничам" в ежедневието им и да записвам част от нещата, които им се случват докато пътуват до работа, университет, дома на родителите им, и т.н.

Проектът има една практическа и една чисто научна цел.

Чисто научната е свързана със способността на хората да се ориентират в града, да запомнят детайли от средата, и да боравят с нейните времеви и пространствени ресурси.

Практическата цел е свързана с подобряването и популяризирането на градския транспорт. Тя разглежда обслужването, комфорта, ценообразуването и синхронизацията на общественя транспорт на базата на реални и възможно най-детайлни данни за използване му. Дори и най-обикновените неща от Вашето пътуване могат да допринесат за решаването на някои от най-сложните проблеми в управлението на градската мобилност!

Градски мобилности в София

Проект на Анна Площева за
всекидневието и движението в
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Appendix 3. Calculating change in commute durations, costs and CO₂ emissions

This Appendix provides the background to the figures which appear in Chapters 5, 6 and 8 in relation to the changing durations, costs, and CO₂ emissions of the commutes of the 20 core respondents. As explained in the main text, these calculations temporarily adopt the major assumption that a 'before' commute and an 'after' commute exist for each respondent in relation to the metro Line 2 launch. Chapters 7 and 8 go on to complicate this assumption, and in a few cases, to dispense with it altogether.

However, understanding the insertion of the expanded metro into the commute through changes in duration, cost and emissions remains important – not least because participants themselves often articulate their new metro commuting experiences in those terms. It is for this reason that they are used as a framework in Chapters 5 and 6.

Below, the workings behind the change in commuting times, costs and emissions for each core participant are provided. These workings include quantitative data, comments, and clarifications about any assumptions made.

Anton

Before adopting the metro as part of his commute, Anton mainly drove to work. Once he started taking the metro, his route depended on weather, hurriedness and mood. On some days, he would transfer from Line 1 to Line 2 at Serdika, and get off at NDK. On other days, he would get off Line 1 before Serdika, then either walk, or take a trolleybus to the office. The calculations below assume that he gets off early and walks, avoiding the transfer, which according to the account he gave as part of ride-along interviews, could be seen as his preferred. Anton works full-time, an average of 22 days per week.

Old commute	35min drive	90.00 levs per month (petrol and car maintenance)	3,276 g per journey
New commute	35min metro+walk	16.00 levs per month Half of 32levs monthly travelcard (metro only) paid for by	728 g per journey

		employer	
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Assya

Assya works full-time and studies part-time at the University of Sofia. The calculations presented here are based on Assya's journey to her place of work.

Old commute	30min metro+walk	23.00 levs per month Monthly travelcard (metro only) before Line 2 opened	416 g per journey
New commute	30min metro+walk	32.00 levs per month Monthly travelcard (metro only)	536 g per journey

Bella

Bella works full-time, an average of 22 days per month.

Old commute	60min tram+walk	50.00 levs per month Monthly travelcard (entire network)	320 g per journey
New commute	30min metro+walk	50.00 levs per month Monthly travelcard (entire network)	248 g per journey

Maria

Maria works part-time, and studies full-time at the University of Sofia. The calculations presented here are based on her journey to her place of work.

Old commute	45min walk	0	-
New commute	17min metro+walk	7.00 levs per month (Monthly travelcard (metro only); Full-time student concession)	248 g per journey

Nikolay

Nikolay works full-time, an average of 22 days per month. Nikolay used to live very close to his workplace, but moved house soon after Line 2 launched. This is the change in his commute that the calculations presented here I based on.

Old commute	10min walk	0	-
New commute	40min metro+walk	50.00 levs per month (Monthly travelcard; entire network)	960 g per journey

Emma

Emma works full-time, an average of 22 days per month.

Old commute	55min tram+walk	35.20 levs per month (Series of carnet tickets, 44 journeys at 0.80levs)	616 g per journey
New commute	40min metro+walk	32.00 levs per month Monthly travelcard (metro only)	584 g per journey

Stella

Stella works full-time, an average of 22 days per month. Stella switched back to driving to work after her health deteriorated. The calculations presented here are based on her metro commute.

Old commute	50min drive	100.00 levs per month (petrol and car maintenance)	3,240 g per journey
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New commute	45min drive+train+metro+walk	66.20 levs per month (10.00 levs petrol and car maintenance; 21.20 levs train travelcard; 44 metro journeys at 0.80 levs based on carnet card)	1,620 g per journey
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Rumen

Rumen works full-time, an average of 22 days per month. He changed workplaces several time over the course of data collection. The calculations presented here are based on his journey to work at the time of the Line 2 launch.

Old commute	1h 5min cycle	0	-
New commute	1h 5min tram+metro+walk	50.00 levs per month Monthly travelcard (entire network)	328 g per journey

Gregor

Gregor works part-time, and studies full-time at the University of Sofia. The calculations presented here are based on Gregor's journey to his place of work. Occasions of trip-chaining (university to work, before heading home, or vice-versa) are ignored for the purposes of these calculations.

Old commute	50min bus+metro+walk	17.00 levs per month Monthly travelcard (entire network; full- time student concession)	1,928 g per journey
New commute	30min metro+walk	17.00 levs per month Monthly travelcard (entire network; full- time student concession)	560 g per journey

Irina

Irina works part-time, and studies full-time at the University of Sofia. The calculations presented here are based on Irina's journey to her place of work.

Old commute	50min tram+walk	17.00 levs per month Monthly travelcard (entire network; full-time student concession)	696 g per journey
New commute	40min tram+metro+walk	17.00 levs per month Monthly travelcard (entire network; full-time student concession)	896 g per journey

Janna

Janna works full-time and during the data collection period, also began part-time studies at the University of Sofia. The calculations presented here do not reflect journeys between home and the University, no trip-chaining between the workplace and the University – they account only for Janna's trips to the office and back.

Old commute	55min drive	80.00 levs per month (petrol and car maintenance)	3,456 g per journey
New commute	35min metro+walk	32.00 levs per month Monthly travelcard (metro only)	504 g per journey

Vladimir

Vladimir works part-time, approximately 11 days per month. He also works freelance as a photographer, at varying locations. The latter work commitments are not included in the calculations below.

Old commute	25min tram+walk	22.00 levs per month (11 days of return journeys, each journey at 1.00lev single ticket)	480 g per journey
New commute	25min metro+walk	22.00 levs per month (11 days of return journeys, each journey at 1.00lev single ticket)	360 g per journey

Maya

Maya works full-time. She gets a lift in a car, for free, most mornings. The calculations presented below are based on her journey home from work in the evening. Maya often has to travel to the offices of her company's clients, but these trips are not included in the calculations presented here.

Old commute	25min bus+walk	22.00 levs per month (22 days per month, return journeys only, at 1.00 lev)	527 g per journey
New commute	25min metro+walk	22.00 levs per month (22 days per month, return journeys only, at 1.00 lev)	160 g per journey

Christo

Christo works full-time, approximately 22 days per month.

Old commute	30min drive	90.00 levs per month	2,412 g per journey
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		(petrol and car maintenance)	
New commute	60min metro+walk	44.00 levs per month (22 days of return journeys, each journey at 1.00lev single ticket)	744 g per journey

Natalia

Natalia works full-time, approximately 22 days per month. She used to take a bus to one of the older Line 1 stations, and take the metro from there to her workplace. When the metro reached closer to her home in 2012, she started walking to the new Mladost-3 station, and switched from an entire-network to a metro-only travelcard, as she no longer needed to use the bus regularly.

Old commute	40min metro+bus+walk	50.00 levs per month Monthly travelcard (entire network)	635 g per journey
New commute	30min metro+walk	32.00 levs per month Monthly travelcard (metro only)	560 g per journey

Nell

Nell works full-time, approximately 22 days per month.

Old commute	60min minibus+walk	66.00 levs per month (22 days of return journeys, each journey at 1.60lev single minibus ticket)	2,464 g per journey
New commute	47min drive+metro+walk	112.00 levs per month (80.00 levs petrol and car maintenance;	4,124 g per journey

		32.00 levs monthly travelcard, metro only)	
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Raya

Raya works full-time, approximately 22 days per month.

Old commute	35min bus+bus+walk	0 (Monthly travelcard for entire network, paid by employer)	1,445 g per journey
New commute	35min metro+walk	0 (Monthly travelcard for entire network, paid by employer)	664 g per journey

Toni

Toni works full-time and studies part-time at the University of Sofia. The calculations presented here are based on Assya's journey to her place of work.

Old commute	40min tram+walk	23.00 levs per month Monthly travelcard (metro only) before Line 2 opened	344 g per journey
New commute	30min metro+walk	32.00 levs per month Monthly travelcard (metro only)	328 g per journey

Tanya

Tanya works full-time, approximately 22 days per month.

Old commute	60min drive	80.00 levs per month (petrol and car maintenance)	2,052 g per journey
New commute	35min metro+walk	35.20 levs per month (22 return metro journeys at 0.80 levs based on carnet card)	416 g per journey

Lilly

Lilly works full-time, approximately 22 days per month.

Old commute	1h40min minibus+trolley+walk	110.00 levs per month (22 return journeys, each at 1 single minibus ticket at 1.50, and 1 single trolley ticket at 1.00)	4,576 g per journey
New commute	1h25min drive+metro	104.00 levs per month (60.00 levs petrol and car maintenance; 22 return metro journeys at 1.00 per journey, single tickets)	5,144 g per journey