Sociospatial reframing of walking through inclusive streets and urban heritage

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**SOCIOSPATIAL REFRAMING OF
WALKING THROUGH INCLUSIVE STREETS AND
URBAN HERITAGE**

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SCHOOL OF CIVIL AND ENVIRONMENTAL ENGINEERING

2020

SOCIOSPATIAL REFRAMING OF WALKING THROUGH INCLUSIVE STREETS AND URBAN HERITAGE

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School of Civil and Environmental Engineering

A thesis submitted to the Nanyang Technological University
in partial fulfilment of the requirement for the degree of
Doctor of Philosophy

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Authorship Attribution Statement

This thesis contains material from 2 papers published in the following peer-reviewed journals in which I am listed as an author.

Chapter 5 is published as Wang, Y., Y.D. Wong, and K. Goh. Perceived importance of inclusive street dimensions: A public questionnaire survey from a visioning perspective. *Transportation* (2019). DOI: 10.1007/s11116-019-10071-1.

The contributions of the co-authors are as follows:

- Assoc Prof Wong provided research direction and edited the manuscript drafts.
- I prepared the manuscript drafts.
- I designed the survey questionnaire, coordinated data collection and analysed the data.
- Dr Goh provided guidance in the design of survey questionnaire and commented on the manuscript drafts.

Chapter 6 is published as Wang, Y. and Y.D. Wong. Repositioning urban heritage for active mobility: Indications from news coverage in Singapore. *Cities* (2020). DOI: 10.1016/j.cities.2019.102525.

The contributions of the co-authors are as follows:

- Assoc Prof Wong provided research direction and edited the manuscript drafts.
- I prepared the manuscript drafts.
- I collected and analysed the data.

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Summary

The complexity of pedestrian behaviour is entwined in the interconnected physical and perceptual dimensions of the built environment. With an exploratory mixed methodology adopted, the research approaches urban walking and walkability—both as a transport mode and as a type of urban experience—through two lenses: (1) inclusive streets and (2) urban heritage.

On the inclusive streets strand, the growing presence of recent street design guides, and the multitude of desirable street qualities presented in them, were addressed by conducting a systematic review of this oft-overlooked grey literature. The review revealed the conceptual triangulation of street (re)design and user inclusivity by transport mode as well as by mobility capacity. Moving from international practices to local experiences, mobile ethnographic interviews were conducted with older adults and persons with disabilities in Singapore to understand their mobility needs and perceptions. The semi-structured interviews unveiled a wide range of sociospatial themes, including movement within an extended pedestrian network, such as detouring and taking shortcuts, and ambivalence about space sharing that is in part caused by both the complications of rights-of-way among active transport modes and preconceptions of social norms in a local-foreign divide. Then, to reach a wider demographic, a street-intercept survey was conducted to investigate perceived importance within a set of six different inclusive street design dimensions in relation to the movement and activity functions of streets. The results confirm the importance of safety and security but also highlight the desirability of streetscape and urban vibrancy with respect to street design. The inclusive street design regime was also found to be compatible with the notion of urban heritage in a meta-narrative review to explore the potential of urban heritage being repositioned for urban and transport planning in which the promotion of walking is a high priority. The meta-narrative review identified six research traditions, namely the ecological model, the new mobilities paradigm, heritage discourse, public life, rhythmanalysis and space syntax. While it was beyond the scope of this thesis to utilise methods of all these research traditions, synthesising respective narratives provided for a roadmap for the other research modules against a unified discourse of heritage for urban and transport planning. To explore how urban heritage may be repositioned for walking in urban planning using an alternative data source, a thematic analysis of heritage- and walking-related newspaper articles was performed. The analysis revealed

broad themes such as a vision of a “car-lite” city and the broadening scope of urban heritage, and specific themes such as heritage trails for learning while walking and the blurred line between locals and tourists. Furthermore, insight into policy implications was derived from a mixed-methods study of the public consultation exercise on urban redevelopment in Macao. The spatial and content analyses of public feedback demonstrated an argumentative diversity in debating a variety of redevelopment/conservation methods, despite a downward trend of intensity over the recent years. Also confirmed was the intricate street network in the historic district emerging as one of the key considerations for urban conservation.

Underscored by qualitative and quantitative findings, this thesis could potentially provide urban planner and policy makers with an interdisciplinary framework of inclusive streets and urban heritage, and the integration of the two, to foster pedestrian-oriented planning practices that are responsive to community needs and sensitive to local contexts. This sociospatial approach to walking will also deepen our understanding of active mobility in the perceptual and humanistic dimensions, and of urban conservation as the management of change in both the built environment and the movement and activity patterns.

Publications and manuscripts

1. Wang, Y., Y.D. Wong, and K. Goh. (2019). “Perceived importance of inclusive street dimensions: A public questionnaire survey from a visioning perspective.” *Transportation*. <https://doi.org/10.1007/s11116-019-10071-1>
2. Wang, Y, and Y.D. Wong. (2020) “Repositioning urban heritage for active mobility: Indications from news coverage in Singapore.” *Cities*. <https://doi.org/10.1016/j.cities.2019.102525>
3. Wang, Y., K. Yamaguchi, and Y.D. Wong. “Site-level public consultation on development control and urban design requirements in Macao: The multivalent nexus of redevelopment and heritage conservation.” *Land Use Policy*. [Under review]

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Chapter 1. Introduction

1.1 Background and motivation

This research lies in the intersection between walking, under the banner of active mobility, and urban design, and investigates how they are linked via perceptual urban design qualities. The practice of urban planning and design is putting a stronger emphasis on the social aspects of community building, and so does transport planning on promotion of walking and cycling. It is worthwhile to look into the behavioural manifestations of perceptual urban design qualities, based on the hypothesis that people are willing to walk more if they find their neighbourhood attractive and meaningful. One of the key elements of interest is urban heritage whose scope is broadening and whose relevance is increasing in the public discourse recently. Another key aspect is how urban design elements relate to the configurational attributes of the pedestrian network and the perceptual qualities of streets and public spaces.

Historic districts in cities or metropolitan regions are often spatially characterised by an organic urban fabric with narrow, tightly woven streets and dense, fine-grained development; alternatively, historic districts are associated with departures, as a result of incremental development, from the predominant, contemporary urban form of rectilinear grids. The heterogeneity of the built landscape within certain geographic boundaries, when viewed in its totality, showcases a diversity of urban character with different implications for transport and lifestyle. For example, a suburban neighbourhood fuelled by automobility stands in stark contrast with urban living in close proximity to consumption and recreation amenities and possibly a higher degree of public transit use and active mobility, such as walking and cycling. A vast body of evidence on the relationship between the built environment and various transport modes and travel purposes has accumulated over the years (Cervero and Kockelman, 1997; Boarnet and Crane, 2001; Ewing and Cervero, 2017). This strand of research is accompanied by an increasing focus on built environmental factors to better explain active mobility behaviour that is susceptible to microscale elements present in streets and public spaces (Iacono et al., 2010), resulting in a comprehensive list ranging from walking infrastructure to street furniture (Craig et al., 2002; Ferrer et al., 2015), and relating to perceptual urban design qualities (Ewing et al., 2013). While extensive research has been conducted to identify the effects of individual built environmental factors on active mobility, the same literature has also reached a consensus that for the

built environment to exert a more than modest impact on prompting people to walk or cycle more frequently, the co-location of a number of positive factors is a prerequisite (Cervero and Kockelman, 1997). This perspective suggests a historical viewpoint by redirecting attention to existing urban areas, which tend to be historic districts, that are traditionally on a human scale and are perceived to be more pedestrian-friendly.

Urban conservation, which has become a pillar undergirding the urban planning and development agenda and discourse worldwide, is institutionalised through a wide array of practices and initiatives at the interstices of economic and social goals (Bandarin and Van Oers, 2012). Notwithstanding the inherent conflict with industrialisation and motorisation, in which some historic urban cores were demolished in the name of modernity, among other socio-economic trappings, the persistence of existing historic districts continues to offer a sense of continuity in the history of urban development (Sitte, 1965). The aesthetic and symbolic values that have accrued on top of the shifting functionality of such a compact, vital urban area further elevate it to the stature of urban heritage (Bandarin and Van Oers, 2012, p.14), which comprises landmark monuments, the urban fabric, as well as the vernacular, less monumental built stock within a larger territorial and natural context. More importantly, urban heritage forms a physical setting of the inhabitants' cultures and traditions. One of the salient conflicts between urban development and conservation manifests itself in the contestation over urban space among motorised and non-motorised transport. This conflict, from the perspective of traffic engineering, is encapsulated in the drastic difference in the scale, or operational envelope, between pedestrians and vehicles (NACTO, 2016) and the tenet of speed maximisation of motorised transport (Banister, 2011). In contrast, from the perspective of urbanism, the conflict reflects local variations of mobility culture (Klinger and Lanzendorf, 2015). As the tension between urban development that is largely premised on automobility and urban conservation tasked with additional social responsibilities, such as community engagement, remains a constant force in shaping cities' morphology and public life, urban heritage emerges as an interface where interdisciplinary exchanges flourish and a unitary process can address and reconcile various societal needs.

One of the principal concerns arising from the agenda of a more inclusive heritage ecosystem is the fundamental question of what constitutes urban heritage. The trend of the widening scope of heritage has been bolstered by a series of international charters that have shifted from a singular focus on monuments to a multi-pronged agenda that

covers the safeguarding of intangible cultural heritage (UNESCO, 2003). However, according to Orbasli's (2000) framework of urban conservation, what is often overlooked is the intermediary spatial dimension between the physical dimension (tangibility) and the social dimension (intangibility). Although attention to the urban setting as part of heritage authenticity is not a recent phenomenon in the heritage discourse (ICOMOS, 1964; UNESCO, 2012), the need to preserve spatial characteristics (e.g., the urban fabric) has been recognised (Tweed and Sutherland, 2007; Zaninović et al., 2018) and remains pronounced. From a procedural perspective, as the practice of urban conservation is becoming increasingly incremental, the broadening definition of urban heritage is concurrent with the pressing need to understand the relationship between urban redevelopment and heritage conservation.

1.2 Purpose and scope

A mixed-method approach incorporating ethnographic interviews and geospatial analysis was adopted. They serve to identify the indicators of the built environment that facilitate positive place attachment as well as the human-environment interactions through which place attachment forms and translates into more frequent utilitarian and recreational walking, i.e. the revalorisation of urban heritage. The findings are expected to contribute to community-oriented and perception-enabled urban planning and everyday place management. The thesis is organised as shown in Figure 1.1. The dashed component and links are beyond the scope of research work for this thesis, but are added to complete the structure with regard to possible further research areas.

Figure 1.1 Structure of thesis.

Chapter 2. The intersection of urban heritage and active mobility

2.1 Literature review objective

The objective of this literature review is two-fold: (1) to explore the intersection between urban heritage and active transport behaviour; (2) to identify the (re-)positioning of urban heritage that is potentially synergistic with urban and transport planning as well as day-to-day urban management. The remainder of this chapter is organised as follows: the methods section (Section 2.2) documents the literature search and screening process using the meta-narrative method and provides an overview of the initial search results based on the six identified research traditions. Seminal works and recent research in each research tradition are further examined in the results and discussion section (Section 2.3). This chapter concludes with additional remarks for further research (Section 2.4).

2.2 Meta-narrative review method

2.2.1 Literature search and screening

The underexplored and multi-disciplinary nature of the topic about urban heritage and active mobility was confirmed by an initial literature search to be relatively sparse and disperse. The descriptive literature review method of meta-narrative was chosen out of a catalogue including other methods such as for synthesising statistical analysis or extending theory (Xiao and Watson, 2017), which were not justified by the literature for this study. According to the review protocol by Greenhalgh et al. (2005), a meta-narrative is characterised by the explicit attempt to identify research traditions situated in respective academic disciplines, in view of the conceptual, theoretical, methodological and instrumental aspects of science and innovation diffusion (Kuhn, 1970; Kuhn and Hacking, 2012). While a meta-narrative can be differentiated from a more expansive scoping review by the former's focus on tracing research traditions and paradigm changes, the two are nonetheless similar in their purpose of describing the academic landscape and thus can be combined expediently (Xiao and Watson, 2017; see also Malekpour, Brown, and de Haan, 2015, for such a hybrid review). Hence, this study was guided the meta-narrative method (Greenhalgh et al., 2005), while with input from the scoping method (Arksey and O'Malley, 2005).

At the outset, key phrases associated with urban heritage or historic districts and those with active mobility or pedestrians were searched in three academic databases, namely EBSCO (the sub-database of Academic Search Complete), Scopus and Web of Science

for their comprehensive indexing of peer-reviewed journal articles (see Appendix A for the search strings used). Due to the initial purpose of locating recent research concerning the two subject themes, a time limit of the year 2009 or later was used. The searches generated 26, 115 and 128 records, respectively, which suggests the paucity of research on the topic. Subsequently, examination of title and abstract, and skimming of the full texts, resulted in the first selection of 20 journal articles for detailed review. As a safeguard against omission, other keywords such as cyclists and wheelchairs were also included for a better coverage of active mobility but doing so did not yield a significant amount of literature about these two topics.

The literature in each research tradition was expanded using snowballing methods, including backward searches (previous works identified in the reference lists of highly cited journal articles) and forward searches (journal articles or books subsequent to the seminal works and tracked in the database).

2.2.2 Initial selection overview

Despite the small number, the initial selection encapsulated an assemblage of theories that were the basis for the reviewed studies or were utilised to undergird the discussion (Table 2.1). Overall, a common study area was a historic district that was considered innately compatible with active mobility, such as pedestrian movement. Also, stationary activities taking place in streets and public spaces, such as standing, waiting, casual conversation and other types of social interaction, were addressed as frequently as pedestrian movement, signalling that their co-existence is vital for maintaining the urban character of places.

More specifically, two studies (Geiger and Werner, 2009; Fillone and Mateo-Babiano, 2018) adopted an ecological approach to walkability, exploring a variety of intra- and inter-personal factors and environmental and institutional factors. Urban heritage, when combined with the active transport mode of walking, finds a niche in the new mobilities paradigm, in which one study of heritage trails (Barber, 2018) and in part, an urban study (Hetherington, 2013), were theoretically positioned. The relational thinking of heritage, often termed heritagisation or heritage-making, was a field of growing interest, with two studies (Hetherington, 2013; Wang and Kao, 2017) building on, or putting in perspective, the authorised heritage discourse.

With regard to public life, or urban vitality, which is often associated with historic districts, two lines of thought, which are not mutually exclusive, prevailed. Two studies

(Özdemir and Selçuk, 2017; Lunecke and Mora, 2018) were affiliated with Danish architect Jan Gehl's renowned work on public life in urban space, whereas on a more abstract level, another two studies (Hetherington, 2013; Tchoukaleyska, 2016) were affiliated with French sociologist Henri Lefebvre, whose proposed "rhythmanalysis" is more a taxonomy of deep metaphors for describing humanistic urban complexity than a standardised set of analytic techniques. Three studies used the theory of space syntax, which is itself an instrument for street network configurational analysis, as the main analytical component (Chiang and Deng, 2017; Mansouri and Ujang, 2017) or in conjunction with the simulation technique of thermal comfort (Saito et al., 2017).

In addition, three studies identified that used comparative urbanism (Ijla et al., 2011; Parajuli and Pojani, 2018; Bass and Livingston, 2019) with comparisons that entailed walkability in relation to street types and furniture (Bass and Livingston, 2019), property values in relation to whether a property is located in a historic district (Ijla et al., 2011), and barriers to the implementation of pedestrianisation schemes (Parajuli and Pojani, 2018). However, due to the high inconsistency of the theoretical bases, comparative urbanism was excluded from the meta-narrative review.

The remaining articles comprise some stand-alone studies, with a single example each of the research tradition of wicked problems (Zhang et al., 2018) and the vicious cycle schema of tourism destinations (Lee and Rii, 2016), and some pure case studies without a specific theoretical basis. It should be noted that the theoretical basis or framing, depending on the type of study, may therefore not be a single commitment but rather a vector of more than one theory. The identification of a certain theoretical basis in a study does not necessarily exclude its association with other theoretical bases.

2.3 Expanded literature review in each research tradition

This section provides further discussion based on additional literature found in each of the six research traditions (Table 2.1), namely, ecological model (the number of references after expansion = 10), new mobilities paradigm (15), heritage discourse (13), public life (11), rhythmanalysis (13) and space syntax (15).

2.3.1 Ecological model integrating built and social environments

Rooted in epidemiology and driven by the need in the public health sector to identify the context of disease risk factors, the ecological model, also commonly referred to as a perspective or framework, initially comprised five categories of the outcome of physical

Table 2.1 Summary of research traditions and implications for re-positioning urban heritage.

#	Research tradition	Academic discipline	Definition and scope	Positioning of urban heritage
1	Ecological model	Transportation and public health	<ul style="list-style-type: none"> • Conceptual model to integrate factors influencing physical activities at various levels, namely intrapersonal, interpersonal, organisational, built environmental and policy-related. • One focus is the built environmental effects on physical activity which can inform policies of public health intervention. 	Transport implications of urban conservation regulations and initiatives, for example, how the traffic network transformed or resisted radical changes which sustained a high level of pedestrian behaviour.
2	New mobilities	Human geography	<ul style="list-style-type: none"> • Study of the movement of people, animals, goods or ideas. • Differentiates itself from transport geography by attending to the embodied nature of human movement, in particular at a local scale. 	The reflexive everyday pedestrian mobilities that are at least occasionally affected by urban heritage driven by exploratory motivations, and in turn morph into a process of heritage-making
3	Heritage discourse	Interdisciplinary, heritage studies	<ul style="list-style-type: none"> • Discourse about the power relations among authorities and the public as to what qualifies for heritage, coupled with institutional support for conservation. • Development in the conception of heritage value, i.e., the emergence of intangible cultural heritage. • In parallel, a de-authorised heritage discourse unravels which aims for empowerment of the general public (e.g., historic landscape characterisation) and refashion heritage as a way of meaning-making. 	An update of the notion of urban heritage that brings back the intermediate dimension of spatial characteristics, as a counter-balancing move to the prevalent narratives surrounding the tangible and intangible values of heritage, corresponding to the physical and social dimensions.

#	Research tradition	Academic discipline	Definition and scope	Positioning of urban heritage
4	Public life	Urban planning and design	<ul style="list-style-type: none"> • Study of public space uses or outdoor activities which are divided into three categories: necessary (chiefly walking), optional/recreational, and social. • Insight gained mainly from observations into how activity patterns may be influenced by urban planning and design decisions and interventions. 	Public space uses including those streets as an integral component of urban character in a historical context where ways of life have formed over time.
5	Rhythmanalysis	Sociology	<ul style="list-style-type: none"> • Study of spatiotemporal rhythms across scales, such as from the physiological rhythms of the body and the flows of people in the city. • Sociological inquiry into cultures and ideologies as the outcome of a combination of various urban rhythms. 	Dynamic views of historic districts that are characterised by rhythmic movements and activities across space and over time.
6	Space syntax	Urban design	<ul style="list-style-type: none"> • A set of configurational measures, such as connectivity, integration, control and choice, used to analyse the distribution of people's movements and encounters. • Space syntactical measures are being enhanced with alternative representations of the urban layout, shifting from axial lines to road centre line segments and others. • The assumption of natural movement as the component determined by the urban layout alone lends appeal to space syntax as a potential fundamental cause of pedestrian movement and has inspired applications to explaining other urban processes, e.g., retail location and housing price distribution. 	Quantification of spatial characteristics which can in turn be used together with contextual (e.g., land use) and dynamic (public space) attributes for the purpose of urban segmentation and, in a broader sense, more effectively convert urban conservation into management of urban change.

Note: For literature search records, see Appendix A.

activity, namely, intra-personal, inter-personal, organisational, community (a hybrid of inter-personal and organisational factors) and public policy (McLeroy et al., 1988). However, this framework did not delve much into the physical environment until recent work by Sallis and colleagues (Sallis et al., 2006; Sallis and Owen, 2015). The aforementioned factor categories were re-organised in “rings” radiating from the intra-personal domain to the policy environment, and in this framework, the physical environment it is placed in the ring of behaviour settings, which include neighbourhood characteristics such as walkability, pedestrian/cycling facilities, parking provision, and transit and transport infrastructure in general (Sallis et al., 2006).

The emphasis on the social environment, rather than merely the psychological intrapersonal factors (McLeroy et al., 1988), directs attention to workplace or school environments that also affect the level of physical activity within occupational settings, whereas the emphasis on the policy environment points to the issue of “collateral damage” from zoning codes that implicitly condone automobility due to reluctance to revoke past regulations (Sallis et al., 2006). Furthermore, in the case of active mobility subsumed under physical activity, neighbourhood design is the set with the most robust correlates (Bauman et al., 2002; Bauman et al., 2012). Although not a model per se that specifies mechanisms among the determinants and correlates of physical activity, the ecological model remains a comprehensive and flexible framework that continues to generate hypotheses testing the relationship between physical activity and the environment at different scales while constantly keeping the context (i.e., outer and inner rings of the model) in view.

A drawback of the almost all-inclusive nature of the ecological model is that specific studies need not self-identify as conceptually ecological, which may detract from the utility of positioning and mapping physical activity research from multiple disciplines. Further literature searches along this line found limited results for urban heritage in particular. Notably, a variant of the ecological model proposed by Alfonzo (2005) gives the heritage-related concept more salience: Topping the hierarchy of walking needs is pleurability, above feasibility, accessibility, safety and comfort. While not unlike Maslow’s hierarchy of needs (Maslow, 1943; Maslow and Frager, 1987), Alfonzo’s version explicitly links historic elements and architectural appeal with pleurability. In a study of physical environmental factors that affect walking, van Cauwenberg et al. (2014) found positive effects of the presence of historic elements along streets, and

hence the perceived attractiveness of such streets, on older adults' willingness to walk. In a virtual walking experiment, Bornioli et al. (2018) found a restorative effect derived from walking in a pedestrianised historic district similar to that derived from walking in a natural environment.

2.3.2 Resurrecting the experiential quality of “new” mobilities

If a traffic engineer were to read the mobilities literature for the first time, the experience could be likened to a serendipitous discovery of a new block after taking a turn from a familiar street. Despite a shared vocabulary in terms of the subjects of interest (e.g., transport, mobility and movement), mobilities studies approach mobility, which concerns the movement of people, animals, goods and ideas, from a sociological perspective. The renewed interest in the inter- and intra-personal aspects of a variety of mobility practices, ranging from everyday mundane pedestrian travel to migration at the global scale, culminated in the “new mobilities paradigms” (Sheller and Urry, 2006) and the “mobility turn” (Hannam et al., 2006). An equally important concept is the antithesis of mobility – immobility, which developed from Urry's (2003) polemic on mobilities and moorings. At the core of this polemic is the relativity and relatedness of the states of mobility and immobility, as Adey (2006) expounds in a seemingly oxymoronic case of a mobile airport.

Further contrasting these two disciplines are two three-part papers in *Progress in Human Geography* – one on transport geography (Keeling, 2007, 2008, 2009) and the other on mobilities studies (Cresswell, 2010, 2011, 2014). At the global scale, Keeling (2007) notes that studies of airlines, shipping and railroads have demonstrated the power of statistical models in explaining the network design of transport systems but “are less forthcoming about the geopolitical, land-use, social, and environmental implications”. The daunting positivist-constructivist chasm resonates with Cresswell (2010, 2014), who summarises the differences of mobility research from transport research, such as the tendency to investigate a variety of mobile subjects (e.g., commodities, logistics and even corporate practices such as outsourcing) and to link across different movement scales, a growing preference for mobile methods, and an increased focus on stillness and immobility. Immobility can refer to extreme situations caused by infrastructure breakdowns or border controls or intermittent pauses in everyday travel, such as waiting for transit or traffic signals (Cresswell, 2011). This comparison is by no means intended to downplay the relevance of transport geography. On the contrary, through the dialogue

with mobilities studies, according to Keeling's (2008) commentary, for example, which is highly relevant to this chapter's topic, econometric heritage tourism research could greatly benefit from theoretical integration and methodological refinement to analyse "how the historical geography of societies' heritage in different regions is being packaged and marketed for niche consumption". Similarly, landscape research can pursue a more transport-explicit direction to investigate "how landscapes are conceptualised, engaged with, and modified as a consequence of transport policies" (Keeling, 2009).

Mobilities studies have since unfolded myriad human mobility practices, including not only the basic modes of walking and cycling but also niche modes of engagement with the built environment, such as conventional sports and the more performative sport of parkour. The sociological flavour can be observed in the emphasis on the embodied nature of everyday pedestrian mobility, which has given rise to mobile methods (Middleton, 2011; Waite et al., 2019). This embodiment is the mechanism through which nuanced perceptions and the extraction of value from urban landscapes are enabled. In a qualitative study using different data sources, such as interview transcripts, GPS tracks and photographs, the participants showed strong dislike for new private development on the grounds that it lacked openness and integration into their neighbourhood, whereas, counterintuitively, others expressed appreciation of the homogeneity of the architectural style because it provided them with a sense of security (Bergeron et al., 2014). These perceptions as an outcome of embodiment may shape attitudes towards mobility practices, and the complex connotations, either positive and negative, of the urban experience of walking need further investigation, which may help further illuminate the common denominators of widely-perceived mobility culture variations. For example, a comparative survey of England and Switzerland tellingly suggests opposing attitudes towards car ownership: in England, having no car is associated with "social deficiencies", while in Switzerland, it is associated with "high status rather than poverty" (Manderscheid, 2014). Although such a sweeping generalisation may be suspect, the linkage between the built environment and embodied pedestrian practices is a promising area for generating a more socially relevant transport research agenda. In the case of historic districts, the experiential quality emanating from urban heritage is therefore of core interest. However, this focus begs the fundamental question of what constitutes urban heritage, which is discussed in the next narrative.

2.3.3 (De-)authorised heritage discourse

“All heritage is intangible,” claims Smith (2006), while clarifying that “there is no need to embrace relativism”. As mentioned in the introduction, this statement holds true, as the paradoxical situation persists in which both the intangibility of heritage – as in iterative “cultural processes of meaning and memory making and remaking” (Smith, 2006, p.74) – and the physicality/materiality of heritage (e.g., relics or sites) have a wide didactic purchase in academia and industry, albeit with a certain theoretical unease and incompatibility with conservation practice (Smith, 2006, 2017). There are two central issues concerning urban heritage in this line of research: the first concerns who has the power to determine what is heritage and thus deserves designation and conservation, which is subsumed under the authorised heritage discourse (Smith, 2006). The second questions the validity of increasingly popularised heritage concepts such as the tautological term “intangible value” and the contradictory term “tangible value” (Smith and Campbell, 2017).

The ontological quest for heritage has led to an academic movement to “de-authorise” the heritage discourse. The British example of historic landscape characterisation (Turner, 2006) epitomises a shift from protection through designation via an approach to managing and mediating change and encourages a management strategy of allowing current uses to continue while creating settings for new uses (Jorgensen et al., 2017). The respect for the urban settings that are the physical foundation for human activity thus calls for greater attention to the multi-layered urban morphology, or what Dobson and Selman (2012) refer to as spatial urban heritage. In the UK context, the historic landscape characterisation has catalysed exchanges between government initiatives that are traditionally in separate domains, such as a health-promotion programme of historic trails in which the urban morphology was valued for its historic legibility (Dobson and Selman, 2012) and a biodiversity action plan in which the aesthetic and recreational value of landscape was recognised (Bieling and Plieninger, 2013). Although there is criticism of the possibility of a de-authorising heritage discourse itself becoming an authorised discourse in the sense that master planned urban transformation can be more easily sanctioned (Williamson, 2013), Pendlebury (2013) highlights a key difference of responsiveness and less control by their originators in such bottom-up, participatory heritage characterisation processes. Furthermore, urban conservation should be

presented as complementary to physical regeneration and economic development to push the heritage discourse forward into praxis (Pendlebury, 2013; Berg, 2018).

Consequently, this multi-faceted approach to urban conservation offers a partial solution to the self-imposed heritage dilemma of tangibility versus intangibility (Smith and Campbell, 2017) through implementing a more cohesive framework for heritage identification and characterisation beyond expert knowledge-driven designation. For example, one conservation focus should be how the current urban settings support existing uses, of which pedestrian movement is invariably a staple, and how proposed changes in the built environment may impact activity patterns. As indicated by a case study arguing for the heritage value in modern housing estates (Nymoen Rørtveit and Setten, 2015), this shift will subsequently render urban heritage a growingly fluid concept in which conservation and change management are indeed two sides of the same coin.

2.3.4 Achieving a vibrant public life through urban design

With enduring popularity in academia and industry, Jan Gehl's *Life between Buildings* (2011), the first edition of which was published in 1971, continues to serve as a reminder that where and how activity takes place in the public realm is as important as how movement and traffic circulation can be facilitated in the built environment. While often cited together with other urbanist classics with a common interest in public space uses, such as those by Jane Jacobs (1961) and William H. Whyte (1980), Gehl's works, including a later manual on how to observe and measure public life (Gehl and Svarre, 2013), are probably the most instrumental. According to his framework, outdoor activities are divided into three categories: (1) necessary (functional) activities, of which walking is the main activity and is only slightly influenced by built environmental factors; (2) optional (recreational) activities; and (3) social activities, the most widespread type of which is "passive contact", that is, "simply seeing and hearing other people" (Gehl, 2011, pp.9-14). The difference of passive contact from active contact, as expected in the programming of event venues, is that opportunities for social interaction can be established and maintained in a relaxed and undemanding manner; thus, the central thesis considers how a social structure consisting of a potential field for social interaction can be created in physical design. Furthermore, tactics of urban design that encourage passive contact include the mixing of people, which is not necessarily a direct consequence of the horizontal or vertical juxtaposition of different land uses; the

creation of “soft edges” to ease transitions between public and private realms; and the placement of primary seating (e.g., benches) and secondary seating (e.g., steps and pedestals) where sitting is a stationary, optional activity.

Recent literature along this line of public life is still to a large extent centred on the conceptualisation of public space (Hamilton-Baillie, 2004; Southworth, 2005; Carmona, 2015), while empirical evidence is accumulating in studies of public space use and pedestrian movement in relation to urban design. The notion of passive contact, when applied to street design, suggests that lower driving speeds enable eye contact between drivers and pedestrians, and therefore, the socialisation of road space in fact improves safety (Hamilton-Baillie, 2004). Through a typology of urban processes shaping public space, such as privatisation, commercialisation, and sanitisation, while maintaining a neutral standpoint, Carmona (2015) draws attention to a scholarly bias towards public space whose social interactivity is to be maximised by design; instead, he calls for open-mindedness underpinned by an acceptance that ultimately, diverse users will seek diverse uses of public space, including the option of shunning whatsoever, which may not or cannot be predefined in an “idealised blueprint”. This view is echoed by Sterrett et al. (2012) whose examination of a road infrastructure plan from a socio-religious perspective undermines the perceived deterministic character of infrastructure for social interaction between communities. In contrast, the informality of less normative urban design and the attendant informal uses add to urban vitality and public life. Vojnovic (2006) relates the concept of built environmental sociability to more concrete urban elements, such as block scale, building frontage and streetscape texture.

Another salient sub-plot of public life research is walkability. Correspondingly, the scope of walkability has evolved from a focus on the provision of facilities for necessary activities (Southworth, 2005) to the inclusion of sociability (Forsyth, 2015). However, the recognition that a walkable place should also be lively and sociable is at odds with the attempt to measure the social dimension in the same way as the physical dimension (Forsyth, 2015). Notably, a recent study analysed longitudinal pedestrian volume data in New York City with respect to static and dynamic built environmental factors and socio-economic factors, and the regression method allowed a quantitative estimation of impacts from changes in the built environment on pedestrian traffic (Lai and Kontokosta, 2018). The absence of social activity intensity data prevented from a similar analysis of

the sociability of the built environment, but this direction appears promising for future public life research that is not only descriptive but also inferential.

2.3.5 Interweaving spatiality and temporality in rhythmanalysis

Henri Lefebvre's legacy is influential in theorising the spatiotemporal decomposition and synthesis of space and society. In *The Production of Space* (Lefebvre, 1991), he lays out a threefold taxonomy that consists of spatial practices, representation of space (i.e., conceived space) and spaces of representation (i.e., lived space). However, it is his last work *Rhythmanalysis* (Lefebvre, 2013), that gives directions to a new mode of analysis focusing on the rhythms of everyday life. His vivid account of a Parisian street and junction, through a reflexive gaze from a window, substantiated two types of urban rhythm concerning people and objects – linear and cyclical. For example, the flux of pedestrians crossing a signalised crossing or tourists rambling in the street are linear rhythms, while on a daily basis, the phenomena of children leaving for school and shoppers arriving at stores in morning constitute cyclical rhythms (Lefebvre, 2013, pp.37-46) akin to Jacobs' (1961) account of a street symphony. Furthermore, the basic elements of rhythm establish a system of *eurhythmia* (concordant or harmonious), *arrhythmia* (discordant or dysfunctional), and, as their spatio-temporal co-occurrence progresses, *polyrhythmia* (Lefebvre, 2013). Although this extended Lefebvrian taxonomy is highly conceptual, and the task of how to practise rhythmanalysis remains unclear (Simonsen, 2016), it has nevertheless been mobilised in numerous urban studies. In a review of Lefebvre's works, Simonsen (2016) emphasises that the phenomenological and interpretative approach of rhythmanalysis is relevant because it foregrounds the stickiness of space and time, i.e., "localised time" and "temporalised place".

Recent literature on this research tradition presents an overview similar to that of new mobilities. In addition to the conceptualisation of social space (Knox, 2005), considerable attempts have been made to operationalise rhythmanalysis (DeLyser and Sui, 2013) along with empirical studies. Simpson (2012) employed time-lapse photography to study the everyday rhythms of a UK urban space with heavy pedestrian footfall that was the venue for a street magician to perform. Sankalia (2014) examined picnicking on the medians of streets in Berkeley and extracted the socio-political implications of the otherwise neutral traffic median, such as the expression of liberal identity by picnickers and selective traffic rule enforcement by authorities. In a case

study of Singapore, Lin (2012) discusses the rationing of travel time through market mechanisms such as road pricing and car ownership control, which results in different urban rhythms for different cross-sections of society. Typically, rhythm analysis has been used as a tool to deepen the understanding of urban rhythms in ethnographic interview studies in which the subject or the body takes central stage (Murray and Dougherty, 2016; Blue, 2017; Tartia, 2018). Different movements at different times of the day can characterise habitual driving and pedestrian routes, which relates to an embodied understanding of the city (Tartia, 2018). In an ethnographic study of mixed martial arts in the UK, through gaining first-hand experience of training with the participants, Blue (2017) emphasises the importance of *eurhythmia* consisting of not only the training itself but also supportive activities outside training, such as diet, which calls for a shift in public health intervention strategy towards “fostering healthy combinations of activities and disassembling the times and spaces of unhealthy practices”.

2.3.6 Space syntax as a potential root cause of movement and activity distribution

Space syntax is a set of network configurational measures developed by Bill Hillier and colleagues (1987) to answer the question of architectural determinism – “Does architectural design create a pattern of spatial life?” Applied to an axial map representation of urban environments where an axial line is the longest possible straight line in urban public space, the initial set of measures is based on the topological distance, i.e., the number of lines, or steps, between one line and another. While detailed formulations of space syntactical measures will not be duplicated here, it is worthwhile to revisit some of the initial ones: As with to-movement, the local measure of *connectivity* is the number of lines that one steps away (i.e., immediately connected); the global measure of *integration* is then the number of lines that are up to a certain number of steps away. As with through-movement, the local measure of *control* is the degree to which a line represents an option for its immediately connected lines; the global measure of *choice* is then the degree to which a line belongs to the topologically shortest routes between all pairs of lines, i.e., the likelihood that a certain line is traversed. While less commonly used, a second-order measure of *intelligibility* is defined as the correlation between *connectivity* and *integration* at a city scale. It should be noted that these measures largely correspond to those derived from the graph theory, such as centrality and betweenness, and both terminologies remain prominent in the literature (Pafka et al., 2018). In a UK study, regressing the pedestrian rates in streets and public

spaces on these configurational measures revealed that integration was the best predictor (Hillier et al., 1993). Based on the observation that configuration is the urban property that remains immutable irrespective of movement and land use, *natural movement* is defined as the proportion of urban pedestrian movement determined by the network configuration itself (Hillier et al., 1993), stemming from the notion of *virtual community* that is determined by co-presence in public space and does not need to be realised through actual interaction among its members (Hillier et al., 1987). Therefore, urban grid configuration represents the probabilistic potential field for movement and encounter. This can influence the success and failure of urban places in a “movement economy”, which depends on the presence or absence of the multiplying effect of different movements by different societal segments to some extent using the same streets or public spaces simultaneously (Hillier, 1996). This in fact showcases theoretical affinity with Gehl’s public life research tradition whereby the key to creating urban vibrancy is less about superficial integration or segregation of land uses or facilities than about simultaneous public space uses by those societal segments (Gehl, 2011, p.101).

The space syntax field has been flourishing as the configurational approach to urban patterns of movement and activity, and more sophisticated measures and analysis methods are evolving. Segment lines, which are more common in GIS road centre line datasets, have been shown to be a valid alternative to axial lines (Turner, 2007). Meanwhile, metric distance and angular distance as alternatives to the topological distance, and hybrid measures combining metric and angular distances have been developed and compared for the purpose of segmenting the urban grid (Haq and Berhie, 2018). A study that compares traditional and contemporary urban areas in Tel Aviv, Israel confirms a positive association between connectivity and pedestrian movement in traditional areas (Lerman and Omer, 2016). Moreover, a meta-analysis of space syntax studies of pedestrian movement indicates that angular integration is a stronger correlate than topological and metric integration measures (Sharmin and Kamruzzaman, 2017). Instrumentally, efforts have been made to couple space syntax with other research instruments, such as multi-criteria analysis (Jabbari et al., 2018). Similarly, the default dependent variable of pedestrian movement can be replaced with other proxies of urban processes, for example, in studies of Chinese cities, relating space syntax to the distribution of retail stores (Lin et al., 2018), social media check-in data (Shen and Karimi, 2016), and urban activity intensity (Li et al., 2016). A notable application of space syntax is Shen and Karimi’s (2017) analysis of the spatial distribution of housing

price, which showed that including space syntactical measures in network-constrained clustering resulted in more realistic market and urban segmentation.

2.4 Chapter summary

The ecological model (McLeroy et al., 1988; Sallis et al., 2006), as an almost all-inclusive organising framework of transport-related matters, sheds light on the policy environment and its potential effects on the built environment, e.g., through zoning, and the indirect consequences of changes in social environments such as workplace. Instead of taking the built environment as a given and merely comparing physical characteristics, such as the provision of walking facilities, the built environment should be viewed more dynamically as in part a product of the equilibrium, if not clashes, between automobility and active mobility from both an infrastructural and a cultural, institutional perspective. From the latter perspective, the widespread awareness of the necessity of urban conservation, although often starting from a symbolic high point concerning sense of place, belonging, and identity, can be brought down a notch and capitalised to inculcate a more grounded understanding of urban development as a process of allocating urban space to various movements and functions (Gössling et al., 2016) and hence of the varying perceived level of walkability in traditional versus modern urban areas.

The new mobilities paradigm (Sheller and Urry, 2006) has revived interest in the temporality, spatiality and embodiment of mobility practices at various geographical scales, although the alleged novelty should be conditioned by the historicity of research (Cresswell, 2010). On the other hand, the intertwined relationship between travel (the act of movement) and mobility (the ability to move or access destinations), when seen from a human-centred perspective, is implicated in a variety of motivations, either intrinsic or extrinsic, with the former lagging into its integration in transport geography (Mokhtarian et al., 2015). The authorised heritage discourse (Smith, 2006) has undergone a de-authorising process, which has led to broadening the scope of urban heritage to include the vernacular (Nymoen Rørtveit and Setten, 2015; Berg, 2018) and more dynamic processes of heritage-making (Dobson and Selman, 2012).

As the duality of mobility and immobility is becoming a norm in mobilities research (Cresswell, 2011) and continues to challenge the presupposed negative utility of travel time (Banister, 2011; Lin, 2012), the tradition of observational studies of public life (Gehl, 2011; Gehl and Svarre, 2013) focuses attention on public space uses, including both movement (e.g., walking) and stationary activities (e.g., sitting, lingering). Despite

a relative paucity of such data, the spatiotemporal dynamism of public spaces, if measured systematically, can be used not only to quantify urban intensity in different urban design settings but also in part to operationalise the Lefebvrian rhythmanalysis. While it is acknowledged that any attempt to quantify urban rhythms with a semblance of mechanistic measurement may defy the essence of rhythmanalysis as a mode of sociological inquiry, as seen in Lefebvre's own early applications (Lefebvre and Régulier, 2013b, a), much can be gained from the middle ground of measuring public space uses as basic components of concordant and discordant *rhythmia*, for example, further testing the relationship between “physical flows of movements and gestures and the culture that shows itself” (Lefebvre, 2013, p.43). Establishing links between the instrumental categorisation of public space uses that can be easily observed and urban rhythms largely as products of daily routines can then overcome the methodological bottleneck of rhythmanalysis and advance the theoretical foundation of public life.

The conceptual appeal of space syntax lies in the configurational properties that are relatively stable over time, and it has evolved as a powerful analytical tool. Therefore, when urban rhythms are measured as the spatiotemporal distribution of public life, space syntax can be employed to further investigate the reciprocal effects of space and movement (Hillier, 1996) as well as activity. As with network representations of the urban layout, one logical extension to the shift from the use of axial lines to segments of road centrelines (Turner, 2007) is the use of carriageways, traffic lanes, and in particular, pedestrian footpaths and other features for non-motorised travel (Iacono et al., 2010). Notably, the public life studies conducted by Gehl's consultancy, which contain a major observational component (GA ApS, 2007, 2013), seem to be extensible to space syntax analysis, which will lead to a fruitful collaboration given the difficulty of collecting public space use data, whether because of the high labour cost of in-field observation or the administrative hurdles and ethical implications concerning the use of, for instance, surveillance camera footage. Nevertheless, big data, social media and alternative data sources (DeLyser and Sui, 2013; Shen and Karimi, 2017; Lai and Kontokosta, 2018) indicate opens up a wide array of possibilities for research on everyday mobilities. In particular, the proliferation of online participatory tools and the availability of social media data, albeit under stricter privacy regulations, not only facilitate a constructive feedback loop for urban management between the public sector and the general public (Afzalan et al., 2017) but also allow for the build-up of an evidence base for the relationships among urban layouts, urban rhythms and public life. In addition, integrated

use of alternative data sources is likely to progress urban and transport studies beyond the predominance of cross-sectional design (van de Coevering et al., 2015). Viewed in the heritage concept, these theoretical advancements and methodological developments contribute to a holistic evaluation of urban conservation whereby the urban fabric and real-life consequences, such as multimodal movements, activities and real estate, are brought into the same picture (Carmona et al., 2018).

Chapter 3. Street design guidance overview

3.1 Introduction – Street design paradigm shift

The multi-faceted nature of streets is usually encapsulated in abstract concepts that form a set of common goals, or street design principles (SDPs), towards a vision of a sustainable transport system and a liveable society. Street design, in a narrow sense, can be synonymous with applying highway design standards and construction specifications that are legally binding and for which formal approvals of traffic plans and drawings from relevant authorities are required. This overemphasis on rigid compliance with geometrical requirements, and lack of flexibility thereof, may forgo the potential to implement more context-sensitive design in the public realm. The objective of context-sensitive design should, in turn, be established at an initial concept stage rather than be overridden by the later detailed design stage. The discourse on street design is often situated in an intertwining dualism. On the one hand, it is treated as a product concerning what infrastructure, facilities and amenities are to be constructed in the road environment and what qualities streets should possess. It is also seen as a process concerning how various actors, including government authorities, designers and engineers, and the general public, are or should be collaborating to the same end, i.e., collaborative design in a broader engineering sense (Belkadi et al., 2012; Belkadi et al., 2013; Blanco et al., 2017). In this vein, it is noteworthy that the public sector is influential for its power and resources in steering the construction of the public realm, of which streets constitute an integral part, under a masterplan or a national agenda that often transcends multiple disciplines. Hebbert (2005) states that the street design situation can be viewed as either an initial disagreement and gradual convergence of standardised street design as an engineering task, or, conversely, the nonstandard opposite as a community-oriented urbanism. Arising from this backdrop of paradigm shift are the following research questions: What qualities are envisaged and desired of streets? And, from a global perspective, how may the street design paradigm shift that is seen to have originated in North American and European regions diffuse into other regions, including developing countries?

In the US, the nonprofit organisation Smart Growth America promotes the implementation of “complete streets” policies, and continues to monitor relevant government policy documents within a ranking framework (SGA, 2018). Three essential attributes of Complete Streets policies—inclusive, diverse, and accountable—are

identified from US Complete Streets through scoring policy components including intent, core commitment, best practices and implementation (Seskin and McCann, 2012, 2013). The adoption of such policies for complete streets has been increasing at the state and municipal levels (Yusuf et al., 2016). However, geographic diffusion was found to be weak, and other research showed that policy prevalence was instead associated with demographic statistics such as population size and education level (Carlson et al., 2017). In addition, different qualities of wellbeing in US transport plans are found to be inconsistently addressed across cities as well as reflecting little attention to mental and social wellbeing compared with physical and economic wellbeing (Lee and Sener, 2016). Preceding complete streets, the concept of liveable streets had already emphasised the importance of the social dimension. The seminal Californian street study (Appleyard et al., 1982) identified adverse impacts of traffic volumes on social interaction among residents along a street. While these sociospatial constructs of streets appear compelling, some researchers have tested their applicability in other street types and geographical contexts, specifically in the developing world. Follow-up replication studies have found that living conditions were perceived to be better on heavy-traffic boulevards than on medium-traffic residential streets (Bosselmann et al., 1999), and in Hanoi's streets, that social interaction remained strong whether the traffic was heavy or light (Sanders et al., 2015). Despite the inherent context-sensitivity issue, the street design paradigms in Western countries may still reign supreme if local socio-economic and cultural factors were not given due consideration. In fact, Appleyard (1983) himself sternly warned against such uncritical adoption of street design guidance. Against the backdrop of this continuous intellectual export on street design, this study also aimed to examine potential shifting focuses of guiding principles from a global perspective.

Another potential detachment of street design guidance from local contexts lies in the legal domain. Street design is deeply entrenched in and influenced by traffic laws, statutes and rules. Legal documents of this sort define and describe various road users in disparate ways that are often characterised by the circumstances under which they have the right-of-way (which is either a general term referring to the space between road reserve lines or the right to proceed uninterruptedly). Alternatively, streets are framed within the presumed sole function of flow under strict definitions of space allocation, chiefly for motorists and pedestrians, whereas sparse attention further marginalises other mobile users such as bicyclists and motorcyclists (Prytherch, 2013; Prytherch and Daly,

2014). The hierarchy of movement and access nearly eliminates non-transport users who engage in various activities – recreational, commercial or cultural – from the status quo of urban life. In a legal geography study, this predominance is even observed in a close reading of a case law concerning the legitimacy of begging in streets in which the focus was not on the person, i.e., the panhandler, but rather on governing through use and space (Blomley, 2007). Such instances prompt regulators and practitioners alike to rethink the role of streets and how to respond to the reviving criticism of the seemingly recalcitrant design paradigm of traffic free flow.

3.2 Revisiting the tradition of street hierarchy

3.2.1 Street typology and neo-traditional street qualities

Much of the contestability of street design concerns with the fundamental question of what exactly a street is. This question brings to the fore the tension between transport and urban design. Amid rapid motorisation in modern societies, the conventional hierarchy of highways, whereby streets are viewed as a traffic engineering product, is easy to blame for the proliferation of mundane streetscapes and the loss of sense of place. In a quest to ascertain the root cause of such “disurban creation” plaguing the built environment worldwide, Marshall (2004) investigated the relationship between transport and urban design, focusing on two strands—the structural logic that applies to the transport network of circulation and access, and the design debate surrounding the roles of streets beyond mere movement channels. Marshall (2004) points out that the typical “arterial-collector-local” hierarchy adhered to by traffic engineers does not necessarily prevent the place functions from being activated on the footways and building frontage, which are essential components of streets from urban designers’ point of view. Rather, it is the alleged inverse relationship between link and place (e.g., that a street providing access to buildings is supposed to be local) that stifles creativity and constrains the variety of street types, such as neighborhood main streets. This street misclassification is also cited by Ewing (2002) as a culprit responsible for “pedestrian-unfriendly” streets and an impediment to context-sensitive street design. Acknowledging the inertia or path dependence of existing street design practices, Marshall (2004) went on to propose a street classification instrument constituted by two axes: One is the “arterial connection” which, while being sympathetic to the traditional road hierarchy based on vehicular traffic flows, relates to the topological connectivity rules at different arterial/local street designations; the other is an axis of urban place on

which a host of urban uses is accommodated. The decoupling, but not segregation, of traffic and activity has led to diversified street classification frameworks (Jones et al., 2007) and has inspired the institutionalisation of a “movement-place” matrix in *Streetscape Guidance* by London’s transport authority (TfL, 2016), along with similar initiatives in other cities.

3.2.2 Streets as public spaces

Amidst a rethinking of the role that streets and, by extension, public spaces play in people’s everyday lives, the new mobilities paradigm (Sheller and Urry, 2006; Cresswell, 2010), or the mobility turn (Hannam et al., 2006; Faist, 2013), calls for a more holistic approach to the variety of movement of people, goods, services and even ideas. Complementing the traffic function is the activity function, whereby the stillness of mobility (Cresswell, 2011) or an array of stationary activities such as sitting, lingering and casual encounters (Gehl and Svarre, 2013) contribute to urban vibrancy. Despite the self-professed novelty of this paradigm, the cross-disciplinary thinking with regard to streets and public spaces is essentially a call for the restoration of the human scale in the built environment (Ewing and Handy, 2009; Hansen, 2014; Park et al., 2019), which has been spurring street design reorientation.

The question of how to fit streets to the local context appears to be a common thread in the discourse on street design. Among studies on SDGs, Garrick and Wang (2005) conducted a systematic review following a four-step framework, namely, context, function, typology, and design details, and noted that the place function of streets has yet to be effectively addressed. In addition to providing recommendations for facility design for various road user groups, another common objective is to offer guidance on how to assess street performance. In another review following a framework of street functions consisting of movement, environment and place, Hui et al. (2017) stress that the applicability of performance measures for the complete street design process is subject to the local context. In addition, the line between streets and public spaces is becoming blurred by time-based use such as temporary road closure, transformation to prioritise pedestrians and enhance street quality, and even politically charged events (Hess et al., 2017). In an effort to decompose the multi-dimensionality of street value, Carmona et al. (2018) conducted pairwise comparisons of five improved and five unimproved streets across London and highlighted less tangible “knock-on” impacts of investment in the quality of streets, such as enhanced opportunities for social interaction.

While the inclusive formulation of the “value of design” can be attributed to the work by the Chartered Association of Building Engineers (CABE, 2007), the use of quantification techniques, such as hedonic or econometric modeling (Nase et al., 2015), is nonetheless indicative of the diffusion of the new mobilities paradigm into the cost-benefit analysis in policy decision making. However, Carmona et al. (2018) also point out the conceptual and practical challenges of such value-of-design studies, e.g., understanding place-based impacts and establishing causal links between intervention and impacts.

3.3 Materials and methods

3.3.1 Selection of street design guides

In the traditionally engineering-oriented field of street design, apart from quantitative traffic data, qualitative grey literature such as government reports and publications on alternative platforms is receiving growing academic interest to address cross-disciplinary public policy concerns. For example, a multiple correspondence analysis of national policies by European ministries on violence and injury prevention revealed differing priorities, ranging from road safety to other social issues (Parekh et al., 2015), and reiterated the importance of an evidence-based approach for policymaking. Past research also studied official documents regarding transport and innovation (Upham et al., 2013) and climate change (Walker et al., 2015). Textual analysis is useful not only for comparison across regions or organisations but also for observing paradigm shifts over time; for example, Hagenzieker et al. (2014) gleaned from the bibliometrics of road safety research a clear upward trend for, inter alia, themes pertinent to drivers, systems, policies and costs. These analyses of grey literature complement primary textual materials contributing to deepening a qualitative understanding of street design, such as interviews with residential and commercial developers (Guthrie and Fan, 2016) and focus groups of residents on car purchase decision-making (Hafner et al., 2017). Therefore, materials published by official or semi-official agencies, e.g., SDGs, can be considered a rich secondary resource for the purpose of gauging collective organisational stances at the urban and transport planning levels. In a broader sense, SDGs serve as a policy manifesto to achieve the objectives for a more holistic land transport system (Marsden and Reardon, 2017).

To allow for comparisons of aspired SDPs from a global perspective with those in Western countries with well-established street design guidance, the *Global Street Design*

Guide, published by the National Association of City Transportation Officials (NACTO, 2016) was selected as the base SDG because it is a representative document of street design guidance from an international perspective. Moreover, it was an outcome of collaboration not only with NACTO's member cities in the US but also a host of other cities in developed and developing countries. Other SDGs for comparison were selected based on three criteria: (1) Published by a relevant government agency, i.e., the transport authority; (2) Tactically positioned between the master planning stage and the detailed design stage, and differentiated from the latter, which is usually prescribed by civil design standards; (3) The city for which the SDG is intended has a population over half a million. While differences in the urban hierarchy and administrative boundaries may pose a technical difficulty in comparing urban populations, especially when the concept of greater metropolitan areas, e.g., the London Metropolitan Region, is commonplace and includes other municipalities and reflects interurban commute patterns (Dijkstra and Poelman, 2012), for the sampling purpose of this study, it sufficed to treat cities and greater metropolitan areas interchangeably. This material selection method differs from a recent study by Hui et al. (2017) in that a wider geographical coverage and singling out a globally oriented SDG enable inquiry into street design paradigms in the developed and the developing worlds. Table 3.1 lists the base and comparison SDGs selected, which consist of three sets: the US ($n = 9$), the UK ($n = 4$) and Australia ($n = 4$).

3.3.2 Street design principles

To extract a set of SDPs, or qualities envisaged by practitioners, an exploratory read was performed on the base SDG and an exemplar comparison SDG—*Streetscape Guidance* by Transport for London (TfL, 2016)—to ascertain their comprehensive coverage of street design matters. Subsequently, to determine text search strings, a preliminary list of SDPs (Table 3.2) was refined using the WordNet Search 3.1 online tool (Princeton University, 2010) so that the stemmed and associated words with respect to a certain SDP were included as appropriate. For example, the SDP of accessibility is defined in this study as the property of allowing for arrival at or movement in a street based on various users' demand, and similar words include convenient and handy.

Table 3.1 Selected street design guides (see Appendix B for thematic descriptions)

#	City	Population ⁽¹⁾	SDG Title	No. of words	Ref
S1	(Base)	-	Global Street Design Guide	94,862	(NACTO, 2016)
S2	Boston	617,594	Complete Streets Guidelines	69,953	(BTD, 2013)
S3	Charlotte	731,424	Urban Street Design Guidelines	53,558	(CCC, 2007)
S4	Chicago	2,695,598	Complete Streets Chicago	22,278	(CDoT, 2013)
S5	Dallas	1,197,816	Dallas Complete Streets Design Manual	58,552	(DCC, 2016)
S6	Louisville	597,337	Louisville Metro Complete Streets Manual	15,968	(LMC, 2007)
S7	Memphis	646,889	Complete Streets Project Delivery Manual	45,674	(MCC, 2015)
S8	New York City	8,175,133	Street Design Manual	56,450	(NYCDoT, 2015)
S9	San Diego	1,307,402	Street Design Manual	18,511	(SDMAC, 2002)
S10	San Francisco	805,235	San Francisco Better Streets Plan	103,127	(SFB, 2010)
S11	Birmingham	1,073,045	Streets for All: West Midlands	18,296	(BH, 2005)
S12	Glasgow	593,245	Designing Streets: A Policy Statement for Scotland	19,631	(TSG, 2010)
S13	Leeds	751,485	Street Design Guide: Leeds Local Development Framework	26,530	(LCC, 2009)
S14	London	8,173,941	Streetscape Guidance	80,006	(TfL, 2016)
S15	Adelaide	1,277,432	Adelaide Design Manual	43,801	(CoA, 2016)
S16	Brisbane	2,192,715	Centres Detail Design Manual ⁽²⁾	10,613	(BCC, 2013a)
S17	Gold Coast	624,263	Southport PDA Streetscape Design Guidelines	7,717	(CoGC, 2014)
S18	Sydney	4,446,805	Sydney Streets Code	21,205	(CoSC, 2013)

Notes: (1) Population information is sourced from the latest census data available: For American cities, based on the 2010 census, extracted from the table of annual estimates of the resident population by place, retrieved from <http://factfinder.census.gov>, United States Census Bureau; for British cities, based on the 2011 census, extracted from the table “KS101EW Usual resident population, local authorities in England and Wales”, retrieved from <http://webarchive.nationalarchives.gov.uk>, Office for National Statistics, and the table “KS101SC - Usual resident population”, retrieved from <http://www.scotlandscensus.gov.uk>, National Records of Scotland; for Australian cities, based on the 2016 census, extracted from the table “Persons – significant urban areas by sex”, retrieved from <http://www.abs.gov.au/websitedbs/D3310114.nsf/Home/2016%20TableBuilder>, Australian Bureau of Statistics. (2) The Centres Detail Design Manual was superseded by the Brisbane City Plan 2014 and attention to streetscape matters was redirected to codes and planning scheme policies in effect. However, the intent of the manual was reiterated as “to deliver footways which reflect the adjacent land use and the likely pedestrian traffic, provide vegetation for shade and add to the city's subtropical image, [and] are constructed and maintained to a consistent standard” (BCC 2014). In the absence of a similar document, the streetscape design-related parts – “Citywide streetscape hierarchy” and “Footway elements and materials” are extracted as the Brisbane SDG text.

Table 3.2 Definitions of street design principles

#	Principle	Definition
P1	Accessibility	The property of allowing for arrival at or movement in a street based on various users' demand (including service providers).
P2	Adaptability	The ability to be modified to fit changed circumstances or meet arising needs.
P3	Aesthetics	The quality of being conducive to appreciation of beauty and reinforcement of local identity.
P4	Comfort	The ability to offer satisfaction or physical wellbeing that is related to infrastructural and environmental conditions, e.g., ease of movement, availability of resting facilities, thermal pleasantness, protection from inclement weather, etc.
P5	Connectivity	The degree to which a street is directly connected to the desired destinations (points of interest or transit nodes) by means of road, railway or pedestrian footpath for all users based on demand.
P6	Ease of maintenance	The level of effort needed to maintain functionality in good order.
P7	Economic viability	The feasibility, usually in the event of implementing a new scheme, as to whether the benefits of traffic condition and business improvement outweigh the construction costs and other environmental and social costs.
P8	Inclusiveness	The ability to cater to the needs of all users including the elderly and the disable regardless of one's mobility capacity.
P9	Legibility	The property of a street whose structure in a transport system or local networks is easy to comprehend.
P10	Multi-modality	The property of being specifically designed to cater to more than one mode of transport besides automobile and active mobility at the street level.
P11	Perceptibility	The quality of being visible or audible; the ability to provide a clear unobstructed view or clear auditory signals where necessary.
P12	Reliability	The quality of being functional regardless of traffic demand or time of the day.
P13	Safety	The likelihood of road users being subjected to harm or loss in road traffic accidents.
P14	Seamlessness	The property of ensuring smooth and continuous journeys, especially among different street segments, with minimal obstruction.
P15	Security	The likelihood of road users being subjected to harm or loss in crime.
P16	Social interactivity	The quality of being conducive to interpersonal exchanges, i.e., in small groups or communities.

3.3.1 Word occurrences, co-occurrences and contextual coding

The SDGs were downloaded in PDF format and converted to Microsoft Word documents using online freeware. Only the text was retained, while quality control measures included deleting unnecessary repeated headers and footers and checking for spelling mistakes and punctuations such as hyphenation. Irrelevant parts in the SDGs such as acknowledgements were also excluded. The cleaned files were then imported into the NVivo 12 software. Word occurrences with regard to each SDG were obtained using the text query function. False matches such as words in different meanings (e.g., secure as a verb as opposed to a street quality) were excluded. The occurrence data were exported for further manipulation and analysis. Pearson's chi-square test was chosen to test for the difference of SDP frequencies among the base and comparison SDG sets. Meanwhile, the context of SDPs in terms of which road user group is in question, among others, was also coded in NVivo.

Co-occurrences were computed as the occurrence of two different SDPs within a 10-word spread (9 words before or after an occurrence). To calculate the relative strength of association among SDGs, the numbers of co-occurrences between SDPs were normalised and scaled with the following procedures (Bickel, 2017): First, the occurrences and co-occurrences were normalised by respective SDG size, and an arithmetic mean was calculated for each set. Scaling of the co-occurrences was then performed based on the smaller frequency in the SDP pair, which represents the percentage of which principle co-occurs with the other (adjusted by their source size and constrained by co-occurrence potential).

3.4 Results

3.4.1 Word occurrence results

The SDGs cover a full sweep of street design-related matters from vision of city building to a catalogue of design considerations and monitoring measures. With regard to the desired qualities that are either declared in or derived from SDGs, it is of interest to examine the counts of the SDPs and inquire into the differences across regions, i.e., which SDP is featured more frequently in one region than another. The SDP frequencies aggregated by country and normalised by source size are shown in Figure 3.1, with groups being arranged in decreasing order with respect to the base SDP. Furthermore, Pearson's chi-square tests for two-sample proportions were performed to test for the pairwise difference of SDP frequencies. Because of multiple comparisons of each SDP,

Figure 3.1 Frequencies of street design principles.

the p -values were adjusted using the Holm correction procedure. In the case of an expected frequency below 5, the Fisher's exact test was applied instead.

As expected, generally, *safety* is the most frequently mentioned SDP in the base SDG as well as in the comparison SDG sets. Notably, the SDP frequency of safety (42.7 times per 10,000 words) is substantially higher than both the rest of the SDPs and the comparison SDG sets, i.e., almost twice as frequent as the US set, with a difference of 22.4 ($p < 0.001$, 95% CI=[18.0, 26.7]), and the UK set, with a difference of 21.7 ($p < 0.001$, CI=[16.9, 26.4]). The second most frequent SDP in the base is *accessibility* (19.9 times per 10,000 words), which is significantly more frequent than the Australian set (diff=7.8, $p < 0.001$, 95% CI=[4.1, 11.5]) and the UK set (diff=4.8, $p = 0.011$, 95% CI=[1.3, 8.2]), and, albeit with a weakly significant p -value, also more frequent than the US set (diff=3.1, $p = 0.04$, 95% CI=[0.0, 6.1]). *Safety* and *accessibility* are arguably the SDPs of utmost universal importance, particularly for the motorised transport modes for which the optimisation of transport network with regard to circulation and access still holds sway. Next is *comfort*, with a different pattern of inter-regional variability where the frequency is significantly greater than those of the US and the UK sets, but there is no significant difference with the Australian set ($p = 0.625$). *Ease of maintenance* ranks fourth, with no significant difference compared with the Australian set ($p = 0.831$), whereas comparisons with the other two sets occur in reverse, showing lower frequencies in the base SDG. *Perceptibility*, herein a composite concept of visibility and audibility, showed a relatively high frequency in the base SDG, although significantly

less than the UK set (diff=-4.6, $p=0.001$, 95% CI=[-7.1, -2.1]). This occurrence is indicative of the trend that universal design (e.g., elements such as tactile paving and audible signals at junctions) should be more thoroughly implemented in the public realm. More specifically, tactile paving in London has four types, more than the typical two-type blister-or-stripe system, and the London SDG (TfL, 2016) sets aside substantial space for its description and good practices. Remarkably, the frequency of *adaptability* in the Australian set is much higher than in the base SDG (diff=-11.1, $p<0.001$, 95% CI = [-14.0, -8.2]). Explicit mentions of social interactivity are almost non-existent but the introduction of the urban place dimension into street typologies in effect supports this notion, which will be further discussed after the subsection on co-occurrence.

3.4.2 Word co-occurrence results

The SDP co-occurrence results are illustrated in Figure 3.2 as circular network visualisations of the relative strength of association. To account for high co-occurrences as a result of low occurrences by chance, the values of co-occurrence where either SDP has a count less than 20 were excluded. Small values below 1% were also excluded. Across all the SDGs, the co-occurrence values range from 1.1% to 62.8%. For example, the highest co-occurrence value occurred in the base SDG between *accessibility* and *inclusiveness*, indicating that 62.8% of the occurrences of inclusiveness, which is the less frequent in the SDP pair, co-occur with accessibility. Given the empirical range, these trimmed values are divided into three bands: strong ($\geq 40\%$), medium (20%–40%), and weak ($<20\%$). There are instances of a majority of SDPs appearing in close proximity to one another rather than in separate sections, which exemplifies the interconnections of SDPs as a key characteristic of desirable streets and urban layouts. The relative order holds both in the respective set and when compared with a different set.

The base SDG, despite its smaller size compared with the other three sets, shows a dense network of interrelated SDPs (Figure 3.2 top-left). The SDPs with a strong association are accessibility and inclusiveness (62.8%) and safety and comfort (40.5%). Stressing these SDPs throughout, the base SDG advocates street design that, through retrofitting street networks, encourages shifts of mobility mode share and prioritises “safe, accessible, efficient, and comfortable walking, cycling, and collective transport over private car use” (NACTO, 2016, p.62). The growing recognition of pedestrian needs is prevalent in the emphasis on sidewalks as public spaces that activate streets socially and

Figure 3.2 Network visualisation of the empirically derived relative strength of associations among street design principles.

economically and are “a fundamental and necessary investment for cities” (NACTO, 2016, p.78). The SDPs with a medium association relate to safety and, at the other end, legibility (31.0%), multi-modality (27.3%), economic viability (27.0%) and reliability (25.9%).

The US set shows a similar co-occurrence pattern to the base SDG, sharing a common SDP link with a strong association – accessibility and inclusiveness (40.0%). In addition, SDPs with a medium association include safety and comfort (32.4%), safety and security (29.5%), and security and comfort (26.0%). Again, the prioritisation of pedestrians can be seen in overarching statements in the street design agenda, for example, “[s]treets are

designed for pedestrians of all ages and abilities, bicyclists, transit users and motor vehicle drivers. Multimodal designs ensure Boston's streets are safe and shared comfortably by all users" (BTD, 2013, p.xiii); "To encourage people to linger, sidewalks need to be safe, comfortable, and attractive, with facilities that provide accommodations for people of all ages and abilities" (BTD, 2013, p.18).

The UK set has only one SDP link with a medium association – safety and security (21.5%). In contrast, the Australian set shows a much sparser network, which may be because it, unlike the other sets, has fewer SDP mentions. The SDP links with a medium association in the Australian set are safety and comfort (32.2%), safety and inclusiveness (22.3%) and safety and legibility (32.8%). Safety and comfort are presented as the key street qualities from the perspective of pedestrians and are applicable across street types, including those that are conventionally vehicle-oriented (CoA, 2016). Furthermore, safety and security, which usually refer to road safety and personal or asset security, are strongly associated with each other—a commonality across the base and comparison sets. The relationship between security and street design is demonstrated in this example: "The built environment ... is a crucial factor to how safe and secure people feel within their community. However, planning out crime can only work if it is part of a wider strategy incorporating other measures such as regeneration, community involvement and town centre management" (LCC, 2009, p.70).

3.5 Discussion

3.5.1 Inclusiveness of mobility capacity

The strongest association observed in the SDP co-occurrences is between accessibility and inclusiveness in the base and the US set (Figure 3.2). With an emphasis on human scale that is not based solely on the able-bodied average pedestrians but also takes into account vulnerable users such as seniors, children and people with disabilities, NACTO (2016) advocates street furniture design to accommodate universal accessibility in addition to typical mandatory street elements such as pedestrian ramps. Specific vulnerable user groups are usually mentioned in the SDGs regarding specific facilities or traffic schemes, such as school zones where high-visibility crossing markings are used to raise motorists' awareness of the presence of pupils, or tactile paving that gives the visually impaired directional and warning cues. However, there remains the problem of how to better integrate universal design elements such as tactile paving into the streetscape at, for example, cultural heritage sites (Lauria, 2017). This is on top of the

growing challenge of space sharing between people and traffic (Hamilton-Baillie, 2008). While the conversion of Exhibition Road is an exemplary shared-space scheme that not only reduces vehicle-pedestrian conflicts (Kaparias et al., 2015) but also ensures universal accessibility in a flexible manner, e.g., the context-sensitive redesign of tactile paving (TfL, 2013), the framing of recently completed schemes of street improvement in London still shares a strong focus on the accommodation of non-motorised modes such as walking and cycling (TfL, 2013, 2017).

The provision for universal accessibility is usually feature-based as described in SDGs, centred on specific barrier-free design features such as pedestrian ramps, kerb cuts, wide walkways, tactile paving and accessible pedestrian signals (with audible tones or verbal messages), and is sometimes simply reduced to a simple reference to standards such as Americans with Disabilities Act. To fulfil the tactical niche of SDGs between master planning and detailed design, better clarification of transport modes is required, for which Marshall's (2004) "modegram" is useful. The spectrum of motorised versus non-motorised transport and the spectrum of solo versus collective combine to form a space of transport mode space that puts solo non-motorised modes such as wheelchairs and shoppers' trolleys in the same context as solo motorised and collective motorised modes. In this light, the base SDG uses speeds and operational envelopes as the determinate attributes of transport modes, according to which, for example, adults, seniors, children, wheelchair users and other person-device variations at walking speeds all fall under the category of pedestrians (NACTO, 2016, p.72). This conversion of mobility capacity into transport modes, whether due to physical disabilities or temporary situations such as carrying a heavy suitcase, is instrumental for rethinking inclusive street design in which universal accessibility is operationalised in space allocation instead of the premature application of standardised barrier-free provision, which may hinder creativity and innovation for other SDPs.

3.5.2 Incorporating traffic conduits and urban places in streets

With respect to the duality of streets as both traffic conduits and urban places, the SDPs surveyed can be loosely divided into two groups. The first is traditional SDPs, which are more compatible with transport planning and traffic engineering and include safety, accessibility, ease of maintenance and economic viability, the first three of which ranked within the top four frequently mentioned in the SDGs. The rest can be grouped as neo-traditional SDPs, which are oriented towards pedestrians and other slow and usually

non-motorised transport modes and which are mostly absent from highway design guidance and standards. Furthermore, when their co-occurrences are in question, the SDPs present an intricate network that may suggest a strong association of desired street qualities that “reflect the degree of cognitive entrenchment of particular words” (Gries, 2008) and thus are likely to be collectively addressed and improved in street-related projects and schemes. The higher degree of interconnectedness observed in the base SDG can be partly explained by the relative disentanglement from the existing civil design codes of a specific city, which in turn enables discussions about an ambitious street design agenda aiming to transfer proficiency and know-how, mainly from the developed world to the developing world, and encourage two-way exchanges among practitioners and stakeholders.

The aspired predominance of pedestrians in streets can be seen in, for example, the subdivision of the footway cross-section into frontage zones, clear paths, street furniture and/or buffer zones (NACTO, 2016). Although the SDGs mostly regard pedestrian priority as equal to other transport modes, there are extreme statements in Chicago’s and Leeds’ SDGs that pedestrians should have utmost priority over all other transport modes, including cycling and public transport (LCC, 2009, p.3; CDoT, 2013, p.5). However, this prioritisation falls short of comprehensive design guidance for pedestrian-friendly street types to justify it, as these two SDGs are relatively brief, and discussions are presented at more of a conceptual rather than a tactical level.

The aforementioned categorisation of traditional and neo-traditional SDPs can be further differentiated by the notions of composition and configuration (Marshall, 2004). Take accessibility and connectivity for instance. Accessibility is largely a geometric compositional property, described by values such as widths and gradients, whereas connectivity is a topological configurational property, conceived in relation to other streets and destinations. The finding that the frequency of accessibility is much higher than that of connectivity (Figure 3.1) is an indication of the SDGs’ focus on the prescription of individual street segments rather than guidance for a street network that constitutes the “bone structure” of the built environment.

The relaxation of the inverse relationship between traffic and access (Marshall, 2004) opens up a finer-graded matrix of link functions and place functions, enabling neo-traditional SDPs such as comfort, adaptability and legibility. This relaxed relationship also leads to the diversification of street typologies based on which SDGs are organised.

For example, Chicago SDG's street typology consists of six traffic capacity levels, from thoroughfare to pedestrian passageway, and seven land uses, including mixed-use and industrial use, which facilitates "the selection of treatments which best reflect the surrounding environment, best accommodate all modes, best reflect regulatory strictures, and best affect desired outcomes: complete streets" (CDoT, 2013, p.27).

Celebration of complete streets is a common thread running through the US SDG set. Taken as project deliverables that are professed to achieve a broad range of outcomes, complete streets (or their equivalents in other countries) are characterised by pedestrian- and cyclist-friendly provisions (e.g., sidewalks, bike lanes) and accompanying modifications (e.g., narrowed car lanes). From an economic viability perspective, these provisions and modifications were found to incur marginal project costs (Shapard and Cole, 2013). However, preferences for pedestrian-friendly neighbourhoods are fundamentally situated within socioeconomic and political contexts, which directs research from the perspective of subgroups of the population occupying a niche in the urban planning and community stewardship processes. One example is a focus group study with residents' groups operating in Southampton, UK, that have diverse demographic characteristics, from which preferences for walkability and social interactivity have transpired (Brookfield, 2017). This local-context sensitivity is of particular relevance in cities in developing countries where street-based schemes to tackle transport and urban problems may still be at a nascent stage but there are already streets that function as de facto complete or liveable streets. Therefore, as Shamsuddin and Ujang (2008) stress that the physical elements and street life inseparably sustain traditional streets as urban places, it is key to contextualise the diverse SDPs, which arise from a more flexible street typology, with respect to the lineage of urban development and local social norms.

Besides traffic conduits and urban places, a third dimension of streets, albeit not the focus of this study, was identified which was infrastructure. The spike in the frequency of SDP *adaptability* in the Australian set (Figure 3.1) is due to the frequent references to the Water Sensitive Urban Design scheme, mainly in the Adelaide and Brisbane SDGs. This scheme prescribes the integration of water-related features such as permeable pavers, verge gardens and bioswales in the streetscape. Entailing use of underground space, there is further scope in integrating different infrastructural components such as water, utility, electricity and telecommunications, and moreover, decentralising their

supply (Derrible, 2017). One challenge would be a deeper degree of cooperation among public agencies, which can still be an issue in both developed and developing countries; however, the need to upgrade any of the infrastructural components could mean an opportunity to enhance others through project integration. In this light, further research is needed to identify ways of incorporating the SDPs in other civil engineering domains that are seemingly insular to urban places.

3.6 Chapter summary

Framed in a comparative narrative between street design in the developed and developing worlds, this study set out to explore the envisaged street qualities using SDGs, which are tactically situated between the upstream stage of transport planning and the downstream stage of detailed design. The *Global Street Design Guide* was selected as the base SDG, which is conceived in this study as a worldwide trendsetter of street design and allows for comparison with the SDGs in the advanced economies. Nine SDGs published by major cities in the US, four in the UK and four in Australia were selected to form three comparison SDG sets. Using predefined text search strings, the occurrences of and co-occurrences among a set of 16 SDPs were surveyed and analysed. Occurrence results showed a prevailing frequency of traditional SDPs such as safety and accessibility, particularly in the base SDG, as well as a plethora of neo-traditional SDPs such as comfort, adaptability and inclusiveness. Co-occurrence results further showed an intricate connectedness among the SDPs with varying degrees of association. The strongest association occurred between accessibility and inclusiveness in the base SDG, which is indicative of a global trend of implementing complete-street or inclusive-street policies to cater for people of all mobility capacities. While explicit mentions of social interactivity, which is a key aspect of streets from an urban design perspective, were rare, further examination of street typologies introduced in the SDGs confirmed the aspirations in street design through the integration of traffic conduits and urban places. This characteristic led to another key finding of this study: The diversification of street types is both compatible with existing road hierarchies and conducive for activity uses in a more liveable built environment. This finding informs a street paradigm in which traditional and neo-traditional SDPs can be realised concurrently and will help generate a virtuous cycle of design innovation and institutionalising such flexibility in street design.

One apparent limitation to this study is the sourcing of only English-language SDGs from three countries. Similar analysis can be performed focusing on individual cities or in other regions such as Asia to further study local street design agendas with regard to desired street qualities. While the diffusion of new street paradigms was addressed by the prevalence of traditional and neo-traditional SDPs in tactical SDGs and it is beyond the scope of this study to comprehensively examine their local interpretations and implementations, geographical and sociopolitical contexts are nonetheless crucial factors that affect how the street design agenda is put into practice. In his built environmental typology study, Wheeler (2015) attributed the differences between cities partly to the strength of public sector intervention, i.e., a more *laissez-faire* public sector in the US and Australia versus a stronger one in the UK. Even under the same rubric of complete or inclusive streets, the contents, or from a policy mobility viewpoint, the actual pathways of public policy learning (Peck and Theodore, 2010), are likely to vary significantly from city to city. It is thus worthwhile to further investigate how the wide range of SDPs has been localised and operationalised at a city level, noting the social phenomenon of city inter-referencing where a city is referred to as an exemplar to emulate or as a practical model to draw specific policy reference from (Bunnell, 2015). This notion appears in disagreement with Appleyard's (1983) objection to haphazard street design imitations, but they may well complement each other in that city inter-referencing acts tactically while detailed street design acts operationally. The latter can also manifest itself in what stands opposite city inter-referencing, or "anti-referencing", as can be seen in, for example, the increasing dissonance of whether cycling cities such as Copenhagen are valid examples for cities of a tropical climate (CLC and ULI, 2014). In addition, as another direction for further research, the legal system, when the issue of tort liability arises from traffic accidents, may also play an important role in the willingness across public and private sectors to adopt unconventional street design schemes. Although the degree to which street design decisions are held responsible depends on the local legislature and although legal legacies such as sovereign immunity in the US to some extent still work to protect civil servants from such tort liability (Ewing, 2002), further research can be conducted with respect to the perceived legal threat, perhaps in the guise of safety and accessibility enhancement, and how it may be contributing to the conservative mentality prevalent in traffic engineering-dominated street design.

Finally, with Singapore's recent multi-agency publication of *Walking and Cycling Design Guide* (LTA and URA, 2018), a comparison of Singapore's equivalent street design guide with those reviewed in this chapter is provided in Appendix B, in terms of how the needs of various street users are addressed by user-specific provisions and management practices. Notably, the guide addresses the experiential, rather than merely utilitarian, aspect of active mobility (i.e., walking and cycling) upfront, thereby setting a place-oriented keynote for street design. More specifically, in response to the mobility-activity street design paradigm, more attention is needed for the effects on pedestrian experiences of alternative routes that transcend boundaries (e.g., cadastral lines and road reserve lines), which have profound implications for the organisation of spatial elements but bear little relevance in everyday travel behaviour.

Chapter 4. Public questionnaire survey on inclusive street dimensions

A journal article based on this chapter is published¹ as Wang, Y., Wong, Y. D., & Goh, K. (2019). “Perceived importance of inclusive street dimensions: A public questionnaire survey from a visioning perspective.” *Transportation*. <https://doi.org/10.1007/s11116-019-10071-1>

4.1 Introduction

In the midst of the new mobilities paradigm (Sheller and Urry, 2006) and a series of technological advances and disruptions in urban transport, a new approach to defining streets by both transport infrastructure and public space functions, or a new vision of the built environment, is emerging. Street design is undergoing a paradigm shift from meeting motorisation needs through the optimisation of vehicular traffic capacity to the support of softer users, such as pedestrians and cyclists, in a multi-modal and socio-functional framework (Kingsbury et al., 2011). The paradigm shift reiterates the place function of streets, which serve not only utilitarian transport purposes but also as a physical setting for public life that involves a variety of other stationary and physical activities (Gehl and Svarre, 2013). One manifestation of this trend is the diffusion of complete streets policies in the American context (Yusuf et al., 2016; Carlson et al., 2017; Hui et al., 2017) and the increasing implementation of traffic calming or shared space schemes worldwide (Hamilton-Baillie, 2008; Karndacharuk et al., 2014; Kaparias et al., 2015). The task of reinstating social interactivity in streets therefore requires a broader view of the built environment in terms of the degree to which streets are integrated into the areas of people’s everyday activities. The subsequent rethinking of street design is represented by a movement-place typology for street classification (Jones et al., 2007; TfL, 2019) in which traffic and activity functions conceptually carry equivalent importance.

In Singapore, recent land transport development has been spearheaded by the Land Transport Authority, which was established through a merger of several government bodies in 1996, and in the next year published a white paper (LTA, 1996; Lew and Choi, 2016) presenting a vision of public transport and land use integration. Under this long-term concept plan, the latest medium-term Land Transport Master Plan (LTA, 2013), with a horizon year of 2030, proposed a “people-centred land transport system” based

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on three pillars: better service, more connections, and a liveable and inclusive community. Contributing to the public discourse surrounding the theme of incorporating inclusive transport into community building is a series of reports published by the Centre for Liveable Cities, a government think tank, in an effort to raise public awareness and increase academic exchanges regarding active mobility (CLC and ULI, 2014; CLC and SI, 2016) and a “car-lite” society (CLC and ULI, 2016a, b). The Land Transport Master Plan for 2040, at the time of writing, has begun its public consultation process and re-emphasises inclusiveness in terms of alternative transport modes and diverse user groups (LTA, 2018a). In practice, drastic changes continue to take place—dockless bicycle sharing systems, personal mobility devices (PMDs), ride-hailing and carpooling services—all reshaping mobility patterns and prompting a rethinking of street design.

In line with the global trend, inclusiveness is gaining traction in the discourse of street design and has begun to be featured in Singapore’s government agencies and media. A shared vision (Senge, 1990; Ache, 2000) of inclusive street design is critical for sustainable urban and transport planning as one of the initial steps of a wider participatory regime of civic engagement. In this study, we focus on the physical aspect of inclusive streets, and upon dissecting what constitutes inclusive streets at a conceptual level, aim to solicit attitudes from the public regarding the constituent dimensions. The guiding definition of an inclusive street is a street that is designed for all users, including pedestrians, cyclists, PMD users and people engaging in activities, as well as for people with various mobility abilities, including the elderly, children, and people with disabilities. In the remainder of this chapter, Section 4.2 contains a brief literature review on street design framed in the context of visioning, both as a product and as a process, as well as planning and public consultation, followed by a description of the data collection and analysis methods in Section 4.3. The questionnaire survey results are presented and analysed in Section 4.4. Section 4.5 delves into discussions of the observed differences in perception in recent cases of street transformation and incremental redesign that have taken place in Singapore. Section 4.6 concludes with the relevance and limitations of this study as well as future research directions.

4.2 Literature review

4.2.1 Inclusive streets decomposed and reassembled

The physical dimension of streets has received fine-grained attention through the development and validation of street audit instruments to measure walkability and to

investigate the relationship of walkability to physical activity and public health. Among the widely used instruments are the Microscale Audit of Pedestrian Streetscapes (MAPS) (Millstein et al., 2013) and the Irvine Minnesota Inventory (IMI) (Boarnet et al., 2006; Day et al., 2006) provided by the US programme Active Living Research². For example, the MAPS contains over 170 audit items, ranging from infrastructure for motorists and pedestrians to crossing facilities, amenities (such as benches or covered shelters) and a variety of roadside land uses (Geremia and Cain, 2016). The microscopic characterisation of streets can be seen as a specific application of the ecological approach (Sallis et al., 2006; Mehta, 2014) that, while taking into account intra-personal, inter-personal and organisational factors, emphasises built environmental effects on active transport behaviour. The individual street audit items, which are either objectively recorded or subjectively evaluated by surveyors, then feed into a scoring scheme for computing a composite index of street inclusiveness that is typically derived from the ratings of stakeholders and experts in the transport and urban planning fields (Pikora et al., 2003). Alternatively, the numbers of positive or negative items grouped in various categories are commonly used in regression analyses to identify the correlates of active transport and physical activity (Bauman et al., 2002; Cain et al., 2017) and in multi-criteria decision analyses to identify which street segments to prioritise for government-led improvement programmes (Marleau Donais et al., 2019).

However, notably overlooked in such technically rational approaches is how the formulation, or vision, of inclusive streets is viewed by the general public upstream in planning processes at a conceptual level. This brings up the procedural aspect of street design, which is interrelated with the product aspect. The next literature review section discusses the practice of visioning and its implications in street design before putting forward the integrated notion of vision and visioning for inclusive streets.

4.2.2 Collaborative visioning and planning

Vision, or the practice of visioning, is a popular term used in the planning literature and practice, but its usage is highly variable, according to Shipley and Newkirk (1999), in terms of whether it is substantive or procedural, literal or metaphoric and whether it engenders collective or individual action. In the realm of public policymaking, van der Helm (2009) characterises vision as a combination of political, business, community and

² Active Living Research. "Tools and Measures."
<https://www.activelivingresearch.org/toolsandresources/toolsandmeasures>

humanistic elements and argues that its guiding power is both ideational (stimulating thinking) and indicative of transformational change, either proactive or reactive. In the latter case of reactive changes, although vision is invariably focused on the future, undesirable or unexpected contextual changes can occur, and vision is often used in textual or visual ways as an evocative response to such changes (van der Helm, 2009).

Notably, abstention from using imagery in strategic planning is becoming common on the grounds that images mask uncertain prospects (Woodcock et al., 2012). Ideally, as in Wiek and Iwaniec's (2014) review of visioning studies that have a focus on sustainability or sustainable development, visions or visioning should display ten qualities along three axes, namely, normative (visionary, sustainable); construct (systemic, coherent, plausible, tangible); and transformational (relevant, nuanced, motivational, shared). However, the theoretical foundation on which the presumed efficacy of government-led visioning initiatives rests has been criticised. For example, Shipley (2002) notes the dubious cause-and-effect relationship between vision and action and the skill gap between creating and communicating future images.

Master plans and vision statements are key instruments of urban and transport planning, which traditionally falls within the remit of government agencies that rely on in-house resources and expertise but are increasingly open to citizen participation and collaboration. Following Arnstein's (2019 [1969]) popularised metaphor of a ladder of citizen participation, the growing ethos of incorporating public feedback and community aspirations as early as possible is in fact, as some authors argue, internally beneficial for making better-informed decisions (Healey, 2009) and externally responsive to a diverse citizenry (Lowndes et al., 2001b, a). When this movement is driven by exigency to move beyond patching the knowledge deficit via the unilateral provision of knowledge (Tàbara et al., 2017), it catalyses an engaging and participatory *modus operandi*, of which the first procedural element is usually collaborative visioning for the joint production of knowledge. A deliberative and interactive decision-making process in public policy, subject to institutional constraints, may improve equity and fairness in the representation of disadvantaged social groups (Bickerstaff et al., 2002) and in the power relations between professionals and laypersons (Bickerstaff and Walker, 2005).

Other scholars have advocated bottom-up participation as a complementary social element in the usually technocratic planning and design stages of urban projects with high stakes related to residents' quality of life, e.g., waterfront restoration (Eden and

Tunstall, 2006; Gregory and Brierley, 2010). With communicative rationality as a theoretical cornerstone (Habermas, 1984; Tewdwr-Jones and Allmendinger, 1998), visioning usually serves as a primer for subsequent collaborative urban planning efforts. However, in strategic urban planning by means of zoning, collaborative visioning is more widely used in the planning of large-scale developments in which the private sector, e.g., the consultant designated as the master planner, wields great clout in “the production of urban geographies” (McCann, 2001). This emerging trend of corporatisation in visioning and public consultation implies that the ideal of citizen empowerment may be co-opted by market-driven interests (Roy, 2015), which carry commercial and political implications for the utopian-sounding vision of inclusive streets.

4.2.3 Inclusive street vision(ing)

The interrelated aspects of visions of, and visioning for, inclusive streets transcend the boundaries of road reserves and extend into land use, which corresponds to the movement-place duality of street functions and counters the rigid preconception of space segregation between traffic and activity. A visioning exercise among academics and professionals about the topic of walking and cycling in British urban areas culminated in three visions (Tight et al., 2011): “European best practice”, “a car-free public transport-oriented future”, and “a localised energy-efficient future” with varying infrastructure requirements and operational targets of modal split and land use patterns, e.g., localised versus centralised. Buildings, usually those that make a strong architectural statement in new developments, are championed as urban landmarks, while adjoining streets are relegated to a peripheral role, not least in allowing traffic throughput and providing building access. In a community foresight initiative led by Eames and Egmore (2011), the themes that emerged from the collaborative visioning activities include crime and safety and shopping and local services and streets were one implicit venue, as could be inferred from references to crime in streets or shopping in streets. The focus on the utilitarian engineering aspect of street design is a by-product of the rigidity of civil design standards (Hess, 2009), even though tenets of traffic safety and efficiency, which are predominantly vehicular and motorised concepts, do not preclude the promotion of alternative uses by design. As Doi et al. (2016) demonstrate, lower vehicle travel speeds and better neighbourhood walkability contribute to fewer traffic fatalities in densely built urban environments.

The growing comprehensiveness and interrelatedness of such constituent elements that cater to both mobile and stationary street uses suggest a multifaceted image that is associated with inclusive streets. However, research is still lacking on how people weigh street qualities against one another at a conceptual level, which can be contextualised in the broader context of visioning. The next section details the questionnaire development and administration of the questionnaire as an initial effort to gauge ground perception.

4.3 Methods

4.3.1 Dimensions of inclusive street design

The compilation and determination of inclusive street dimensions was the first part of a joint research project driven by the intent to balance both transport (Lowry et al., 2008) and land use elements, which are equally important for urban liveability. Go-along interviews were conducted with local residents to ascertain the range of views regarding streets and mobility needs. In large part informed by street auditing tools (Boarnet et al., 2006; Day et al., 2006; Millstein et al., 2013) and recent guidelines that adopt an inclusive street design concept (NACTO, 2016; TfL, 2016), six dimensions pertinent to inclusive street design are summarised in Table 4.1, which was in part based on Table 3.2. Although Singapore is the intended context, the generic dimensions are believed to be easily applicable to other regions.

Accessibility, when specifically intended for people with physical disabilities, though it often benefits users universally, is usually mandated in building- and transport-related codes and regulations. This aspect is of increasing relevance, as social exclusion due to reduced mobility and the often-overlooked transport needs of the disabled are being researched in more depth (Bjerkan and Øvstedal, 2018).

Streetscape can be viewed in a macroscopic or a microscopic sense. The former relates to the urban form in which a street segment is situated, and urban metrics such as street widths, building heights and setbacks are used to quantitatively characterise the “look and feel”. From a microscopic lens, the furniture and amenities that populate a street are thought to functionally influence liveability in addition to fostering an image or urban character that is accentuated in the streetscape (Mahmoudi et al., 2015). Urban vibrancy as a result of development intensification, e.g., building bulk and height, receives mixed reactions from Australian residents (Woodcock et al., 2012) but is a norm in Singapore. These dimensions are not exclusive of one another; in fact, a recent study (Arranz-López

et al., 2017) examines urban metrics of accessibility zones and retail zones as contributors to urban vibrancy.

Table 4.1 Definitions and subcategories of inclusive street design dimensions

Dimension	Description	Subcategory
Accessibility	The property of allowing for arrival at or movement in streets and their associated transit nodes based on various users' needs, including the maintenance condition	<ul style="list-style-type: none"> • Roads, transit nodes • Car parking provision • Walking paths • Cycling paths • Bicycle parking provision • Universal design
Connectivity	The degree to which a street is directly connected to the desired destinations	<ul style="list-style-type: none"> • Junctions • Pedestrian/cyclist crossings • Alternative routes • Access to destinations • Signage and markings • Free of obstruction
Streetscape	The view and scale of a street and the placement of physical elements that contribute to an amiable environment	<ul style="list-style-type: none"> • Seating • Amenities • Building exteriors • Heritage and hard landscaping • Views of natural features • Free of disorder
Safety and security	The low likelihood of users being subjected to harm or loss in traffic accidents or crime	<ul style="list-style-type: none"> • Traffic calming • Buffer and separation • Sight lines and lighting • Signals for traffic control • Free of trip hazards • Surveillance
Urban vibrancy	The intensity of human activity that enlivens urban areas	<ul style="list-style-type: none"> • Residential destinations • Commercial destinations • Destinations of other land uses • Non-mobility activities in streets • Public space other than streets • Free of undesirable land use
Greenery	Foliage or plants in various configurations along a street	<ul style="list-style-type: none"> • Trees • Soft landscaping • Vertical greening

4.3.1 Questionnaire design and data collection

The questionnaire survey presented a statement that inclusive streets are streets that are designed for all users, including pedestrians, cyclists, personal mobility device users and people engaging in activities, and for people with various mobility abilities, including the elderly, children, and people with disabilities. The aim was to discover among members of the general public the relative importance of the six dimensions pertinent to inclusive street design, each of which was rated on a seven-point categorical scale from “not important at all” through the middle point, “average”, to “extremely important”.

Numeric labels from 1 to 7 were not assigned until the data input step. The second part of the questionnaire collected respondents' characteristics, including gender, age (divided into six groups) and habitual transport modes, defined as the modes used by the respondent at least once a day, two days per week. The transport modes included car as a driver; car as a passenger; bus; train, including mass rapid transit (MRT) and light rail transit (LRT); and bicycle and personal mobility device (PMD), such as electric scooters with and without a seat. Walking was not included as a transport mode since a dichotomous choice would result in no variation where all respondents were assumed to be pedestrians.

While its purpose was to gauge the relative perceived importance of various general aspects of street inclusiveness, the paper-and-pen questionnaire survey was conducted using a street-intercept method in nine areas so that a broad geographical spread across Singapore would enable access to different demographic segments (Figure 4.1). The surveyors were instructed to randomly approach respondents, excluding children and tourists, at locations in public spaces with high pedestrian traffic, such as pedestrian footpaths, MRT stations, bus stops or hawker centres. When intercepted, the respondent was shown an information sheet on which the example subcategories (Table 4.1) were listed next to the dimensions. To enhance the sample representativeness, the Eunos area, for instance, was included on the grounds that several eldercare centres are located near the MRT station, which made it easier to intercept the elderly. During July 2018, 929 responses were collected, of which 816 were complete and were used in the data analysis. The sample characteristics are summarised in Table 4.2. Approximately half of the respondents were male (53%), and most respondents were in their twenties (29%) and thirties (28%). A majority reported regular use of public transport, namely, bus (73%) and train (75%), while use of cars as a driver (23%) or as a passenger (39%) also accounted for a substantial portion. Although motorcycles were originally not listed in the questionnaire, a few respondents reported this mode under the "other" option; thus, motorcycles were coded as a separate transport mode.

Figure 4.1 Questionnaire survey areas in Singapore and sample sizes.

Table 4.2 Summary of respondent characteristics (n = 816).

		Count (%)		Count (%)	
Gender	Female	384	(47%)	Mode	Car as a driver (yes)
	Male	432	(53%)		(no)
Age (yr)	<20	148	(18%)	Car as a passenger	316
	20-29	234	(29%)		(39%)
	30-39	230	(28%)	Bus	594
	40-49	113	(14%)		(73%)
	50-59	51	(6%)	Train	610
	>=60	40	(5%)		(75%)
				Bicycle	206
					(25%)
				PMD	129
					(16%)
				Motorcycle	687
					(84%)
					52
					(6%)
					764
					(94%)
					10
					(1%)
					806
					(99%)

4.3.2 Data analysis

To obtain an overview of the associations and differences in the ratings among the six dimensions, bivariate correlations were first calculated, and the non-parametric

Wilcoxon signed-rank test was conducted on the rating pairs. Next, with the respondent characteristics taken into account, the multivariate canonical correlation analysis was conducted to determine the association between two sets of data that are usually numeric since the analysis is based on assumptions of multivariate normality and equal variance-covariance matrices. However, in the case of categorical data, as in this study, a generalised version would be required. Therefore, the categorical canonical correlation analysis described by Gifi (1990) and performed in a transport context (Golob, 1986; Golob and Recker, 2004) is a suitable alternative that can be considered a special case of homogeneity analysis. In a two-set formulation for which a classical canonical correlation analysis is a special case (van de Velden, 2011), this approach involves optimal scaling, which uses an indicator matrix to transform the categorical data to category scores in a non-linear manner and employs an alternating least squares algorithm that alternates between updating the category quantifications and weights, which combine to determine the category scores, and the object scores until the iterations minimise a loss function, similar to maximising the correlation between two sets in an ordinary canonical correlation analysis. In terms of category quantification, when treated as a single nominal, the variable uses only one non-linear transformation, whereas a multiple nominal variable has more than one and up to $p-1$, where p is the rank of the indicator matrix of the variable (van der Burg et al., 1994). One advantage of this approach is the convenience of graphically examining the entire multidimensional dataset after reducing the dimensionality and usually producing two-dimensional plots. The Gifi method was implemented by the “homals” package on the R platform (de Leeuw and Mair, 2009). Then, the set of respondent ratings and the set of respondent characteristics were scaled simultaneously and plotted (see the next section). Similar to Deutsch and Berényi’s (2018) questionnaire survey of the perceived importance of sustainability-related factors, an inspection of potential clustering and high leverage among the levels of the ordinal or nominal variables was performed before the individual regression analysis proceeded.

Given the discrete nature of the variables (i.e., ordered rating points and dichotomous transport mode-related variables), two types of univariate ordinal regression models, i.e., logit and probit, were fitted separately to the dataset, with ratings for each of the six inclusive street dimensions as the dependent variable and the respondent characteristics as the independent variables. As an extension of the discrete choice modelling widely used in transport studies (Ben-Akiva and Lerman, 1985; Hosmer et al., 2013), this

approach models the cumulative probabilities of the rating points, retains the order information and transforms the points to the scale of the linear predictor by means of a link function of either log-odds or the inverse function of a standard normal distribution. Coefficients in the linear predictor are estimated by maximum likelihood. Goodness-of-fit measures were computed using the “generalhoslem” R package.

4.4 Results

4.4.1 Overall ratings

The frequencies of ratings on the seven-point importance scale are shown in Figure 4.2. Clearly, the ratings are skewed to the positive end of the scale on 5—“moderately important”, 6—“very important” and 7—“extremely important”. Almost no respondent rated *accessibility*, *connectivity* or *safety and security* as 1—“not important at all” or 2—“of low importance”, but such negative ratings were notably present in the other dimensions, especially *urban vibrancy* and *greenery*. Although a general high level of perceived importance was expected with respect to inclusive streets, the association varies, as shown in the bivariate correlations in the lower half of Table 4.3. All correlation coefficients were significant at a .001 significance level. The strongest correlations occurred between *accessibility* and *connectivity* ($\rho = 0.683$), *urban vibrancy* and *greenery* ($\rho = 0.638$), and *streetscape* and *urban vibrancy* ($\rho = 0.546$), whereas some pairs showed weak associations, such as that between *connectivity* and *urban vibrancy* ($\rho = 0.163$). The Wilcoxon signed-rank tests (the upper triangle of Table 4.3) showed no median difference in the ratings between *accessibility* and *connectivity* ($Z = 1.07$, $p = 0.287$) or between *urban vibrancy* and *greenery* ($Z = 1.51$, $p = 0.132$), which corresponds with their strong association. In the former case, the concepts of accessibility and connectivity might have been perceived as interchangeable despite the distinction that was made in the introduction at the beginning of each survey. In the latter case, a similar level of perceived importance was observed between the conceptually distinct dimensions of *urban vibrancy* and *greenery*.

Figure 4.2 Frequencies of ratings (1—“not important at all” through 7—“extremely important”) in the six dimensions.

Table 4.3 Bivariate correlation coefficients, Spearman’s ρ (lower triangle) and Z scores for the Wilcoxon signed rank tests (upper half).

	O1	O2	O3	O4	O5	O6
O1	-	1.07	11.15***	3.40***	13.79***	14.29***
O2	0.683***	-	10.65***	2.80**	13.03***	13.73***
O3	0.285***	0.258***	-	-8.85***	5.71***	5.96***
O4	0.351***	0.357***	0.344***	-	12.50***	13.51***
O5	0.223***	0.163***	0.546***	0.354***	-	1.51
O6	0.233***	0.189***	0.457***	0.413***	0.638***	-

(***, <0.001; **, <0.01; *, <0.05)

4.4.2 Categorical canonical correlation analysis results

Divided into two sets, the categorical variables of both ratings and respondent characteristics were scaled in the categorical canonical correlation analysis. The quantification matrices were restricted to rank 1, i.e., a single nominal. As with the ordinal variables, an additional level constraint was applied such that the first column of category quantifications would be increasing or decreasing (de Leeuw and Mair, 2009). Area indicators were not included in the computation to minimise the loss function. The eigenvalues, or the squared canonical correlations, are 0.164 and 0.149, indicating 0.313 or 31.3% explained variance. Based on the optimal scaling, the category centroids, which are the centres of gravity of individual object scores under each variable, are plotted against the two canonical variate axes. The distance between or clustering of the points of one set and those of the other can be interpreted as the strength of association, meaning that the closer the category levels are to one another on the two-dimensional

space, the more strongly they are associated. The quantification matrices are provided in Appendix C.

Figure 4.3 Plot of category centroids against two canonical variates with variable quantifications restricted to a single rank (point labels—category levels).

As illustrated in Figure 4.3, highly negative ratings are located far from the origin, such as *streetscape-1* and *safety and security-1* in the bottom-right quadrant and *accessibility-2* and *connectivity-2* in the top-right quadrant, which reflect their low frequencies. In the top-left quadrant are the highly positive ratings of *streetscape*, *safety and security*, *urban vibrancy*, and *greenery*. Remarkably, farther away are the elderly age group (≥ 60) and the motorcycle transport mode. The age group 50-59 years is also in this quadrant, albeit closer to the origin. This finding indicates that older adults and motorcyclists attributed more importance to these four dimensions than other age and transport mode groups, while such a difference is not present in *accessibility* and *connectivity*, which were

widely perceived as very important and thus failed to demonstrate variation in the plot. However, the small sample size of motorcyclists ($n = 10$) is worth caution, and inferences from this subset are less conclusive. In the lower half of the plane, differentiated by the vertical axis, are the transport modes of car driver, car passenger and PMD rider as well as non-bus passenger and non-train passenger, which are closer to negative ratings, while in the upper half, the opposite transport mode groups are located closer to the positive ratings.

4.4.1 Regression results

With a focus on how various age and transport mode groups might view inclusive street dimensions differently in terms of relative importance, ordinal logistic regression models were fitted to the dataset separately with each of the six dimensions as the dependent variable. Polynomial contrasts were specified for the ordered age factor. The results were similar between the two sets, and only the ordinal logistic regression results are presented Table 4.4. Most of the results remain significant after controlling for the location where the survey was conducted (Figure 4.1). McFadden's and Nagelkerke's pseudo- R^2 indicated improvement of the fitted models over the null models, albeit to a limited degree. The Hosmer-Lemeshow and the Lipsitz goodness-of-fit tests for ordinal logistic models (Lipsitz et al., 1996; Hosmer et al., 2013) showed non-significant results, indicating a lack of evidence that they were incorrectly specified. The exception was the model for urban vibrancy ($\chi^2 = 81.03$, $df = 53$, $p = 0.008$).

Gender was non-significant in the regression results across all dimensions, indicating the absence of a gender effect on the perception of an inclusive street dimension as more important. In contrast, age was significant in its linear and quadratic effects across five of the dimensions; the exception was *safety and security* (O4). The analysis of deviance confirms the same significance results for age, e.g., in the *accessibility* (O1) model ($\chi^2 = 17.73$, $df = 5$, $p = 0.003$). In a graphical illustration, a comparison of age effects on the predicted rating probabilities when the other variables are set to their sample average (Figure 4.4) shows a significant increase in perceiving *accessibility* as 7—extremely important (0.53 for age ≥ 60 and 0.34 for age 50-59) as opposed to the non-significant variation in *safety and security*. Among the transport modes, being a regular car passenger was significant in increasing the odds of rating a dimension, except for *streetscape*, as more important by 1.37 to 1.52 times. The mode of using a car as a driver was significant in the dimensions of *accessibility*, *connectivity*, and *safety and security*

Table 4.4 Ordinal logistic regression models on individual inclusive street dimensions.

Coefficient	O1 – Accessibility			O2 – Connectivity			O3 – Streetscape			O4 – Safety & security			O5 – Urban vibrancy			O6 – Greenery		
	Est.	SE	OR	Est.	SE	OR	Est.	SE	OR	Est.	SE	OR	Est.	SE	OR	Est.	SE	OR
<i>Respondent characteristics</i>																		
GenderM	0.07	0.13	1.07	0.05	0.13	1.05	0.17	0.13	1.18	0.04	0.13	1.04	0.11	0.13	1.11	0.22	0.13	1.24
Age.L ⁽¹⁾	0.94	0.25	2.56***	0.36	0.25	1.44	1.25	0.24	3.47***	0.18	0.24	1.20	0.69	0.25	2.00**	0.52	0.24	1.68*
Age.Q ⁽¹⁾	0.62	0.24	1.87**	0.63	0.24	1.88**	0.71	0.23	2.03**	0.37	0.23	1.45	0.45	0.23	1.56*	0.66	0.23	1.94**
Age.C ⁽¹⁾	0.05	0.22	1.05	0.10	0.22	1.10	0.22	0.21	1.25	0.08	0.21	1.08	0.09	0.21	1.10	-0.08	0.21	0.92
Age^4 ⁽¹⁾	-0.14	0.20	0.87	-0.14	0.20	0.87	-0.05	0.19	0.95	-0.06	0.19	0.94	-0.08	0.19	0.92	-0.01	0.19	0.99
Age^5 ⁽¹⁾	0.01	0.17	1.01	0.02	0.17	1.02	-0.12	0.16	0.88	-0.09	0.16	0.92	-0.21	0.16	0.81	-0.03	0.16	0.97
Car_driYes ⁽²⁾	0.43	0.20	1.53*	0.54	0.20	1.71**	0.13	0.19	1.13	0.52	0.20	1.69**	-0.01	0.20	0.99	-0.10	0.19	0.91
Car_pasYes ⁽²⁾	0.41	0.16	1.51**	0.32	0.16	1.37*	0.11	0.15	1.12	0.37	0.16	1.45*	0.33	0.16	1.39*	0.42	0.16	1.52**
BusYes ⁽²⁾	0.46	0.20	1.59*	0.24	0.20	1.27	0.15	0.20	1.16	0.08	0.20	1.08	0.06	0.20	1.06	-0.19	0.20	0.83
TrainYes ⁽²⁾	-0.03	0.21	0.97	-0.02	0.22	0.98	-0.14	0.21	0.87	0.04	0.22	1.04	-0.16	0.21	0.85	0.09	0.21	1.10
BicycleYes ⁽²⁾	-0.09	0.19	0.91	0.00	0.19	1.00	-0.11	0.19	0.90	-0.16	0.19	0.85	0.11	0.19	1.12	-0.14	0.19	0.87
PMDYes ⁽²⁾	0.21	0.27	1.24	-0.16	0.29	0.85	-0.08	0.28	0.92	0.51	0.29	1.67	0.15	0.29	1.17	0.61	0.29	1.84*
MCYes ⁽²⁾	0.88	0.65	2.41	0.63	0.63	1.87	2.34	0.67	10.38***	1.49	0.63	4.46*	0.66	0.60	1.94	0.12	0.68	1.12
<i>Area</i>																		
B	-0.63	0.26	0.53*	-0.54	0.26	0.58*	-0.44	0.25	0.65	-0.13	0.26	0.88	-0.59	0.26	0.55*	0.01	0.26	1.01
C	0.82	0.30	2.26**	1.39	0.30	4.00***	-1.21	0.28	0.30***	-0.57	0.28	0.56*	-2.73	0.30	0.07***	-2.52	0.29	0.08***
D	-1.26	0.29	0.28***	-1.06	0.28	0.35***	-0.06	0.27	0.95	-0.23	0.28	0.79	0.11	0.28	1.12	0.05	0.28	1.05
E	-0.89	0.26	0.41***	-0.81	0.26	0.45**	0.01	0.25	1.01	0.28	0.26	1.32	-0.53	0.26	0.59*	0.34	0.26	1.41
F	-1.02	0.29	0.36***	-0.86	0.29	0.42**	0.47	0.28	1.60	-0.46	0.27	0.63	0.13	0.28	1.14	0.24	0.28	1.27

	O1			O2			O3			O4			O5			O6		
Coefficient	Est.	SE	OR	Est.	SE	OR	Est.	SE	OR	Est.	SE	OR	Est.	SE	OR	Est.	SE	OR
G	-0.25	0.33	0.78	0.09	0.34	1.09	0.02	0.33	1.02	1.16	0.34	3.20***	-0.29	0.34	0.75	0.76	0.33	2.14*
H	-0.64	0.29	0.53*	-0.76	0.29	0.47**	-0.22	0.28	0.80	-0.80	0.29	0.45**	-0.52	0.29	0.59	-0.40	0.29	0.67
I	-1.31	0.31	0.27***	-1.16	0.31	0.31***	-0.73	0.30	0.48*	-0.56	0.30	0.57	-0.58	0.30	0.56	-0.43	0.30	0.65
<i>Intercept</i>																		
1 2	-10.43	2.80		-14.16	25.35		-6.12	0.64		-6.69	1.04		-4.96	0.38		-4.00	0.34	
2 3	-6.02	0.62		-6.36	0.76		-4.49	0.38		-5.30	0.57		-3.90	0.33		-3.04	0.31	
3 4	-4.26	0.37		-4.47	0.39		-3.25	0.31		-3.71	0.35		-3.11	0.31		-2.38	0.29	
4 5	-2.37	0.29		-2.40	0.30		-1.61	0.29		-1.75	0.28		-1.48	0.28		-1.16	0.28	
5 6	-0.98	0.28		-0.77	0.28		-0.03	0.28		-0.17	0.27		-0.02	0.28		0.43	0.28	
6 7	0.81	0.28		0.96	0.28		1.72	0.29		1.39	0.28		1.86	0.29		2.37	0.29	
Deviance			2124.4			2092.3			2370.2			2232.2			2459.1			2494.5
AIC			2178.4			2146.3			2424.2			2286.2			2513.1			2548.5
McFadden's pseudo-R^2			0.055			0.064			0.039			0.038			0.060			0.070
Nagelkerke's pseudo-R^2			0.149			0.171			0.117			0.109			0.183			0.214
Hosmer-Lemeshow goodness-of-fit test (chi-squared statistic, <i>df</i> , p-value)																		
	47.60	44	0.328	40.36	44	0.629	70.45	53	0.055	26.72	53	0.999	81.03	53	0.008**	59.19	53	0.260
Lipsitz goodness-of-fit test (likelihood ratio statistic, <i>df</i> , p-value)																		
	7.76	9	0.559	7.76	9	0.559	4.07	9	0.907	8.64	9	0.471	9.27	9	0.413	10.76	9	0.293

Notes: (1) The 6-level ordinal variable of age is modelled as polynomial contrasts to preserve its orderedness. The labels Age.L, Age.Q, Age.C, Age^4 and Age^5 denote the linear, quadratic, cubic, quartic and quintic polynomial contrasts, respectively. (2) These labels indicate whether a respondent is a regular car driver, car passenger, bus passenger, train rider, bicyclist, PMD rider and/or motorcyclist. The coefficients are for the cases of yes, e.g., the label Car_driYes refers to the case where a respondent is a car driver.

but not in the other three dimensions, which have less to do with vehicular traffic. Public transport modes of bus and train and the active modes of bicycle and PMD did not achieve the significance level except that the bus mode was significant ($t = 2.32$, $p = 0.020$) in the *accessibility* dimension, and the PMD mode was significant ($t = 2.14$, $p = 0.033$) in the *greenery* dimension. The greatest effect was observed in the motorcycle mode despite its low sample size; being a motorcyclist increased the odds of a higher importance rating by over 10 times ($t = 3.47$, $p < 0.001$) for *streetscape* (O3) and by over 4 times ($t = 2.37$, $p = 0.018$). In the case of using a train, although the significance level was not achieved, a negative sign was observed in some coefficients, which indicates that commuting on a train separates a user almost entirely from the street environment; thus, from the perspective of train riders, the concept of inclusive streets is less relevant.

4.5 Discussion

4.5.1 The elderly and Silver Zone

Overall, the concept of inclusive streets resonated more strongly with the older age groups (Figure 4.4). Researchers have recently begun to take more interest in the mobility needs of the elderly, ranging from utilitarian trip-making to facilities and services to the affective needs of maintaining independence and control (Musselwhite and Haddad, 2010), and these sensitivities can be addressed by a shift to designing street spaces as a kind of social space (Doi et al., 2016).

One initiative in Singapore in response to the need to create a safer environment for the elderly is the Silver Zone programme, which began in 2014; the number of Silver Zones is expected to increase to fifty islandwide (LTA, 2016b). Silver Zones encourage lower speeds through regulatory and physical measures, and typical features include reduced speed limits of 40 km/h, lane-narrowing or median-widening treatments such as gateways and pinchpoints, raised zebra crossings and mini-roundabouts. These measures are in addition to the rigorous road safety assessment that is undertaken for new road construction and temporary traffic diversions (LTA, 2017a). In a broader sense, they are also in line with the more senior-friendly environment and transport system called for by the Action Plan for Successful Ageing (MOH, 2016). While significant variation across age groups was not observed in the dimension of *safety and security*, it is argued that such features would drastically and positively change the character of roads (Ho and Chin, 2016), and therefore, how they are perceived by residents and signal a broader vision of neighbourhood street design should be further investigated.

Figure 4.4 Age effects plots of O1—accessibility and O4—safety and security.

4.5.2 Car passengers in the new mobilities paradigm

Another factor that significantly affected the perception of inclusive streets was the mode of being a car passenger. Part of the “mobilities turn” in urban geography research is related to the “still” stages of trip-making, such as waiting at a bus stop or sitting in a train (Cresswell, 2011). The dataset did not allow for further examination of differences among specific passive vehicular modes, such as in private cars, taxis, carpooling, etc. However, the significant result of car passengers as an aggregate mode suggests that the passive mode that guarantees seating and affords a different travel experience may encourage taking a more holistic view of streets. In traffic modelling, the assumption that commute time is purely a travel cost and should be treated as unproductive is relaxing. Perhaps the most disruptive force in urban transport is the burgeoning car-sharing and ride-hailing services, which have profound implications for street design as a whole. A higher level of customisation of pick-ups and drop-offs may incur more irregular parking behaviour in streets, which is closely related to accessibility and connectivity. While a somewhat different story is unfolding in Singapore, a central issue in the car-sharing controversy of Sydney, as revealed in Dowling and Kent’s (2015) examination of public-private partnerships, is the blurring of the line between public right-of-way and private land for on-street parking when such services are officially supported. However, much remains to be explored in regard to passenger experiences across different public and private transport modes and different settings in terms of social interactivity.

4.5.3 Bicycle sharing and PMD use

The non-significant results concerning the modes of bicycle and PMD were somewhat unexpected. This finding is in contrast to an interim report on the feedback gathered

from a recent public consultation regarding the Land Transport Master Plan (LTA, 2018d) in which respondents expressed wishes for more space and for the prioritisation of pedestrians, cyclists and PMD users. These wishes could be fulfilled if the government succeeds in curbing the growing private car population, thus making it easier to reclaim part of the road space to enhance pedestrian and cycling facilities (Lianhe Zaobao, 2018). The past few years have also seen a bumpy introduction of dockless bicycle-sharing systems and a proliferation of PMDs. Indiscriminate parking prompted reactionary measures such as demarcating yellow boxes in public spaces for shared bicycles (LTA, 2018b) and tighter licensing and regulation of operators (LTA, 2018c). Another major concern is space sharing. In response, the Active Mobility Act, which incorporated input from the Active Mobility Advisory Panel, took effect in 2018, and rules for cyclists and PMD users are being fine-tuned (AMAP, 2018). In particular, the resulting demarcated parking spaces can be regarded as a balancing act between *accessibility* (parking provision) and *connectivity* (free of obstruction) as well as a compromise between dockless and docking station-based systems. Moreover, a recent survey study revealed a similar user profile in the two systems (Chen et al., 2018), indicating that an equilibrium is forming between the opposing forces of the mobile and stationary aspects of mobility.

As van der Helm (2009) argues, rapid contextual changes in travel patterns—in this case, partially contributed by the uncontrolled forces of bicycle sharing and PMD use—lead to a vision that is more adaptive than ideational, i.e., incrementalism versus visioning, but these two elements should be seen as complementary in that visionary ideas are realised through concrete incremental actions. Nevertheless, it can be surmised that would-be cyclists and PMD riders are more informative than other subgroups in terms of gauging their aspirations for inclusive streets.

4.5.4 Uncertainty in vision realisation

As the questionnaire aimed to inquire into public perceptions of inclusive streets while keeping the constituent dimensions as generic as possible, its basis was that the effects of transport mode use in evaluating their relative importance can be attributed to an individual's beliefs or vision regarding how streets ought to be. Meanwhile, although the utopian-sounding vision of “streets for all” may stoke unrealistic expectations, hypothetically removing financial and political constraints from a visioning exercise has the advantage of promoting critical reflection and out-of-the-box forward thinking

(Davies et al., 2012). Downstream in the planning and implementation processes, however, differences in perception and preferences may become more pronounced if scenarios are included to elicit choices of potential trade-offs, for example, space reallocation and dedicated facilities if the active modes of bicycle and PMD were to be prioritised over the mode of private cars. While an extensive review of street redesign projects is beyond the scope of the study, some are noteworthy. Sukaryavichute and Prytherch's (2018) case study of a bus rapid transit (BRT) project on Ashland Avenue, Chicago, exemplifies the tensions arising from different concrete visions for the allocation of an existing street cross-section among transport modes and stakeholders that culminated in the project's suspension, e.g., bus lanes for better public transit efficiency versus a reduction in vehicular traffic that is believed to cause a decrease in economic activity.

4.6 Chapter summary

This study undertook a public questionnaire survey and investigated the differences in the perceived importance of inclusive street dimensions, namely, accessibility, connectivity, streetscape, safety and security, urban vibrancy, and greenery. The graphical and statistical analyses show that age and the car passenger transport mode were significant in increasing the likelihood of perceiving a certain dimension as more important. Contextualised in the visioning for urban and transport planning, further discussion was engaged in relation to recent developments in Singapore's urban transport landscape that point to an inclusive street vision and the visioning of it, both ideational and adaptive.

Road improvements and a variety of traffic schemes are usually dedicated to a specific transport mode. However, as people invariably take different transport modes for either utilitarian or recreational purposes, the need for a holistic and pluralistic approach to redesigning the street environment is continually increasing, especially owing to the deep uncertainties of the changing landscape of automobility and personal mobility (Lyons and Davidson, 2016), the challenge imposed on transportation departments to maintain an innovative mindset (TRB, 2018) and the public-private fragmentation of planning practice (Parker et al., 2018). Evolving in part from the lineage of urban planning and design, the current street design paradigm seems to have inherited an inherent paradox between a seemingly fixed vision and the expected malleability of strategic urban and transport planning in coping with rapidly changing travel demands

and patterns in the envisioned future. Several limitations exist in the study: for example, the frequency of transport mode use, including walking which respondents were assumed to partake in given the nature of street-intercept surveys, was not asked in finer detail, which could have in turn generated more insight into how travel patterns are associated with an inclusive street vision. Alternative uses of streets and public spaces were not probed, which could have been the cause of the mixed significance results for the model specification in the *urban vibrancy* dimension, and the heterogeneity of the built environment could have been explored in more depth in terms of the indirect influence over perceptions of streets in general. Nevertheless, the study serves as a precursor for further research into specific inclusive street dimensions, possibly utilising a variety of creativity and visualisation techniques (Wiek and Iwaniec, 2014), for the iterative drafting and crafting of action-oriented visions and plans.

Chapter 5. Ethnographic go-along interviewing of the less mobile

5.1 Introduction

The resurgent interest of urban and transport planning in revitalising walking as a basic form of physical activity, and by extension, the need for the built environment to better accommodate geriatric and aided pedestrian mobilities correspond with the two salient principles of inclusive street design: inclusiveness for all transport modes and for all mobility capacities. Research has been extensively conducted on the built environmental effects on active transport and physical activity across macro-, meso- and micro-scales, generating a vast body of knowledge ranging from urban parameters (e.g., land use mix) to pedestrian facilities that is useful for public health interventions (Heath et al., 2006; Sallis et al., 2006; Saelens and Handy, 2008; Bauman et al., 2012). Commensurate with a shift of focus from macroscale to microscale urban settings and elements, neighbourhood walkability studies have contributed to the refinement of measurement instruments and facilitated comparisons between cities and regions (Wang and Yang, 2019). However, aggregating built environmental attributes and correlating them with physical activity at a neighbourhood level and above obscures individual pedestrians, particularly those with limited mobility capacity, and moreover, the interaction of the physical and social realms as experienced and negotiated by pedestrians (Heath et al., 2006; Castrodale, 2017).

Furthermore, urban experiences of active mobility are confounded by intangible factors, i.e., how street physical elements that have safety and security connotations (Alfonzo, 2005) and more generally, societal structures (Klein, 2016), are perceived by their intended beneficiaries. This is particularly of interest because the discrepancy between the objectively measured and subjectively perceived built environmental factors has been widely reported, e.g., distance (Bauman et al., 2002; Wang et al., 2015), which further relates to mobility cultures (Klinger et al., 2013). Despite a growing interest in the affective relationships between body and space (Hughes and Mee, 2018), the literature offers few grounded accounts and analyses on how the two realms intersect and co-occur.

In this vein, the chapter proceeds with an explanation of the rationale behind adopting a mobile method for investigating the multifaceted mobility needs of the less mobile (Section 5.2). The procedures of go-along interviewing with older adults (Section 5.3) were extended to person with disability (PWD) subjects as a sample booster to obtain as

wide a range of views as possible. A descriptive summary (Section 5.4) is presented based on a textual analysis of the transcripts. Along with field notes and video footage, the rich qualitative data corpus was explored in depth and several themes emerged (Section 5.5), which led to our concluding remarks on their implications for urban and transport planning (Section 5.6).

5.2 Literature review

5.2.1 Dichotomies of accessibility and walkability conceptualisations

Walkability is an integral component of accessibility of the built environment because almost all travel involves a certain degree of pedestrian movement in the first and last miles and/or in between. The vast body of accessibility research covers a wide aggregate-disaggregate spectrum (Geurs and van Wee, 2004; Bert van and Karst, 2016), including measures based on infrastructure to those on person, location and utility, and measures directed to the better incorporation of time-space constraints as well as individual cognition and perception (Ferreira and Batey, 2007). There exists a wide array of contrasting conceptualization and operationalisation in transport studies ranging from theoretically- versus empirically-driven modelling of travel behavior (van Acker et al., 2010) to accessibility measures differentiated by whether they are objective or subjective (Lin and Moudon, 2010), descriptive or prescriptive (Páez et al., 2012), or place-oriented or people-oriented (Ferreira and Batey, 2007).

Clarifying one such dichotomy, however, Ferreira and Batey (2007) argue that place-oriented and people-oriented accessibility concepts or measures are interchangeable in that the practical difference lies in which reference point the measure is taken from, e.g., in a place-oriented sense, the number of bus routes that travel in an area, and in a people-oriented sense, the provision of wheelchair-accessible buses plying between point A and point B, the attempt to address one of which invariably involves the other in urban management praxis. Nevertheless, these dichotomies serve to categorise the formulation of accessibility measures depending on which components, i.e., transport, demand and supply of land use, temporal and individual, are incorporated (Geurs and van Wee, 2004).

When applied to walkability as a subcategory of accessibility, its conceptualisation and formulation is confronted by the problem of scale in that both regional-level and vicinity-level built environmental characteristics must be taken into account (Alfonzo, 2005), hence the requirement of microscopic geospatial data for accurate measurement (Iacono et al., 2010). Although the improvement of quantitative data in resolution and

scale in part accentuates the fluidity and complexity of walking, or pedestrian movement, as both a mode of transport and a type of urban experience, it should be noted that a majority of accessibility and walkability measures serves the purpose of transport modelling where the outcome variable is typically vehicle miles travelled or the level of physical activity (Boarnet and Crane, 2001) but may lack a theoretical justification of why a specific measure matters (van Acker et al., 2010), or as a motivation of this study, on-the-ground verifications of such lived experiences (Hughes and Mee, 2018).

5.2.2 Mobility needs of vulnerable pedestrians

The development of the conceptualisation of accessibility and, by extension, walkability can also be seen as a perennial call for built environmental as well as societal inclusiveness, which is receiving increasing interest in the field of environmental gerontology (Sánchez González and Roguez-Roguez, 2016). The heterogeneity of health conditions or impairments causes multifaceted accessibility issues (Luiu et al., 2017). However, other mobility-impaired people may not be as recognisable, e.g., the partially sighted. Thus, the built environment, i.e., whether a street is friendly or not, may have a greater impact on these sensitive user groups. Broader street design should be able to cater to their special needs and accessibility barriers, such as slippery surfaces, narrow doorways, and dropped kerbs with no adjacent tactile warning, which can be identified and removed to provide for a smooth journey (Lavery et al., 1996). Similarly, in a pedestrian level-of-service scoring scheme, ten physical elements including tactile paving and wheelchair-accessible drinking fountains were singled out to estimate street accessibility for the disabled (Asadi-Shekari et al., 2013). In this vein, the myriad built environmental factors associated with pedestrian transportation, such as the provision of pedestrian facilities, traffic management and safety, the proximity of destination land uses, etc. (Ferrer et al., 2015) differ in terms of sensitivity to individual factors rather than range between able-bodied and less mobile pedestrians.

Mobility needs go beyond the utilitarian dimension of accessibility and extend into psychologically more advanced levels, as Musselwhite and Haddad (2010) theorised, including affective needs for independence and control and aesthetic needs, where the purpose of travel points to a hedonic experience per se. Meeting these needs is vital to the quality of life at those mental and social dimensions that are less adequately addressed in transport planning (Lee and Sener, 2016), especially more so for older adults and PWDs. Reflecting the critical thinking of accessibility in transport and urban

planning is Martens' (2015) recommendation of a "potential accessibility and mobility framework" that, for instance, stresses the importance of people's needs and ability to pursue out-of-residence activities in transport-land use systems.

5.2.3 Sociality of walking

The rich variety of walking types (Kärrholm et al., 2017) and the complex social implications manifested through walking can be better investigated in qualitative mobilities studies than in quantitative transport geography—which is mainly a derivative of a positivist spatial science (Cresswell, 2010)—or by the collaboration of the two disciplines (Hanson, 2015). Lager et al. (2015) employed the concept of social capital to study older adults' everyday mobilities and explored their intra- and inter-generational social interaction afforded by walking and gatherings. Analogous to the analysis by Vanoutrive et al. (2018) of motorway network growth, the potential convergence of positivistic and hermeneutical stances in transport and mobilities studies is also relevant to the case of pedestrian networks where societal factors such as politics in decision-making can significantly add to the explanatory power with respect to infrastructural development. In Middleton's (2018) examination of the micro-geographies of everyday urban walking, the theme of what makes a "good pedestrian" emerges as one of the spatiotemporal practices which also entangles with social norms and identities. What these studies have in common is the avoidance of committing to a priori theories and the attempts to retain the contexts of mobility practices, whose reliance on rich qualitative data makes on-the-move methods a compelling choice.

5.2.4 The ethnographic go-along method

The new mobilities paradigm (Sheller and Urry, 2006; Cresswell, 2010) or the mobility turn (Hannam et al., 2006; Faist, 2013), which is novel in perspectives on the movement of people, goods, services and ideas, lies at the intersection of urban transport and social sciences. Cross-disciplinary thinking has thus spawned diverse applications of mobile methods, which enable researchers to be in the same physical setting and a more collaborative environment with mobile research subjects.

Go-along interviewing is a widely used mobile method. As a hybrid between unobtrusive, detached observation, e.g., as a transit passenger (Tomić et al., 2015), and reflective sit-down interviews, go-along interviewing is an effective tool that facilitates the researcher's task through the participation of movement to unearth inner layers of the research subjects' lived experience in the dimensions of perception, spatial practices,

biographies, social architecture, and social realms (Kusenbach, 2003; Hein et al., 2008). Such a mobile ethnographic approach helps researchers develop an empathic experience with the participant by putting the spatial practices in a rapport-building setting and using the built environment as a prompt, or what de Leon and Cohen (2005) termed as “walking probes”. Evans and Jones (2011) provided an evidence base showing go-along produces more place-focused account than does seated interviewing. In conjunction with video-taking, this facilitates recollection of such relational undertakings as well as enhances the capacity to look into the “quiescence” of everyday mobilities (Spinney, 2015). Nevertheless, despite the “allusions to phenomenological closeness”, embracing mobile methods is not intended to undermine more conventional methods but rather complement them and synergise disparate approaches to the same social phenomenon of active mobility (Shaw and Hesse, 2010; Merriman, 2014).

As reviewed by Hein et al. (2008), some recent studies put the extended agenda of nuanced human-place interactions into practice by exploring the multisensory aspects, especially soundscape, of the built environment and people's engagement with it; similar undertakings are prevalent in other mobility studies that transcend transport, tourism and sociology (Büscher and Urry, 2009). Carpiano (2009) engages in extensive discussion of the advantages and limitations of the go-along method in social research, referring to a neighbourhood health study, and offers practical advice for adopting this method. Such go-along applications exist in a wide range of mobility practices, for example, adolescents physical activity in public open spaces (van Hecke et al., 2016), the perceived accessibility of older adults in the neighbourhood (van Cauwenberg et al., 2012), campus users with special needs (Heitor et al., 2014), and the attempt to integrate the qualitative go-along interview data “walking competencies”, such as telecommunications practices and vigilance and the geospatial walking route data (Hodgson, 2012).

While it is beyond the study's scope to statistically test the relationships among a variety of mobility- and perception-related variables, the aim is instead to offer some grounded vignettes of how the bodily movement of less mobile pedestrians is reassembled in an intricate web of behaviour, perception, attitudes and preferences over the limited yet condensed space and time of a pedestrian trip.

5.3 Methods

Go-along interviews were conducted in Singapore, which has a tropical climate with a mean annual temperature of approximately 27°C (MSS, 2018), a population of 5.64 million and a land area of 719.9 km² as of 2018 (DOS, 2018). The total population comprises 3.99 million residents (3.47 million Singapore citizens and 0.52 million permanent residents) and 1.65 million non-residents holding long-term permits to stay or work in the country (DOS, 2018).

The vision of inclusive streets is gaining ground in the public discourse and policymaking concerning urban development in Singapore. The Land Transport Master Plan lists “livable and inclusive community” as one of the three key focuses apart from enhancing connectivity and serviceability of the road network and public transport system (LTA, 2013). This is in congruence with a growing recognition that streets are a type of public space functioning as both links and places, or serving for both traffic and activity (Jones et al., 2007; URA, 2014). However, confounding Singapore’s urban mobility landscape is a rapidly ageing population—it is projected that 1 in 4 Singapore citizens will be aged 65 years and above, an 8-fold increase from 1970 (MOH, 2016). The prevalence rate of disability was estimated to be over 13% of the residents who are aged 50 years and above as of 2015, calling for a continued effort to build an inclusive and age-friendly society (3EMSC, 2016).

In keeping up with the diversifying personal mobility situations, the Road Traffic Rules define a pedestrian as an individual who is walking, in a non-motorised wheelchair, pushing a motorised or non-motorised wheelchair, or walking beside and pushing a bicycle (AGC, 2018). While this definition of pedestrians reflects the inclusive accessibility requirements of the built environment and accessibility inadequacies have been surveyed and studied extensively, people and streets are still often treated separately in static domains, with relatively little attention being paid to the ways people, with varying mobility capabilities, handle or adapt to inaccessibility.

5.3.1 Conducting go-along interviews

Based on previous similar methodology (Simons et al., 2014; Ferrer et al., 2015), Table 5.1 presents a summary of the semi-structured interview guide. An action camera was fixed on the interviewer’s shoulder during the go-along interviews to record the visuals of the environment.

The one-on-one go-along interviews took place in a mundane and day-to-day setting outdoors in the daytime, mostly starting from a mass rapid transit (MRT) station or participant's residence. As shown in Figure 5.1, interview locations in urban areas geographically spread across the main island of Singapore. The interviewer would accompany the participant on a pedestrian trip in an area familiar to him or her. Interview duration depends on the route the participant and the interviewer discussed and agreed on at the outset, as well as the participant's willingness to show the interviewer around while elaborating on his or her views of the built environment and other aspects pertinent to active mobility. Approval of the go-along method had been obtained from NTU IRB prior to the interviews. Each participant was offered a supermarket voucher worth 20 Singapore dollars as reimbursement for his or her time. During the go-along journey, an action camera recorded the GPS tracks, but unfortunately, a high proportion of semi-

Table 5.1 Semi-structured go-along interview guide

Step	Topic	Question
Opening	Greeting	1. Tell us your name and which neighbourhood you live in.
Intro	Travel pattern	2. What mode of transport do you use most often?
		3. How many minutes are you willing to walk?
Transition	Free association	4. What comes to mind when you hear "Inclusive Streets"?
Key	Explore factors and mobility needs	5. Please recall what it feels like to walk/move around, as a pedestrian, in your home neighbourhood. What is it like? Do you feel comfortable? Do you feel safe? At different times of day, does it change?
	Elicit attitudes towards space sharing	6. Let's imagine a scenario. Now you are a pedestrian/ cyclist/ wheelchair user. How should you behave to be as considerate as possible for the other road users?
	Desirable features	7. What improvements do you expect?
Closing	Identify crucial and additional factors	8. Choose one element that you think is most crucial for Inclusive Streets.
		9. Is there anything else that we should have talked about?

Figure 5.1 Starting locations of go-along interviews in Singapore

outdoor (e.g., sheltered walkways) and indoor locations prevented it from obtaining good-quality satellite signals and the pedestrian routes were instead plotted manually.

The go-along interviews ($n = 33$) were conducted in two phases. In the first phase in the first quarter of 2017, convenience sampling using the contacts of previous research projects, which was later supplemented by snowballing, was employed to recruit older adult participants ($n = 26$) who were between 64 and 79 years old and were able to travel independently without use of mobility devices or walking aid. In the second phase in March 2018, the outreach to enlist the help of relevant voluntary welfare organisations (VWOs) resulted in additional participants ($n = 7$) being introduced from the targeted PWD groups with vision or physical impairment (2 partially sighted, 1 blind and 4 wheelchair users, between 21 and 49 years old). In the combined sample, there were 14 males and 19 females; 26 interviews were conducted in English, and 7 were conducted in Chinese. All participants were Singapore citizens. While previously unobserved challenges facing the vulnerable pedestrians were revealed by extending the interview exercise to PWDs in the second round, building on the already extensive range of attitudes and views in the first round reached what Small (2009) referred to as saturation in sequential interviewing.

5.3.2 Coding interview transcripts and thematic analysis

Field notes were produced within two days after conducting each go-along interview to describe the route taken and to record pertinent responses and observations of interest. The audio recordings were then transcribed verbatim and the transcripts were imported into computer-assisted qualitative data analysis software (CAQDAS), NVivo 12. The coding of interview transcripts consisted of two cycles. Two-cycle descriptive coding was performed to facilitate theme identification (Saldaña, 2016). The first cycle of descriptive coding employed text searches for built environmental factors mentioned, and further inspection excluded search results that yielded irrelevant meanings. The second cycle involved careful readings of the transcripts. This numeric component, which shows the frequency and spread of specific keywords, is intended to aid the extraction of themes in perspective and complement the subsequent in-depth thematic analysis (Guest et al., 2011). The latter relied on the primary qualitative data obtained in both verbal form, i.e., interview transcripts and non-verbal form, i.e., video footage, and engages in discussion about the specific spatial practices imbued with personal perceptions, which would not have been feasible had transcripts been the only source to draw upon.

5.4 Descriptive results

5.4.1 Myriad factors influencing active mobility behaviour

The adopted peripatetic method is found to be effective in obtaining enriched micro-vignettes of active mobility behaviour through—while being on the move—soliciting views and

perception about the friendliness of the streets in Singapore, opinions about space sharing between pedestrians, cyclists and other road users, their desirable street improvements, etc. As presented in Table 5.2, item mention frequency is classified into four levels based on the quarters of percentages of participants (%p) according to Ferrer et al. (2015): “Almost all”, %p > 75%; “Many” 50% < %p ≤ 75%; “Some”, 25% < %p ≤ 50%; “A few”, %p ≤ 25%.

5.4.2 Comparison of two groups – older adults and PWDs

Many older adult participants mentioned pedestrians in the context of pedestrian footpaths and interaction with on-road motorists and other users. However, this did not reach the highest quartile perhaps because being engaged in the practice of walking

Table 5.2 Frequencies of selected items mentioned by the participants.

Item	Related keywords	Older adult ⁽¹⁾	PWD ⁽¹⁾	Frequency ⁽²⁾			
Category				Almost all	Many	Some	A few
User							
Pedestrian	-	64 (22)	5 (1)	○			◇
Motorist	driver, car	64 (18)	23 (5)		○◇		
Cyclist	bicyclist, bike	148 (25)	16 (5)	○	◇		
Personal mobility device (PMD) user	electric scooter, skateboard, kick-scooter, hoverboard, e-wheel, Segway	36 (10)	3 (3)			○◇	
Transit rider	bus, MRT, transit, public transport	295 (25)	45 (5)	○	◇		
Infrastructure							
Footpath	footway, pavement, sidewalk, walkway	38 (12)	26 (2)			○◇	
Ramp	slope	47 (9)	28 (5)		◇	○	
Curb	-	3 (2)	4 (4)		◇		○
Intersection	junction	3 (2)	3 (2)			◇	○
Crossing	crosswalk, zebra	23 (10)	9 (3)			○◇	
Overhead bridge	overhead, overpass	33 (11)	0 (0)			○	◇
Shelter	sheltered	59 (14)	30 (6)	◇	○		
Stair	step	44 (15)	47 (5)		○◇		
Vertical circulation	lift, escalator, elevator, traveller	49 (14)	11 (4)		○◇		
Travel behaviour							
To access	-	9 (5)	0 (0)				○◇
To walk	-	468 (26)	80 (6)	○◇			
To cycle	bicycle	41 (16)	0 (0)		○		◇
To cross	cross over, cross into, cross onto	97 (23)	37 (6)	○◇			
To park	park (car/bicycle)	15 (9)	8 (3)			○◇	
To turn	turn left, turn right, U-turn	12 (8)	28 (6)	◇		○	
To keep left/right		7 (2)	1 (1)				○◇
To cut through	cut short, cut across, shortcut	8 (5)	1 (1)				○◇
To give way		27 (9)	9 (4)		◇	○	

Note: (1) number of mentions (number of participants); (2) The symbols ○ and ◇ denote the older adult and PWD groups, respectively.

reduced the need for self-referencing as a pedestrian. The relatively low frequency of mentions of pedestrians by only one PWD participant may be partially attributed to the fact that four of the seven PWD participants were in a wheelchair, and thus, the act of walking is not applicable per se. Nevertheless, it is worth further exploring how the PWD participants view their relationship with other road users, which is discussed in the next section. Notwithstanding the absence of intentional prompts in the space-sharing questions (Table 5.1), motorists were mentioned as frequently as cyclists. As

pedestrian travel involves movement along paths and negotiation at points of conflict, what first came to mind according to the participants was the interaction between pedestrians and motorists, which poses a greater safety threat. Although personal mobility devices (PMDs) were consciously included in the space-sharing questions in response to the introduction of the code of conduct for safe sharing of paths (LTA, 2016a) and the commensurate popularity of PMDs, they are not as frequently mentioned as cyclists. This can be explained by the similarities of the physical setting and the behaviour of cyclists and PMD riders along a pedestrian footpath, which is the most likely location on the road cross-section for them to coexist, and the discussion of such interactions generally applies to each other. Furthermore, it was implicit in participants' accounts that the speeds of non-motorised bicycles and motorised PMDs make a substantive difference to pedestrians, who are often the most vulnerable users in terms of potential impact of collision and perceived safety.

The free association question about the phrase "inclusive streets" led to confusion among almost all participants, who asked for a repetition or explanation. After the researcher explained the concept in lay terms by saying that inclusive streets are designed for everybody (i.e. transport modes and mobility capacity), most participants still did not understand the terminology, which resulted in a relatively low frequency of the word "inclusive". However, they did share their mostly positive opinions about the concept and then were quick to voice some desirable features of their own. This reaffirmed a communicative challenge foreseen from the outset of the semi-structured interview design. Nevertheless, including the term of "inclusive streets" in the questions enriched the verbal aspect of the interviewing process insofar as it acted as a cognitive stimulus. The participants were making an effort to understand it, probably in part due to the widely known phenomenon of social desirability or wanting to help in a researcher-subject setting.

The most frequently mentioned infrastructural elements include vertical circulation facilities such as ramps, stairs and escalators and amenities such as shelters, as in pedestrian sheltered walkways. Just as stairs are a common barrier, ramps are an indispensable element of a public transportation system, e.g., boarding and alighting from a bus, and road infrastructure, e.g., dropped curbs, and building accesses as required by barrier-free design. In general, when they were asked to think from a wheelchair user's perspective, older adult participants expressed similar opinions that

ramps were preferred over stairs. However, the older adults interviewed also preferred ramps because the lesser gradient makes their climb easier, and this has much in common with the effect of slopes on wheelchair users' movement. On the other hand, railing design was cited by PWD participants as a trip hazard partly due to the spacing between the horizontal bars which a white cane can easily fail to detect.

5.5 Thematic analysis results – sociospatial themes

This section presents the sociospatial themes emerging from the verbal and non-verbal data collected. The field notes prepared immediately after each interview also served as a useful supplement for identifying emerging themes, contradictions or ambivalent attitudes through triangulation with the aforementioned two major data sources. References to participants are made using alphanumeric labels. The editing of the flow of speech or the grammatical mistakes in participants' quotations was kept to a minimum. For visualisation purposes, the pedestrian routes taken are plotted in Google Earth where the base aerial image is selected such that the image date is as close to the interview date as available. The overlaid images are screenshots of the go-along video footage.

5.5.1 Cut-throughs and informal paths

The participants had control over the pedestrian routes and were encouraged to share their travel patterns and mobility needs. As expected, footpaths along streets, which apparently enjoyed a preference among older adults (Booth et al., 2000), were only one component of a wider pedestrian network. Soon the author would find himself navigating local pedestrian networks. In the order of the relative position from major roads, the elements of such a pedestrian network include walking surfaces outside buildings, sheltered footpaths along building frontage which are a prominent feature of traditional shophouses as well as commercial buildings, footpaths linking to other destinations, and alternative routes through buildings which, for instance, are facilitated by direct linkage between transit nodes and commercial buildings. Moreover, in the case of Singapore's public housing estates which occupy a large proportion of the urban landscape, the crisscrossing internal footpaths, and the void decks which are a typical design at the ground level of public residential blocks, add porosity to pedestrian networks as opposed to private condominiums and other entities where pedestrian through traffic is not allowed. The utilisation of such localised spatial knowledge was observed, for instance, when participant P8 began the interview at an MRT station and used the pedestrian footbridge that connects the MRT concourse to the adjacent

shopping mall on the second floor. “Many people do not come to the shopping mall for shopping per se but to avoid the warm temperature outside,” said P8 when walking past an escalator leading to the ground level and entering the mall; “If I were to go from there [the station] to here [the mall], I would go through air conditioned places wherever possible because it is simply too hot.”

Figure 5.2 A segment of the go-along with P10 around Simei (base photograph: Google Earth 2017).

Accessibility at a facility level and connectivity at a network level were the contentious issues raised by the participants when discussing their walking experiences and challenges. When asked whether she thought streets in Singapore were accessible to all, participant P10 made use of the locality to elaborate:

“It's only some of the roads or walkway, it's not well-designed in the sense that to... To reach one place from another. For example, I need to go over to the opposite, the next block. Now, I have to cut through the car park to go through this. Otherwise, I have to squeeze through all these small little lanes” (Figure 5.2).

She went on to point out the slight changes in height and unevenness of walking surfaces as a trip hazard. For instance, the stone pavers (Figure 5.2) in the meadow directly linking the street and residential block are cheap and in need of upkeep. Despite the connectivity improvement, “... they should make a better pavement. ... Then, it's safer.

If not like that, in between, sometimes elderly can just miss a little gap. They will just trip and fall” (P10, female, 71).

5.5.1 Detouring versus “jaywalking”

Steps and stairs are a major barrier that forces circumvention on the participants’ part. From home to her destination (a shopping mall) travelling along a major artery by bus, participant P5 would alight on the same side, but on the way back, would have to access the bus stop opposite the road, which can only be crossed using a pedestrian overhead bridge yet to be fitted with an elevator. As illustrated in Figure 5.3, the unfortunate inaccessibility due to her physical constraints was compensated by a bus ride that happened to take a U-turn nearby.

“Because of my legs. And I also cannot take this (bridge). ... I can't take , I can take, but I think need one and a half hour”. At another location further explaining the same

Figure 5.3 Actual and intended segments of the go-along with P5 around Marine Parade (base photograph: Google Earth 2017).

problem “Long ago, they don't have the barriers. So I am just run across. Jaywalked. Now, they want us to use the overhead bridge, but then people like me, difficult. With my legs with arthritis, very difficult. ... I will show you where I always get another bus to come back here. Crazy, right?” (P5, female, 66).

“People will feel more convenient to walk (across) than you climb up the stairs, especially for their (old) age. The police call it jaywalking, but you don’t expect old people to climb up and down, right? So, sometimes, it has to be flexible” (P12, male, 72).

To a lesser degree, the stairs in the underground pedestrian network connecting a shopping mall at the basement level slightly deterred partially sighted participant P27 from choosing this apparently more comfortable route over the ground-level route (Figure 5.4). At the ground level, a higher degree of pedestrian-vehicle conflicts poses a greater challenge, particularly in crossing the street. However, instead of adhering to formal traffic rules, participants made informal crossing decisions based on the need for direct routes, their perceptions of traffic safety, their self-awareness of visual disabilities and moreover, how visible such visual disabilities are to others. For example,

“Here I will wait. And make sure no car or I just follow. Now there's car. For my case, I still can gauge la but for my husband, he can't. He will definitely need help if I am not with him. I'll always say you go out ah, you must take the cane. With the cane, at least people will know. Some passer-by will also help us. Then if all this driver see, they also will slow down” (P27, female, 44, partially sighted).

5.5.2 Ambivalence towards space sharing

The discussion of space sharing among pedestrians, cyclists and other road user groups reflects the topic’s multifaceted nature beyond the provision of pedestrian and cyclist facilities and includes a desired mutual understanding of considerate user behaviour. Separate paths for pedestrians and cyclists seemed to be an obvious infrastructural solution as suggested by the participants. However, the sharing of footpaths by pedestrians and cyclists remains the dominant situation where the difference in travelling speeds creates safety issues more adversely affecting vulnerable road users.

“In their PMD, their bikes, they are travelling at high speeds when they pass by. It’s like a challenge for us. So it's very ironic that we, the visually impaired, do all the avoiding when we walk around” (P30, male, 36, partially sighted).

Electric scooters were perceived to pose a danger to pedestrians due to their high travelling

Figure 5.4 Actual and alternative segments of the go-along with P27 in Orchard Road (base photograph: Google Earth 2018).

speed, while mobility scooters used by older adults were considered positive due to the autonomy they provide for everyday travel. Some participants brought up the issues of parked bicycles encroaching on pedestrian footpaths, and the ringing or alerting behaviour of cyclists to overtake pedestrians, which, if done too excessively, could be annoying.

The rights-of-way by transport mode are usually well designated, with some facilities being shared. Acknowledging the need for a space-sharing mindset, one participant expressed, “as you know we have to share the lane. Last time, not so many cyclists. But we cannot be so selfish also,” while citing interpersonal reasons, “because my husband is also one of these cyclists” (P20, female, 63). When asked how the space-sharing situation could be improved, however, more participants singled out education as the key in spite of acknowledging that some portions of walking paths were too narrow. While not necessarily mentioned in a negative light, residents of nationalities other than Singaporean were woven into such discourse. For example,

“Even on pedestrian pathway, they also cycle a lot. Because there are a lot of Chinese nationals here, a lot of residents here”, adding that “there are pros and cons. If we don't allow them, these cyclists, I can see a lot are elderly, you know, like my age. I think they are used to cycling in China, right? It's one of their means of transport, correct?” (P9, female, 70).

“Work-wise, the workers are OK. Usually they will let pedestrians walk past, and they will just stop. Then sometimes I think the workers are OK because they just lay out the construction area. They will tell us to walk here, walk here. At least they will advise us regardless of whether we are normal or if we have any disability” (P27, female, 44, partially sighted. See also Figure 5.4).

However, another participant, when asked about how pedestrians should behave to be more considerate, elaborated: “Indians, those who come from India, called foreign workers, would walk in a row and not give way, forcing you to step sideways”. Further sharing an episode when he confronted them and told them the rules in the street, e.g., to give way, he used an umbrella to re-enact the scene, gestured to poke it at someone and said: “I know they are foreigners, right. If they were to get into a fight they would be in trouble. Then, they would step aside obediently” (P19, male, 79). He said so in a slightly aggressive tone stressing their difference in nationality, which insinuated an unequal power relationship. This narrative contrasts his earlier comment that it is difficult to educate people or change their travel habits.

5.6 Discussion

With an abductive step taken in data analysis (Tavory and Timmermans, 2014), this section engages further discussion based on the aforementioned sociospatial themes and frames them in broader urban mobility and social contexts.

5.6.1 Converting accessibility constraints into opportunities

The unintended detouring travel (Figure 5.3) sheds light on the intertwining relationship between accessibility and connectivity, and on the profound impact it has on shaping the travel patterns of less mobile pedestrians. One of the street connectivity measures is the number of connecting sidewalks or crosswalks (Clifton et al., 2007), which was found to be positively associated with the prevalence of walking in streets (Moniruzzaman and Páez, 2016). In a broader sense, grade-separation and at-grade crossing facilities both contribute to street connectivity, although accessibility issues to less mobile pedestrians may be masked due the oversight of microscopic elements such as stairs. While it is straightforward to reduce such inaccessibility, for example, by installing lifts at pedestrian overhead bridges, a fuller picture of the resulting adaptive behaviour is needed to understand the mobility practices of the vulnerable pedestrians. In this light, Hägerstrand’s (1970) conceptualisation of space-time constraints is instrumental: capability constraints in the form of limited physical ability interact with the other two

types of time-space constraints: coupling constraints, in the form of “bundles” due to personal commitments or other utilitarian purposes, and authority constraints that control entitlement to resources through “domains”. The adaptive detouring observed can thus be regarded as an outcome of the interaction of capability constraints and relaxed coupling constraints (Hägerstrand, 1970; Páez and Scott, 2007) among retired older adults. This also corresponds to previous research that found that the overall impact of the built environment on the unmet travel needs of older adults was limited, especially for those with a car (Haustein and Siren, 2014; Luiu et al., 2017), which can be realised only with substantial extra effort.

Some interviews included a bus or train ride in between to capture participants’ active mobility behaviour in the first and last stages of the trip. The extra time spent could be simply treated as “deadweight”, but the transit time was not a complete waste because the conversation continued, lending some anecdotal support to the notion that travel time is not always unproductive (Lyons and Urry, 2005). Therefore, an integrative approach is needed to understanding the negative effects of the remaining inaccessible features in the built environment, to address the component of waiting and stillness in mobility practices (Cresswell, 2011), and to recognise the potential offset of the concurrent use of travel time for transport and activity, either on foot or in transit.

5.6.2 Extended pedestrian networks

Alternative informal paths and public spaces, including void decks at the ground level of public housing estates, constituted an important part of the pedestrian network that the participants actually used to navigate. Some of these paths or physical elements are, in a semiotic sense, highly symbolic, and thus, they function in a similar way to traffic signs, allowing or prohibiting certain travel behaviours. For example, the opening in the median (see Figure 5.3) or in the fence subliminally serves as a permission or invitation to cross the road informally at a specific location. Another example is the well-trodden paths on the planting verges of streets as a materialisation of desire lines (Figure 5.5).

Pedestrian behaviour has been found to be associated with a variety of built environmental elements (Boarnet et al., 2011; Adkins et al., 2012) and is mediated by knowledge and perception (Booth et al., 2000). The evaluation of accessibility or attractiveness is performed on a known set of links, and thus, informal or unconventional paths, like the cut-throughs observed in buildings and across planted verges, may be overlooked. To borrow a critique of long-haul mobilities, Hughes and Mee (2018)

caution that the narrow focus on predetermined paths may spuriously frame journey disruptions as an intrinsically negative force. Applicable to active mobility on shorter distances, this calls for a higher-resolution survey of the extended pedestrian network and land use patterns (Iacono et al., 2010) to better identify the missing links in existing GIS databases and the unmet mobility needs prior to analysing accessibility more systematically in conjunction with perception and emotions. At the city level, desire lines have attracted scholarly attention and a recent study modelled desired transport corridors compared with the existing road network (Bahbouh et al., 2017).

Figure 5.5 A well-trodden path on the planting verge on the route of P12 in Tiong Bahru.

Similarly, the connectivity level of pedestrian networks should take into account the informal paths and public spaces already functioning in people's everyday mobilities and the desired but missing links, which will benefit not only less mobile pedestrians but all pedestrians. The go-alongs focused on individual pedestrian movement and blurred the line between formal and informal components in an extended pedestrian network that transcends the public and semi-public domains. Moreover, the planning, construction and management of such an integrated pedestrian network will require continued collaboration of various stakeholders. For example, the route choice of participant P27 (see Figure 5.4) to avoid the underground pedestrian network due to frequent changes in level suggests that the devil is in the details. In 2004, the Urban Redevelopment Authority released a master plan of underground pedestrian links in Orchard Road area, which identified critical links whose construction would be subsidised by the government, and the subsidy scheme was extended till 2018 (URA, 2016a). The lukewarm adoption of the plan by mall owners and developers (ST, 2016) and the recently announced plan to revamp Orchard Road and enhance ground-level

urban vibrancy indicate that street design is prioritising inclusive streets for both traffic and human activities. This also offers opportunities to make the built environment more inclusive by monitoring and rectifying inaccessible design elements in a more effective manner. To this end, a variety of street auditing instruments have been used to survey the physical elements along street segments and evaluate the provision for primarily active transport modes (Boarnet et al., 2006; Day et al., 2006; Millstein et al., 2013). The findings from older adults and PWDs reveal that more attention should be paid to the fine details of the built environment to ensure a smooth and hazard-free journey for everyone.

5.6.3 Towards a space-sharing culture in non-motorised transport

The challenge of space sharing is more acute in Singapore because pedestrian footpaths are typically only 1.5 m wide, which is exacerbated by the growing popularity of PMDs, the introduction of dockless systems of shared bicycles with the ensuing incivility problems such as indiscriminate parking. The confusion about and contentious claims by the participants over space sharing, in particular between pedestrians and cyclists, reflect a potentially steep learning curve of the traffic rules with regard to rights-of-way among a diversified host of pedestrians and non-pedestrians on the sidewalk. While Table 5.3 lists clearly which mobility devices are allowed in which locations, and the code of conduct further stipulates best practices in the case of conflicts, Singapore is still at an attuning stage of inculcating a friendly and inclusive street environment supported by a widespread space-sharing culture. The reduction in speed limit on footpaths is a welcome move, as some participants of this study cited annoying and reckless cycling behaviour such as unnecessary alerting from behind and not slowing down when overtaking pedestrians. Although traffic rules regarding active mobility include fines and punishment for various types of offences, there also exists an acute awareness of the need for cultivating social norms that are conducive for space sharing. For this purpose, the Land Transport Authority has collaborated with the stakeholders to roll out safe riding coaching sessions of bicycles and PMDs (LTA, 2017b). It is noteworthy that the traffic rules have excluded an individual driving a motorised wheelchair or riding a mobility scooter from the definition of a pedestrian (AGC, 2019). The effects of these educational efforts, in tandem with a nuanced definition of pedestrians, remain to be seen on the diffusion of safe riding and considerate road sharing behaviours. Nevertheless, more research needs to be done concerning the complexity of legal statutes

Table 5.3 Speed limits and allowed locations of mobility devices (source: LTA, 2019).

Location	Speed limit	Type of device			
		Conventional bicycle	Power-assisted bicycle	PMD	Personal mobility aid ⁽²⁾
Cycling/shared paths	25 km/h	✓	✓	✓	✓
Footpaths	15 → 10 km/h ⁽¹⁾	✓	✗	✓	✓
Roads	Road speed limit	✓	✓	✗	✗
Locations with “No Riding” signs	-	✗	✗	✗	✓

Notes: (1) When the rules were first announced in September 2018, the speed limit on footpaths was 15 km/h. This was later reduced to 10 km/h (LTA, 2019). (2) E.g., motorised wheelchairs, mobility scooters.

on right-of-way (Prytherch, 2013) and its long-term indirect impact on street design and mobility culture cultivation.

5.6.4 Active mobility as identity expression

The intangible attribute of exposure to other ethnicities appears to influence people’s perception of a local-versus-foreigner divide. Although not the most prevalent theme in terms of the number of mentions, the episodes shared vividly by the participants—relating to, on the one hand, ethnicity and nationality and, on the other hand, walking and cycling behaviour—can be seen as a result of Singapore’s large migrant population. Singapore’s substantial non-resident population of 1.65 million (DOS, 2017) mostly consists of the foreign workforce of 1.37 million, 21% of whom are foreign construction workers who typically hold a work permit (MOM, 2017). With widespread construction works, including residential or commercial development and road works in proximity to people’s neighbourhoods, the interaction of the two demographic groups in public spaces becomes more frequent. Yeoh and Chang (2001) have written in depth about this transnational flow of migrant, low-skilled workers into Singapore against the backdrop of globalisation, which occasionally appears in the limelight of public discourse. Those in the construction sector mainly come from India, Pakistan and Bangladesh, though they are often generalised as Indians by Singaporean locals, among other popular misperceptions about migrant workers (ST, 2020). Non-governmental efforts are in progress to allow migrant workers a more prominent voice and to provide assistance for social integration (TWC2, 2017).

However, anti-immigrant sentiments may remain an undercurrent. Analysing whether Singapore residents would accept an immigrant as a neighbour, Dirksmeier (2020) found that disliking racially different neighbours was a strong predictor. Analogously, the

perceived threat to local social norms may extend to encounters in an informal urban setting. Our results contrast with those of Yuen and Kong (2019), who conducted a go-along study of older adults in Singapore in which mostly positive pull factors (e.g., social interaction, recreation and relaxation) for visiting neighbourhood communal spaces were reported. Through the implicit use of pedestrian behaviour and etiquette to confirm individuals' ethnicity-related perceptions of others, such informal encounters potentially convert everyday mobilities into a litmus test on a cosmopolitan-parochial spectrum (Kothari, 2008).

Perceptions and attitudes with regard to assumed origin were also reported in a study of perceived age-friendly city attributes among elderly residents in Hong Kong who tended to distinguish locals and non-locals, particularly new immigrants, by their courteousness in public spaces (Sun et al., 2018). Such presumptions or heightened awareness might have been elicited by the perceived difference in social norms between locals and foreigners and reinforced by prior unpleasant experiences, which are often entangled with negative affects and emotions (e.g., in public transport) (Bissell, 2010; Klein, 2016). In relation to the asserted and entitled rights to the city, Middleton (2018) further argued that a politics of urban, non-motorised transport can deepen the conceptualisation of everyday mobilities. Adding to this is the assertion or expression of one's identity through active mobility behaviour (e.g., following local norms), as can be deduced from the participants' nationality-focused accounts. As diversification in the active mobility landscape is a recent phenomenon in Singapore, the aforementioned code-of-conduct educational programmes for pedestrians using various devices and sharing road space can be viewed as a move to instil a common set of norms for locals and foreigners alike and, through the learning and practising of these norms to boost social cohesion. In this light, more research is needed to examine how perceived cultural differences are internalised and influence the different tactics adopted when negotiating with other road user groups.

5.6.5 Methodological reflections

One of the strengths of the mobile method stated by Kusenbach (2003) lies in observing and understanding spatial practices. This is already apparent in the verbal aspect of the go-along interviews, as seen in the travel behaviour category of the descriptive coding results. As the participants were told to take the lead, they would give directions to the researcher and describe a variety of situations where they must cope with other road

users. While the act of crossing is synonymous with road crossing in this study, there exists variations in the exact crossing locations along a stretch of a road – formal crosswalks at intersection and midblock locations and informally making a crossing at least 50 m clear distance from any nearby crosswalk. Crossing the road within 50 m vicinity but not at the formal crossing itself is jaywalking, which is traded-off in the difficulty of using the formal crosswalk (for example, an overhead bridge) against safety hazards. A large proportion of the spatial practices were performed, rather than demonstrated, in situ and without verbal narration. For example, only a few participants mentioned cut-through behaviour (Table 5.2) but such behaviour was observed in many. The advantage of having video footage for corroborating contexts greatly facilitates unearthing the subliminal effects of the physical elements of travel behaviour.

The efficacy of walking probes (de Leon and Cohen, 2005), which further translates into the “shorthand” of body language (Kelly et al., 2011) by way of, for example, pointing at immediate surroundings or specific physical elements to assist expression, is a major advantage of the go-along method. Furthermore, the shared urban experience of pedestrian movement was instrumental in eliciting the perceptual and social aspects of the built environment for pedestrians and uncovering walking sociality with respect to ethnicity and identity-related desirability, for which purpose other methods such as questionnaire surveys administered online or in street are likely to have limited utility (Kelly et al., 2011).

It is postulated that the sociological findings of this study would not have been possible in a conventional questionnaire survey, even one with open-ended questions without the go-along setting. The go-along interview allows participant to more deeply share his or her pedestrian experiences and perceptions while building rapport with the researcher during the trip as well as using environmental cues to assist in storytelling. This is indeed the methodological motivation for some previous qualitative transport research. Hafner et al. (2017) conducted both focus group and one-on-one interviews to explore factors of car-purchase decisions and found that the factor of image, such as aesthetics or reflection of self-image and identity, appeared more frequently in the one-on-one interviews and on average, appeared later than other factors such as practicality and financial considerations.

There are some limitations to this study. Implicit references in the transcripts, i.e. in the form of pronouns, were not converted and reflected in the descriptive coding results, as

it would be too labour-intensive, but examination of the transcripts in conjunction with fieldnotes and video footage minimised the risk of omitting important references. The go-along interviews were conducted in the daytime, so it was not feasible to observe participants' travel behaviour at night, when lighting probably plays a critical role. However, conducting go-along interviews at night may have safety implications, and alternative methods can be considered. Although cycling behaviour and pedestrian-cyclist interactions were discussed during the go-alongs, these topics primarily covered the perspective of pedestrians; a similar application of the go-along method to the transport mode of cycling, albeit overcoming additional logistical challenges, is likely to yield new insight into cyclists' mobility patterns and perceptions, particularly in such a city as Singapore where inclusive road infrastructure is instrumental to cultivating an active mobility culture.

5.7 Chapter summary

This chapter sheds light on the perceptual dimension of active mobility, i.e., the adaptive travel behaviour and the intertwining complexities in a multifaceted construct that is infrastructural as well as cultural. Two vulnerable pedestrian groups—older adults and the PWDs—were interviewed using go-along which is an empirically-grounded and mobile method. Descriptive coding of the interview transcripts show that shelter, mostly part of the sheltered pedestrian walkways, kerbs, ramps and stairs are the mostly frequently mentioned built environmental elements, corresponding with the travel manoeuvres of turning, crossing streets, and overcoming grade-separated barriers.

Further analysis using additional primary data sources, fieldnotes and video footage allowed for the identification of intersecting nexuses of physical and perceptual dimensions of human mobility at an individual level. Three themes emerged, each with different implications for studies of accessibility and mobility, and more broadly, inclusiveness of the built environment. First, adaptive travel behaviour in an extended travel network was observed, which calls for more thorough geospatial network data that include shortcuts through commercial buildings and car parks or informal paths on street verges and medians. Two subtypes of adaptation were observed: detouring due to inaccessible features and taking shortcuts including informal crossing and using materialised desire lines. Street-auditing exercises are effective in scoping the physical elements along street segments, but the adverse impacts of detouring due to inaccessible features that are not obvious to the able-bodied should be incorporated. Second,

ambivalence towards space sharing between pedestrians and other road users prevailed, not only because of right-of-way complications but also due to perceived differences in the understanding of social norms among different nationalities or ethnicities.

In relation to the challenge of improving walkability in an already advanced level of nominal pedestrian infrastructure provision (Adkins et al., 2017), the “ethnoscape” of streets and public spaces may serve as a lens through which perceived barriers and incivilities are addressed holistically together with urban and transport planning practices. As such, the employment of localised spatial network knowledge in daily routines and the perceived built environmental “ethnoscape” combine to signal “an improvement in the inclusion of the accessibility effects” resulting from the integration of objective evaluation measures and subjective perception, specifically in the case of active transport modes (van Wee, 2016). This integration may also address the potential mismatch between infrastructure provision and perceived accessibility (Wang et al., 2015) by investigating the user identity-related influences on the intentions of active mobility. In parallel with the increasing sophistication of accessibility measurement and transport modelling as described in the literature review, in this study, we argue that the ethnographic go-alongs, while effectively functioning as an individualised audit of streets as well as public spaces, will continue to be an essential means to study everyday mobilities situated in the local urban geography and culture. The findings of this study lead to a deeper humanistic understanding of the daily movements and spatial practices of less mobile pedestrians. Moreover, as the vision of inclusive streets implicitly calls into question the orthodoxy of urban transport policies (Kębłowski and Bassens, 2017), further research using the human-centred go-along method for slow modes can provide urban and transport-related policymakers with valuable insight into the perceptions of active mobility and the implications of building an inclusive society.

Chapter 6. Repositioning urban heritage for active mobility

A journal article based on this chapter is published³ as Wang, Y., & Wong, Y. D. (2020). “Repositioning urban heritage for active mobility: Indications from news coverage in Singapore.” *Cities*. <https://doi.org/10.1016/j.cities.2019.102525>

6.1 Introduction

Urban heritage is an integral component of the present cityscape that embodies nostalgic linkage to the past. It is an outcome of commercial and cultural forces in past circumstances that is nevertheless subject to socioeconomic dynamics. Against the backdrop of localised tourism development as one mechanism for heritage conservation and revitalisation (Orbasli, 2000), the conservation of urban heritage, when viewed as physical assets and protected by urban development regulations, is invariably concomitant with the adaptive reuse of historic buildings (Yung et al., 2014), whose value is thus realised through economic consumption (Guzmán et al., 2017). Worldwide, urban planning and design have long focussed on infusing a community spirit through development control measures and urban design guidelines. Another economically less quantifiable but socially important aspect is the perceptual qualities of the built environment that influence sense of place or place attachment among residents. Although these concepts of meaningful human-environment relationships take on numerous constructs and measurements (Williams and Vaske, 2003; Hammitt et al., 2006; Lewicka, 2011), of particular interest are the cognitive and perceptual processes deriving from urban settings (Stedman, 2003).

From a transport point of view, historic districts tend to be viewed as a working example of urban liveability in which a pedestrian-friendly and organic urban fabric coexists with a city’s economic functions (Koh and Melic, 2017). The evolving role urban heritage plays in urban development and management, when examined within Orbasli’s (2000) three-dimensional framework of urban conservation in conjunction with tourism, can be seen as strengthening the linkage between the physical dimension, concerning building conservation, and the social dimension, concerning community involvement. In the latter, urban heritage is utilised as a resource for community bonding and social cohesion (Plevoets and Sowińska-Heim, 2018). However, the third spatial dimension, concerning

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traffic and pedestrian movement, is still relatively isolated and treated mainly as an engineering task of ensuring circulation and access through highway design and car parking provision. This dimension is, nonetheless, of growing importance as pedestrians are gaining greater priority over vehicles in the traditional hierarchy of transport modes, which is bolstered by a continued public discourse about liveability and sustainability. Top-down efforts by government agencies are influential in shaping both the built environment and public discourse, but the issue of policy silos may still be prevalent. Despite the increasing relevance of urban heritage conservation across government agencies, which suggests a collaborative role they can play in achieving public policy agendas, there has been little research thus far into the potential linkage of urban heritage with other domains, such as transport.

To explore this intersection from a public discourse perspective, newspaper articles are utilised as a suitable source because they cover a wide range of views from society and reflect how heritage is portrayed by the state and perceived by the general public. Using this source of local news coverage, the objectives of the present analysis, which were formulated iteratively through data extraction and examination, are (1) to survey the range of views and glean insight into urban heritage as a key component of urban planning and management oriented towards active mobility, and (2), with a narrower analytical focus, to examine the prevalence of and association among major heritage-relevant government agencies in newspaper articles. The remainder of the paper is organised as follows: Section 6.2 of literature review is centred on the relevance of urban heritage to active mobility, specifically, walking. Section 6.3 of materials and methods describes the method of sampling relevant news articles for the contingency table analysis and thematic analysis. After Section 6.4 of results and discussion, the identified themes, such as urban and transport planning, congruence of heritage and arts, heritage trails and maintaining the everyday relevance of urban heritage, are further discussed. Due to the lack of a single theory encompassing urban heritage, active mobility and the interconnections between them, the discussion draws from the reviewed theoretical framings, such as the authorised heritage discourse (Smith, 2006), the new mobilities paradigm (Sheller and Urry, 2006) and place attachment (Lewicka, 2011). This chapter concludes in Section 6.5 with a summary of the findings, limitations and suggestions for future research.

6.2 Literature review

6.2.1 A broadening scope of urban heritage

Ahmad (2006) documented the scope and definitions of heritage-related terminology over the lineage of charters promulgated by international organisations such as the United Nations Educational, Scientific and Cultural Organisation (UNESCO) and the International Council on Monuments and Sites (ICOMOS) and distinguished from the expertise of the International Council of Museums (ICOM). As these terminological changes are also a reaction to diverse regional interpretations and practices, urban heritage, unlike the generic notion of cultural artefacts preserved in museums, should not be considered a matter of discrete buildings and sites that are insulated from the quotidian life of residents and passers-by. Arising from the vision of a more engaging and inclusive heritage landscape is the primary question of what constitutes heritage. As can be observed in the trend of widening the scope of heritage, for instance, the Convention for the Safeguarding of Intangible Cultural Heritage (UNESCO, 2003), the convergence of tangible and intangible heritage is realised through social norms, values and practices (Munjari, 2004). Furthermore, the trend harks back to the emphasis in the Venice Charter on conserving the urban setting of monuments (ICOMOS, 1964), and consequently location and setting are recognised as types of authenticity (UNESCO, 2012). Tweed and Sutherland (2007) extend the concept of cultural heritage to incorporate under the umbrella of sustainable development sites that do not fit well with legislation for monuments and historic districts but are worthy of conservation because of their urban character. Although cautioning against extreme relativism, Smith (2006) is critical of the “authorised heritage discourse” that emphasises the material basis and expert knowledge of heritage and argues that all heritage is intangible. By this definition, “the heritage gaze is directed to the affect of heritage rather than to the cultural ‘object’ or ‘event’ itself” (Smith, 2006, p.56).

6.2.2 Urban heritage in tourism

The role of tourism in the revalorisation of urban heritage has been widely researched (Chang et al., 1996; Orbasli, 2000; Nasser, 2003). Economic revenue is an evident justification for urban heritage conservation when it is pitted against the need for urban redevelopment to exclude incompatible historic buildings. However, this process is often accompanied by the woes of rapid tourism-oriented development, such as excessive numbers of tourists and tourist facilities, the decline in urban character, and

the authenticity issues and accessibility inequality that result from gentrification (Orbasli, 2000; Carr and Servon, 2009; Zhang et al., 2015; González Martínez, 2016). These problems, most of which stem from space contestation, detract from the conservation principle of authenticity and may exacerbate the local-foreign divide (Liu et al., 2017; Soszyński et al., 2017). Guzmán et al. (2017) critiqued the scope of cultural heritage addressed in urban development reports for being limited, e.g., cultural consumption for tourism.

In parallel with the broadening scope of urban heritage, the negative effects of its adaptive reuse and other treatments have been widely documented in heritage tourism and urban studies in an Asian context (Yung and Chan, 2011; Cho and Shin, 2014; Yung et al., 2014). Furthermore, the individual changes in buildings and public spaces through economic revalorisation will increase the pressure with respect to the sacrifice of traditional communities. As shown in a case study of Hong Kong (Yung et al., 2014), the few traditional Chinese shophouses that remain were conserved on the grounds that they embody a local collective identity, and the conversion to commercial uses was undertaken as part of larger urban renewal schemes, resulting in mixed responses to the discontinuity in building use, way of life and sense of place. However, the potential benefits for psychological and social wellbeing are much less frequently addressed, tactically rather than strategically, in the framing of conservation necessity and integrated into heritage conservation action plans and assessment frameworks.

6.2.3 The everyday mobility of walking

Urban heritage is a catalyst for the formation of sense of place and place attachment, and when the disruption of the material basis of such affective bonds looms large, the behavioural responses that ensue will be aimed at maintaining the status quo (Devine-Wright, 2009). However, residents might also succumb to urban redevelopment pressures and resort to destroying urban heritage elements that are meaningful to them (Amin, 2018). In contrast to drastic urban transformations, an equally important question to ask about the behavioural effects of urban heritage concerns people's travel or mobility patterns in a day-to-day setting (Deutsch and Goulias, 2012). This behavioural inquiry is connected to the "new mobilities paradigm" (Sheller and Urry, 2006; Cresswell, 2010) or the "mobility turn" (Hannam et al., 2006; Faist, 2013), which they foreground how people perceive their surroundings and the preferences and attitudes that drive people's travel behaviour. This mobility aspect is particularly relevant to

active modes as walking is heralded as the greenest transport mode and promoted for public health benefits. In a broader context of wellbeing, Gatrell (2013) explored the two-way implications of walking, that is, being influenced by the material aspects of the built environment and, conversely, modifying the social context of a therapeutic landscape. As a holistic approach to studying pedestrian behaviour, Kärholm et al. (2017) devised a vocabulary of “walking assemblage” and “boundary objects” to encapsulate a plethora of walking types—the relational role of the walking person, including joining an informal group of queuing transit passengers, and the diversity of activities that boundary objects such as a footpath or a shared space can afford to sustain. When the same concept is applied to heritage places, the interface between historic buildings and open spaces as a boundary object is distinct from either in isolation because its dual identities (i.e., the frontage of buildings laden with meanings versus open spaces merely for pedestrian traffic) combine to exert a transformative force in a series of human-environment transactions.

The emphasis of the mutable embodied nature of walking as an urban experience stands in stark contrast to the positivist approach to quantifying the relationship between travel and the built environment in transport planning research, in which the measurement of the built environment is often operationalised as the “D variables” with a major focus on travel efficiency (Cervero and Kockelman, 1997; Ewing and Cervero, 2010): density (e.g., population, dwelling units, employment, and building floor area per unit of area), diversity (entropy measures to differentiate single-use and mixed-use environments), design (street network characteristics; average block size, proportion and number of four-way intersections), destination accessibility (regionally speaking, the distance to the central business district; locally speaking, the distance from home to the closest store), distance to transit, demand management and demographics. In addition to objectively measured variables, subjective variables, such as aesthetics, also come into play (Humpel et al., 2004; Owen et al., 2004; Hoehner et al., 2005; Ferrer et al., 2015). Despite the seeming compatibility of urban heritage being framed as an aesthetic element, in the transport literature, aesthetics could be operationalised as disparate variables that are contingent on specific analytic constructs. For example, in a questionnaire survey study by Humpel et al. (2004), aesthetics was the output of a factor analysis and a composite of scenery, attractiveness, the pedestrian-friendliness of the environment and social friendliness. Another concept that has been found to influence

walking is social dynamics, defined by Craig et al. (2002) as the potential to observe people sitting, standing or moving about.

Such a diverse range of factors and variables in the qualitative and quantitative research on walking reflects the activity's high degree of sociality (Middleton, 2018), and thus, promoting urban walking requires a deeper understanding of the meanings borne by pedestrian encounters in everyday life. This concept suggests that, on top of meeting basic accessibility requirements, a place can be cherished for its social contacts or lively atmosphere and hence invite visitations on foot.

6.2.4 Urban heritage as a district-wise perceptual quality

Although few studies have directly investigated the relationship between quotidian active mobilities and urban heritage, the gap can be partially bridged by attending to the mediator of sense of place or, in most cases interchangeably, place attachment. Place attachment by definition converges on the concept of “emotional bonds which people develop with various places” (Lewicka, 2011), which is construed in place research as a predominantly social and experiential concept rooted in phenomenology (Seamon, 1980, 2012). However, in psychometric studies, place attachment is operationally determined by a plethora of constructs and measurement scales (Hernandez et al., 2014). The frameworks proposed by Scannell and Gifford (2010) and Manzo and Perkins (2006) include *place* as a distinctive dimension that can to some extent be separated from the social interactions afforded by the physical setting; however, their review also showed that the place dimension is the least researched one, as opposed to the cognitive and affective dimensions; thus, place is often presented as an abstraction stripped of its built environmental characteristics. Myriad constructs have been devised to measure sense of place for inclusion in quantitative travel behaviour models (Deutsch and Goulias, 2012; Deutsch et al., 2013; Chen and Sekar, 2018). In a study of the locus of place identity as a component of sense of place, Cuba and Hummon (1993) found that significant factors vary depending upon the geographical scale: place identity with respect to one's dwelling is influenced mostly by demographic and migration characteristics, whereas community-level place identity is based on social participation attributes, and region-level place identity is based on inter-community spatial activity. At the neighbourhood level, as revealed by a survey of property owners (Stedman, 2003), place attachment to a lake landscape could hardly be ascribed to the physical environment characterised by shoreline development density, but indirect effects that were mediated by different place

meanings, such as a place of escape or a social place, prevailed. The magnitude of sense of place being independent of the meanings ascribed to places begs the question of what level of detail of heritage places can foster attachment: specific architectural elements, architectural ensembles or streetscapes punctuated or dominated by heritage.

Thus, returning to the place dimension of the tripartite place attachment framework (Scannell and Gifford, 2010), some studies in environmental psychology have specifically compared affective differences in restoration between urban and natural settings (van den Berg et al., 2003; Kinnaefick and Thøgersen-Ntoumani, 2014; Bornioli et al., 2018). In particular, Bornioli et al. (2018) probed the restorative effects in terms of stress relief and pleasure obtained from virtual exposure to the urban environment and found that positive psychological changes similar to those derived from walking in a natural setting, such as a park, could also be offered by a pedestrianised historic setting. With a finer urban design resolution, Lindal and Hartig (2013) used computer-generated residential streetscapes composed of buildings of varying heights, silhouettes and surface attributes placed along a street segment in different orders and found significant mediating effects of entropy (as the measure of architectural variation) on self-appraised restorative quality via the sense of escape and fascination. In this case, walking was used as a conditioning method; hence, whether the same effect could be deduced in the opposite direction, from perception to intention to engage in active mobility, might warrant a different research design. Although applied in different disciplines, affective qualities, such as restoration, and place-based urban design qualities (Ewing and Handy, 2009; Ewing et al., 2013) share methodological similarities and can complement one another in unravelling the perceptual complexities of urban settings. For instance, imageability refers to “the quality of a place that makes it distinct, recognisable, and memorable” (Ewing et al., 2013, p.5). Based on expert ratings, imageability is found to be significantly associated with the presence of plazas or pocket parks, major landscape features, the proportion of historic buildings, buildings with non-rectangular silhouettes, and the presence of pedestrians and outdoor dining (Ewing et al., 2013, p.47). Urban heritage, due to its physical attributes and urban context, can also affect other urban design qualities, such as enclosure, human scale, transparency, complexity, coherence and legibility. Past research has showcased the built environment, including its subcategories from urban to rural settings, as an enriched combination of physical attributes, perceptual qualities and individual or collective meanings.

However, the complete path from the built environment to daily active mobility mediated by perceptual and experiential urban characteristics remains an under-researched topic in the cross-disciplinary literature. Meanwhile, public opinion of the role that heritage should play in urban development can emerge from different angles, be subject to different government policy agendas and be contingent upon specific geographical and cultural conditions. As this study was motivated by the question of the potential active mobility outcomes of heritage places, which have profound implications for urban and transport planning and everyday neighbourhood management, it is worthwhile to study the themes emerging from public opinion with a focus on interaction between government agencies and indirect behavioural effects of urban heritage, compare them with the academic research strands reviewed above and thereby obtain locally relevant research directions.

6.3 Materials and methods

As a result of iterative material selection and data extraction, a mixed methods approach (Johnson and Onwuegbuzie, 2004) that is qualitative-dominant was adopted. The major analytic component is a thematic analysis to gauge the range of views regarding urban heritage. The minor analytic component is a contingency table analysis to test for statistical associations among four relevant government agencies in news coverage. Two themes identified in the thematic analysis and described further in the Results section, i.e., Theme 1 (pedestrian-oriented urban and transport planning) and Theme 2 (synergy between heritage and arts), were consistent with the significant results of the contingency table analysis. These findings from qualitative and quantitative analyses complement each other and offer stronger indication for future research with a focus on issues such as government-led initiatives. For clarity, the presentation of analysis methods and results follow the sequence of data processing.

6.3.1 Study area

The convergence of urban heritage and active mobility is gaining traction in Singapore's public realm, a city-state widely recognised for its rapid economic development after its independence in 1965. In recent years, growing attention has been paid, in large part driven by governmental efforts, to history and heritage in a search for a deeper understanding of the national identity. In 2019, Singapore was celebrating the bicentennial of Sir Stamford Raffles' arrival, harking back to its colonial past. Reiterating the continued importance of safeguarding historical landmarks, which was

articulated with the landmarks' first legal designation in 1973 (NLB, 2014), the National Heritage Board (NHB, 2018) further claims that conserving places serves as a physical reminder of both national history and individual and collective memories. The emphasis on place acts as an extension of the traditionally museum-associated heritage. The interaction of the physical and perceptual aspects of heritage creates new possibilities for how the vision of heritage conservation can find practical applications in other sectors such as transport. For example, Singapore's government has continually rolled out schemes to promote active mobility, such as extensive construction of sheltered walkways linking transport nodes, and temporary or permanent pedestrianisation of street segments rich in historic architecture. This emphasis on active mobility promotion has been added to the previous reactionary pedestrianisation initiatives in commercial and historic areas (Yuen and Chor, 1998).

6.3.2 Material selection

Texts are a major data source for social research and can be primary sources, such as interview transcripts, or secondary sources, such as newspaper articles, with the latter receiving renewed interest owing to digitisation (Bauer, 2000). Given its exploratory nature, this study utilises the data source of newspaper articles and capitalises on the ability of electronic databases to construct historical data to decipher social trends and achieve as wide a range of views as possible. English is the working language in Singapore, and according to 2017 statistics (SPH), the local newspaper with the largest circulation is the English-language *Straits Times*. For data corpus generation, the database used is LexisNexis Academic, which contains global news, legal and business information, including full-text reports from *The Straits Times*. For an overview of the selection criteria (Figure 6.1), news articles related to heritage were searched from the past two decades (from 1996 to 2018, see also Table 6.1 for the choice of study period) and restricted to Singapore, composing the base pool of bibliographic records. Figure 6.2 shows that the annual total number of articles has remained relatively stable, but the frequency of heritage-related articles is clearly on an upward trend, which is indicative of growing public recognition. The peak in 2015 coincided with the fiftieth anniversary of the nation's independence and the inscription of Singapore Botanic Gardens on the UNESCO World Heritage List.

Subsequently, as illustrated in Figure 6.1, based on bibliographic information and keyword occurrences, the article records were refined using two filters: (1) subject

matter that is loosely about urban heritage in Singapore, namely, buildings, sites and landscapes, and about walking and pedestrian-related facilities; and (2) co-occurrence of the Land Transport Authority (LTA) and any of the other three major government agencies involved in urban heritage, namely, the National Heritage Board (NHB), the Urban Redevelopment Authority (URA), and the National Arts Council (NAC). Although urban heritage was the focus, the article selection did not exclude co-occurrence with other types of heritage; however, irrelevant sections such as overseas travel and world news were excluded. Despite the additional keywords, heritage with other meanings might have appeared in the results. To address this issue, the full texts were skimmed, and those that were confirmed to be highly relevant were selected for further thematic

Figure 6.1 Steps of article selection, number of articles at each step and corresponding analyses (see also Table 6.1 for acronyms).

Figure 6.2 Frequency of heritage-related articles in *The Straits Times* (1996–2018).

analysis. For instance, those that were purely informational, such as lists of event dates and venues or award recipients, were excluded. The resulting sample comprised a mix of news articles, editorials (written by correspondents but expressing their views), and opinion pieces by non-correspondents (refer to Appendix D for the bibliography of the sample).

6.3.3 Contingency table analysis

One focus of this study is how the public sector, in an inter-agency manner, addresses the relationship between urban heritage and active mobility, as revealed in newspaper coverage. In the base pool of articles, mentions of Singapore's four major relevant government agencies (Table 6.1) were searched for in the same period, considering the years since their establishment, to generate a contingency table. There is overlap in the urban heritage function between the NHB and URA, and it should be noted that the designation of national monuments and conserved buildings rests with the URA.

Table 6.1 The four relevant government agencies of Singapore.

Name	Since	Function
National Heritage Board (NHB)	1993-08-01	Management of museums, heritage institutions and heritage sites
Urban Redevelopment Authority (URA)	1974-04-01	Land use planning, heritage designation, urban design and conservation guidance
National Arts Council (NAC)	1991-10-15	Promotion of literary, performing and visual arts
Land Transport Authority (LTA)	1995-09-01	Land transport planning, road and public transport management, vehicle and mobility device regulations

6.3.4 Thematic analysis

As mentioned previously, the sample of heritage-related articles was collated based on the two relevance criteria and then subjected to a thematic analysis to gauge the range of views and identify key themes. The thematic analysis procedures follow Braun and Clarke (2006) and, in more detail, Guest, MacQueen, and Namey's (2011) textbook. Despite a predominance of quantitative studies in the transport field, thematic analysis as a qualitative approach has also been adopted, for example, to explore symbolic motivation and national culture in relation to transport choice (Ashmore et al., 2018) and to understand the decision-making process of car purchasing (Hafner et al., 2017). In their attempt to demarcate thematic analysis as a distinctive method, Braun and Clarke (2006) highlighted its flexibility, i.e., its independence of theory and epistemology, as the key utility. Because the study was driven from the outset by the question of how

urban heritage and active mobility have been reported and how they are interconnected in public discourse, the cross-disciplinary and exploratory nature of the inquiry and the need to hedge for unexpected propositions justify thematic analysis as an appropriate method to identify socially relevant problems and lay the groundwork for future research in this underexplored intersection. The first author indexed the entire sample, while as a reliability check, two undergraduate students were hired to index an identical subset of 50 articles independently using the resulting codebook of themes and subthemes (refer to Appendix D for the detailed codebook). The average percentage agreement aggregated at the theme and article levels ranged between 62% and 93%, indicating moderate to excellent agreement (Saelens et al., 2006) and confirming the prevalence of themes in this exploratory study.

6.4 Results and discussion

With regard to the narrow research question, this section presents the analysis results of the contingency table of key government agencies and further discusses their interaction in public policy in terms of the first two prevalent themes (Theme 1 and Theme 2) identified in the thematic analysis. Then, the study proceeds to the broad research question, and a wider range of themes (Theme 3 through Theme 7) is discussed.

6.4.1 Results of contingency table analysis of key government agencies

The four-way contingency table (Table 6.2) shows that, as expected, only 71, or 2%, of a total of 3,792 articles mentioned the LTA. To further examine the association among the four agencies simultaneously, a loglinear model was fitted to the contingency table. Unlike logistic regression models, in loglinear models, the cells are treated as independent observations of a Poisson random component, and the symmetrical treatment allows for the examination of association in the joint distribution of variables (Agresti, 2013). The residual deviance of the estimated model can be used in assessing goodness of fit (Fox and Weisberg, 2011). Statistical analysis was conducted on the R platform using the base installation (R Core Team, 2017).

First, a saturated model was fitted. The type II analysis of deviance showed that all three-way interaction terms were non-significant at the 0.05 significance level except for NHB:LTA:NAC ($p = 0.02$). Subsequently, two reduced models of the significant terms were fitted. Model 1 included the NHB:LTA:NAC three-way interaction term and, by the principle of marginality, the corresponding two-way interactions; Model 2 contained

Table 6.2 Heritage-related article counts of NHB, URA, NAC and LTA (1996–2018).

NHB	URA	NAC	LTA	
			Yes	No
Yes	Yes	Yes	4	7
		No	7	43
	No	Yes	1	88
		No	8	682
No	Yes	Yes	0	12
		No	16	221
	No	Yes	0	144
		No	35	2524

up to two-way interactions. The comparison of the two models (Table 6.3) shows that the three-way interaction did not result in additional significant parameters.

Although the goodness-of-fit tests based on the residual deviance indicate a moderately good fit for Model 1 ($p = 0.172$) and a poor fit for Model 2 ($p = 0.028$), the difference in the AIC and the dissimilarity indices is negligible. Because a dissimilarity index of less than 1% indicates an excellent fit (Agresti, 2013), it is practically equivalent to interpreting Model 2 without three-way interaction. The only significant interaction terms are URA:LTA and NHB:NAC. In the absence of higher interaction terms, the conditional odds ratios of two variables remain the same for the combinations of the others, i.e., homogeneous association. The conditional odds are calculated by taking the exponents of the coefficients. For URA:LTA, the conditional odds ratio is 7.5, with a 95% confidence interval of (4.5, 12.2), indicating that the LTA is 7.5 times more likely to appear when the article mentions the URA than when it does not. Similarly, for NHB:NAC, the conditional odds ratio is 2.4, with a 95% CI of (1.9, 3.2).

Therefore, we infer a strong positive association between the URA and LTA and a moderate association between the NHB and NAC. Within the context of urban heritage, the association between the former can be attributed, on the one hand, to the close relationship between land use and transport planning, with transport as one type of land use in the master plan. On the other hand, the competition for land resources and potential conflict between urban development and conservation might be at play. The management of heritage sites is often compatible with arts affairs, which might explain the association between the NHB and NAC. The contingency table analysis reveals significant associations in two pairs of government agencies. The next thematic analysis

(in the following section) aimed to derive more depth from the inter-agency agendas and capture other aspects of the interplay beyond the public sector.

Table 6.3 Summary of loglinear models.

	Model 1		Model 2	
	Coeff.	S.E.	Coeff.	S.E.
<i>Intercept</i>	7.84***	0.02	7.84***	0.02
NHB	-1.33***	0.04	-1.33***	0.04
URA	-2.50***	0.06	-2.50***	0.06
LTA	-4.39***	0.17	-4.36***	0.15
NAC	-2.87***	0.08	-2.89***	0.08
URA:LTA	2.01***	0.25	2.01***	0.25
NHB:NAC	0.84***	0.14	0.89***	0.14
NHB:LTA	0.11	0.30		
LTA:NAC	-18.64	3979.61		
NHB:LTA:NAC	19.58	3979.61		
<i>Residual deviance</i>	9.02	(df = 6)	18.71*	(df = 9)
<i>AIC</i>	104.19		107.89	
<i>Dissimilarity index</i> [†]	0.84%		0.89%	

Notes: Significance: * < 0.05; ** < 0.01; *** < 0.001. [†] $\sum_i |n_i - \hat{\mu}_i|/2n$, where n_i is the observed cell count, $\hat{\mu}_i$ is the estimated cell count, and n is the total number of observations.

6.4.2 Thematic analysis results

This section delves deeper into the prevalent themes. It and the previous sections are related through a discussion of Theme 1 and Theme 2 that focusses on the interactions between key government agencies and substantiates the contingency table analysis results. More broadly, the other themes (Theme 3 through Theme 7) draw from official stances and public opinions on heritage. The number of theme occurrences ranges from 20 to 68, accounting for 16%–54% of the articles. As illustrated in Figure 6.3, a general pattern can be observed of the themes being mentioned more frequently in recent years (2012–2018) than in the earlier periods (1996–2003 and 2004–2011) of the study timespan. Representative quotations from the newspaper articles are presented to facilitate discussion. For clarity, the quotations are assigned a source reference number (refer to Appendix D for individual article indexing) and differentiated by the sector represented by the interviewee or commentator, namely, government agencies, non-governmental organisations (NGOs), research institutes, industry stakeholders, correspondents themselves providing general observations and members of the general

public expressing their opinions. Despite potential editorial bias in reporting, the overall balance between positive and negative views and the multiplicity of interviewee types reflect a broad base of public opinion, and thus the authors deemed the sample of newspaper articles sufficient for the purpose of exploring themes and linkages. It is beyond the scope of this study to examine how these societal sectors cooperate or conflict with one another.

Figure 6.3 Number of articles (n=126) coded under a theme (divided into three periods and arranged in decreasing order; see Figure 6.4 for theme label descriptions).

Additionally, to illustrate their linkage to the hypothesised behavioural manifestation of walking, the themes are organised in a theoretical flowchart (Figure 6.4). Although the prevalent themes were identified in and grounded by the local press coverage, the arrows indicate a potential correlation or causation that is worth further research and do not rule out other possible pathways leading to walking in historic or heritage-infused areas.

- **Theme 1 – Pedestrian-oriented urban and transport planning**

The paradigm shift in urban and transport planning to reduce car dependency and promote active mobility is likely to create scope for heritage conservation. The URA and LTA have developed respective master plans, and the recent plans complement each other as follows:

Figure 6.4 Flowchart of hypothesised sequence from urban heritage to walking.

“The belief underpinning this theme is that Singapore cannot afford to focus solely on increasing capacity to address its transportation needs. ... making increasingly hefty investments in infrastructure ... is wasteful and unsustainable in the long run. Hence, the URA's decentralisation plan – to put more jobs nearer homes – is finally gaining traction drawing board since the 1980s.” (correspondent, 2013h)

On this united front, time-based street pedestrianisation schemes have been created to reclaim urban space from cars. Among the recent ones, which correspond with the increasing occurrence of the catchphrases “car-lite” and “car-free” observed in the articles, are the “Streets for People” and “Car-Free Sunday” schemes. The Streets for People scheme, launched by the URA in 2015, aims to revitalise the public asset of streets through temporary closure and event programming. The eligibility criteria require that, in principle, the applicant be a resident or a stakeholder in the street and the access not be limited, e.g., by ticket sales or registration (URA, 2017). Despite the alleged ground-up community nature, regular implementation of this scheme has been concentrated in a few street segments in conservation areas and night life havens that are off limits to vehicles for several hours on weekends (URA, 2019). On a larger scale, the monthly Car-Free Sunday event temporarily closes the streets in the civic district, where a majority of Singapore’s historic buildings are located (URA, 2016b). This event has centred on a variety of themes, ranging from fitness to augmented reality.

However, the higher level of flexibility adopted by urban management for alternative uses of public space, which is contextualised in the national push for a car-lite society, tends to be event-centric and pays little attention to everyday uses that can be mundane, such as walking or taking a stroll, or stationary, such as sitting and taking a rest.

- **Theme 2 – Synergy between heritage and arts**

The NHB and NAC share a major public education mission through either heritage or arts. These issues are often mentioned in the line-up of events that occur in historic districts and feature visual and performing arts. The close working relationship of the two agencies is captured in detail in some articles, for example, reports about the conversion of the old Parliament House into a heritage and arts centre. In a report about the conversion of the adjacent former Supreme Court and City Hall into the National Gallery, a stakeholder comments that “Singapore is making a statement about the importance of heritage by taking an existing building to make its national gallery, unlike cities such as Hong Kong and Dubai which are building galleries from scratch” (stakeholder, 2014f).

The prevalence of heritage and arts in terms of programming is indicative of the movement to bring what is traditionally thought to be fixed in museums outside into a public space for a broader and more engaging outreach, which in turn helps broaden the scope of urban heritage (T2→T3 in Figure 6.4). Another recurring subtheme is the synergistic relationship between heritage and arts programming related to the annual Singapore Heritage Festival since 2004 and extending into the revitalisation of historic districts. However, at the same time, much innovation is also being applied to the curatorial efforts of heritage and art institutions. Artworks, whether museum exhibits or public art installations, can be thought-provoking stimuli that are effective for engagement and meaning formation. With appropriate equipment and instruments such as a crowd-sourcing app, as Ross et al. (2018) argued, divergent interpretation leads to a higher sense of ownership of cultural heritage, and this process itself is heritage-making. At a regional level, Johnson et al. (2011) analysed Melbourne’s household travel survey data with a focus on the trip purpose of art and cultural activities and found a pattern of one- or zero-car ownership and members of inner-city households being more likely to travel to art destinations. This finding sheds light on the potential symbiosis between art and transport, particularly in a car-lite vision in which a reduction

in private vehicle travel is expected to be realised in part by a higher level of active mobility. In this context, heritage fits well with this symbiosis, drawing more attention and innovation to public policymaking and planning practices.

- **Theme 3 – The broadening scope of urban heritage**

An increasing recognition of heritage value in unconventional built types, other than colonial-era buildings and the more recognised shophouses, prompted concerns about carelessly giving way to urban development. These built types include public libraries, public housing blocks and playgrounds, private strata-titled buildings, industrial structures and even some old bus stops and tree-canopy roads, which have a less pronounced presence in the cityscape. In 2008, the URA designated towers, bridges and structures for conservation for the first time. Commenting on this move, the then-National Development Minister said, “What makes a place distinctive and memorable [are] not just buildings. It could be an elegant tower, a historic bridge or a beautiful pavilion. There are many places and landmarks that we can identify with and feel for in Singapore – places where we spent quality time with our family and friends” (government official, 2008f).

This more vernacular take on urban heritage has been carried through in recent years, in parallel with a conscious effort to defy the stereotype of heritage, as shown in the reporting of how heritage was to be experienced. For example, the inaugural Heritage Festival was touted as a “realm-of-the-senses event” without “artefacts in air-conditioned galleries or wordy lectures to sit through” (correspondent, 2001a).

- **Theme 4 – Sensitivity to and perception of urban heritage**

Regarding heritage promotion, there appeared to be an acute awareness that heritage might not be as deeply-rooted in the local culture as desired. Apathy or lack of interest prevents people from engaging with heritage places despite proximity. For example, “Museum officials also recognise that Singaporeans are not yet avid museum-goers, a fact which is acknowledged to be due to a lack of museum-going culture” (stakeholder, 1997b).

More broadly, passive familiarity with places that people pass by regularly but do not bother to learn about also tends to hinder sensitivity to the built environment that is absent of an external force of change, such as participation in walking tours or the advent of mobile apps. Nonetheless, there is an implied correlation, often discussed in an

abstract manner, between the perceptual quality of urban vibrancy and the intensity of public life.

Some reports lamented the loss of vibrancy, for example, “Evolution or revitalisation: Many of us lament the loss of Chinatown's cultural wealth and hustle and bustle, which we get to savour only occasionally, such as during the Chinese New Year and Mid-Autumn festivities” (correspondent, 1998d). The major renewal of ethnic enclaves such as Chinatown, Kampung Glam and Little India, interspersed with incremental improvements, has spurred a public debate about authenticity and vibrancy. The justification for the commodification of a historic district is often based on tourism concerns, although it is not without public support. Simultaneously, this market-driven rationalistic view invites criticism of the neglect of the intrinsic neighbourhood spirit or urban character. For example, rebutting a pro-tourism view that “Little India is not as organised as Chinatown. Most of the shops in the small lanes feature businesses that have no relevance to tourism at all, such as shops selling automobile spare parts, and food caterers” (member of the general public, 2016a), a Singapore Heritage Society member countered that “‘organised’ is not always the best approach, and while Chinatown is geared towards tourists, it is authentic heritage that gives visitors a meaningful experience” (NGO, 2016n).

The mentions of the perceptual qualities of heritage places, such as sense of place and urban character, mirror the literature of place (Lewicka, 2011). Although past transport research has addressed the non-physical factors affecting active transport, such as walking, by adding the category of aesthetics (Humpel et al., 2004; Ferrer et al., 2015), the standard practice, for instance, of treating both physical and non-physical factors as equal independent variables affords little explanation of the potential mediating effect of urban heritage linking the physical and behavioural realms (see the pathway of $T3 \rightarrow T4 \rightarrow T6$ in Figure 6.4). While the complexity and multidimensionality of urban heritage in terms of perception and cognition are confirmed qualitatively in this study, more emphasis is placed on their behavioural manifestations, as discussed in the sections on the next three themes. This exploratory component also extends beyond the intra-personal boundaries and serves as an initial attempt to fill the gap in place research where less is understood about the physical and procedural aspects of attachment (Scannell and Gifford, 2010; Lewicka, 2011), particularly on an intra-urban localised scale.

- **Theme 5 – Kinaesthetic heritage learning by locals and tourists alike**

The theme most closely related to both urban heritage and walking was heritage trails, which were often associated with walking tours. Heritage trails are designed primarily by the NHB to string together heritage places of various sorts on routes along which signboards or markers are installed. Moreover, private companies in the tourism industry design walking tours that offer alternatives to mainstream tourist attractions. Community organisations also use this method to mobilise residents to rediscover special and meaningful places in neighbourhoods in a bottom-up manner. Regardless of the type of organisation, a thread running through these initiatives is the notion of learning while walking, which can be serendipitous, compared with a classroom setting.

The expansion of official heritage trails from the first one in the civic district to later trails covering Singapore's heartlands is in itself a reflection of a more inclusive definition of urban heritage. Appreciation of or sensitivity to urban heritage is to a great extent enabled by prior knowledge, experiences and memories (Markwell et al., 2004). Although mobile apps began to be featured in 2010 and provided easier access to information, the framing and curation of heritage trail contents did not substantively change. Unfortunately, in the sample, there was no account of how the proliferation of information communications technology (ICT) has affected the prevalence of heritage walking behaviour and decision-making. While the concept of learning while walking is compelling and effective for knowledge attainment, the fact that it takes a toll on pedestrians should not simply be overlooked. Vivid recounting of heritage trail experiences, such as the brutal weather making lengthy write-ups difficult to read through (member of the general public, 2013b), is a reminder of the physical challenges during such kinaesthetic learning.

For the purpose of learning and remembering, the popularity of hands-on experience, or kinaesthetic learning, by means of heritage trails has been on the increase in both community-building initiatives and tourism. However, tourism is often at the forefront of a local-foreigner divide and controversy. To attenuate dichotomous thinking that heritage places and activities are for either locals or tourists, the niche role of locals as tourists, or "resident tourists", has begun to be featured.

"NHB hopes that more and more Singaporeans will embark on self-guided tours or sign up for community-led tours so that they can be resident tourists for a day and rediscover Singapore's heritage anew" (government official, 2017g).

A heightened awareness of the surroundings and curiosity about the history and stories behind places can be more effectively sustained and satisfied by direct engagement, such as urban walking, or by reconstructing a walking assemblage of transformed socio-material relationships (Kärholm et al., 2017) through the learning of urban heritage. Although heritage trails support walking tours, which are a type of walking, the proactive learning process is likely to help people internalise heritage values and meanings, resulting in a continuation of walking behaviour apart from occasional event participation.

The wide array of heritage trails corresponds to Barber's (2018) typology based on a case study of similar trails in Hong Kong: state-generated, market-oriented and community-based. However, the overlap among these types can be substantial, particularly between the state-generated and community-based heritage trails over which, in the case of Singapore, the government agencies maintain a pronounced presence through the mobilisation and coordination of residents, stakeholders, service providers and volunteers, apart from event funding. In addition, the expansion of heritage trails is not without potential negative aspects. From a place branding perspective, the storytelling of a place, although collaboration can now be more easily incorporated due to ICT, ultimately favours consonance over dissonance for a consistent and distinctive place identity (Bassano et al., 2019). The implicit pressure to abide by funding bodies' requirements (Barber, 2018) can have an adverse effect on the diversification of bottom-up interpretations of heritage places. The nature of such heritage trail activities on a predetermined-spontaneous continuum (guided or self-guided tours or sporadic encounters), when coupled with varying degrees of self-censorship, might condition an individual's willingness to interact with places on foot on a day-to-day basis. Nonetheless, compared with some instances of provocative urban walking as a form of behavioural art (Goh, 2014), heritage trails have a broader appeal and are suitable for individual exploration or community building. In a community walking initiative documented by Dobson (2011), the residents participated initially in the design of walking routes using what Cheung (2003) described as the detective's eye and then in group walking tours to discover the hidden patina in ordinary landscapes. Although one of the initiative's objectives was to turn physically inactive people into regular walkers through social bonding, the intensity of the new attachment that was believed to have been formed and the effect on walking frequency and intentions remain unclear.

Therefore, there is scope to further probe how perception influences walking and other physical activities in the case of heritage trails.

In line with one of the key concerns of the new mobility paradigm in relation to everyday transport (Sheller and Urry, 2006), role switching between locals and tourists for deeper urban experiences is typical of the nuances of various modes of transport that otherwise tend to be classified in a simplistic leisure category, but the behavioural effects on daily active transport—whether they exist and persist—remain elusive. However, this geographical scale of mobility is more localised than those that have been extensively studied in place research, such as country migration and residence relocation (Lewicka, 2010, 2011). In contrast to the preconception that traditional place attachment invariably implies rootedness and nostalgia, Lewicka (2010) used a cluster analysis of psychometric measures to identify an active type of place attachment characterised by openness to new experiences and social interaction. The applicability of active attachment at an intra-urban level, i.e., willingness to explore places outside one's residence but within a city, rather than a regional or international level, is thus of particular interest for investigating the mechanisms through which habits of walking and other active transport modes form to maintain proximity to the surroundings. Routine place-environment interactions are akin to the generative processes of place attachment described by Seamon (2014, p.17), one of which is termed place identity with an emphasis on its procedural aspect “whereby people living in or otherwise associated with a place take up that place as a significant part of their world” (p.17). In this vein, it is the knock-on effect of participation in kinaesthetic learning activities such as heritage walking tours, rather than the repetition of those activities per se that is key to initiating and possibly sustaining a new line of place-environment interactions, or “time-space routines” (Seamon, 1980).

According to Seamon (2014), how interaction and attachment influence each other need not be understood as entirely personal and arbitrary; rather, through another generative process of “place intensification”, public policy and urban design have the potential to shape and strengthen the perceptions of place. With these concepts applied to the aforementioned schemes in Singapore, “Streets for People” and “Car-Free Sunday”, it is noticeable that participation in one-off events appears to be the key objective; the presumed prerequisite of novelty, for example, introducing different themes each time, may have been amplified by the preferential reporting in news articles. As a result, the

ensuing everyday behaviour or time-space routines that align with the car-lite vision are often overlooked. Although the “Streets for People” scheme allows for longer-term regular iterations, the policy’s leaning towards event programming and high mobilisation costs are likely to entail a predominance of performance and retail that can be sustained only by active participation, whereas passive uses that are enabled by street furniture and traffic-calming measures are not adequately addressed. These uses are another area in which the respective government agencies, such as the URA and LTA, can more extensively collaborate, in addition to assisting applicants in seeking approval from other agencies (URA, 2017), in a place intensification initiative that incorporates both active and passive uses of streets and public spaces.

- **Theme 6 – Recreational and/or utilitarian walking**

Based on the specific descriptions in the sample (as opposed to the implied walking component of heritage trails), walking experiences in urban areas are multisensory, or intentionally enhanced to be more so, such as by a heritage festival where participants are encouraged to “sweat, walk, climb trails, smell, cook and eat” (stakeholder, 2001a) or by “Little India’s colourful sights, aromatic smells and cleanliness despite the crowds” (member of the general public, 2016n). Despite the low frequency, the specific type of walking behaviour that is associated with the destination’s sense of place of heritage character did appear.

For example, for utilitarian purposes, “After going on a free walking tour of Joo Chiat last year, I was hooked. I go there to eat about once a week but I wanted to learn more about the place” (member of the general public, 2014d). For recreational purposes, which can be situated in an indirect exchange with heritage surroundings, “And just because most Singaporeans do not have ancestors interred there (Bukit Brown Cemetery, which was slated to make way for highway construction) does not mean they cannot claim the space for strolls and jogs, appreciation tours, or to enjoy the rich flora and fauna there” (NGO, 2016m). Alternatively, the human-environment interaction can occur at a deeply personal level, e.g., “Sometimes, I relive my childhood days by taking a walk down Orchard Road at night” (member of the general public, 2018i).

- **Theme 7 – Maintaining everyday relevance**

Public education, as a means of inculcating the relevance of urban heritage, can be complemented by kinaesthetic learning approaches such as walking tours. Although this

issue is framed in a historic sense, the everyday relevance to locals and tourists alike is equally important. For example,

“... this notion of utility or relevance ... was a consistent factor of consideration when it comes to the general public's evaluation of a heritage site's importance. Most people go about their daily lives with more mundane concerns, such as getting to work ... and getting home” (researcher, 2018j).

“Tourists tend to be very well read, they've done their homework and are curious about what is going on. You cannot explain history meaningfully without relating it to what is happening today in Singapore and the world” (stakeholder, 2012f).

Informed by Themes 6 and 7, walking and maintaining everyday relevance are postulated as a mutually reinforcing process. This process capitalises on the distinctive affective quality of walking among various transport modes (Gatersleben and Uzzell, 2007). Rather than heritage designation, “heritage by appropriation” through daily use (Tweed and Sutherland, 2007) affords more meaningful human-environment and social interactions operating at cognitive and affective levels. Although a recent study (Johansson et al., 2016) investigated the affective walking experiences and found that the intention to choose or avoid a certain route was significantly influenced by perceived urban design qualities, the aggregation of three such qualities (complexity, upkeep and greenery) occurs at the expense of a more fine-grained resolution to identify the effects of specific physical elements. In the case of the identified themes, examining the pathway from historic districts is likely to yield more planning- and policy-relevant insight into a pedestrian-oriented car-lite urbanism.

In addition to the direct impact of pedestrian-oriented planning, this study has uncovered a more complicated potential pathway mediated by other heritage-related factors. The existing synergy between urban and transport planning and between heritage and art programming appears to suggest a higher level of integration. These traditionally segregated public policy domains can be linked by other aspects, such as intensity of public life, land use mix, and heritage elements affecting perceived urban vibrancy and walking behaviour that is motivated by the urban character, which merits more academic attention. A car-lite vision is likely to and ought to introduce significant consequences into the urban landscape, e.g., a shift in space allocation from motorised to non-motorised transport modes, further allowing for more engaging urban experiences. As

more public space is released for pedestrian and recreational uses in a densely built urban environment, urban vibrancy can be restored through a finer-grained pedestrian network and abundance of amenities alongside incremental changes in other built environmental variables (Cervero and Kockelman, 1997; Ewing and Cervero, 2010). The potential for such urbanism, focussing on liveability and sustainability, is immense, particularly in a time when vernacular buildings and structures are increasingly being recognised for their heritage value (T1→T3 in Figure 6.4). With the growing personal and collective importance of urban heritage recognised by both the government and the general public, a variety of historic districts and heritage places, traditionally coupled with a perceived characteristic of high walkability, is a powerful institutional tool and suitable urban setting for investigating the behavioural effects on active mobility. By using research designs such as longitudinal or quasi-experimental designs instead of the cross-sectional design, which still prevails in place attachment and travel behaviour studies (van de Coevering et al., 2015), more in-depth insight into correlation and causality is likely to be gleaned and transferred to other localities and communities. For instance, follow-up can be carried out with participants in heritage walking tours, which are already receiving governmental support (e.g., the expansion of heritage trails and periodic highlights in the programming of heritage festivals) as well as private sector interest, to determine whether an enhanced sensitivity or attachment to heritage elements in their neighbourhood ensues, which might further translate into more frequent everyday walking behaviour. Similarly, more research can be conducted on the behavioural effects of community-led temporary street closures while controlling for the endogeneity, or self-selection, of walking preferences of those who engage themselves in street event organisation as opposed to the residents who happen to pass by. These suggestions all point to potential pathways to a virtuous cycle of walking and maintaining built environmental relevance or meaning, in which urban heritage has an important role to play.

6.5 Chapter summary

This study sought to explore the range of views in the public discourse on urban heritage and active mobility, with a focus on the potentiality of the former to enhance the perceived pedestrian-friendliness of and attachment to the built environment. A contingency table analysis of the four major government agencies, which was part of the data corpus generation process, identified a positive association between the URA and

LTA and between the NHB and NAC. This association is not only indicative of the synergy between the respective domains of public policymaking (urban and transport planning, and heritage and art promotion) but also suggestive of a broader paradigm shift towards a pedestrian-oriented and perception-enabled urbanism. Subsequently, the thematic analysis confirmed this trend and derived a wide range of emerging themes, as illustrated in the hypothesised flowchart (Figure 6.4).

The broadening scope of urban heritage was observed to attempt to defy the stereotypes of inaccessible heritage in the traditional expertise-driven discourse, as was manifest in the recognition of heritage value in unconventional and vernacular types of buildings and structures. Addressing the prevalent apathy towards historically significant structures, the increased number of heritage trails diversifies the means of interacting with heritage places by championing the concept of learning while walking. In addition, the reporting of heritage trails also revealed a thread in which, contrary to the widely perceived local-foreigner divide, the roles of tourists and locals can switch over, particularly in the case of resident tourists. This finding challenges the presumed dichotomy of residents and tourists (Orbasli, 2000), which in turn calls for relational thinking on the direct and indirect consumption and interpretation of urban heritage and thus enhances our understanding of its evolving role that transcends the physical, spatial and social dimensions.

The identified themes shed light on the potential of repositioning urban heritage for walking as an alternative strategy to promote active mobility, which is expected to be applicable to different cities because of the growing importance of heritage conservation on the public agenda. Specifically, three pathways warrant further research. First, the proliferation of heritage trails and the increasing popularity of walking tours offer an avenue to evaluate the longitudinal effect on people's perceptions of the neighbourhood and built environment. Studying the difference among various degrees of participation (Johnson et al., 2011) and the local-tourist code-switching will lead to a deeper understanding of the diverse interpretations of urban heritage, other than the local-tourist divide, in globalising cities and metropolitan areas. Second, further research is needed on how urban vibrancy, among other urban design qualities (Ewing et al., 2013), is related to the built environmental elements, particularly urban heritage. This type of work will generate direct input for the evaluation and modification of urban design regulations, such as those concerning activity-generating uses. Third, the emphasis on

maintaining the everyday relevance of heritage places under a more inclusive definition of heritage highlights the reinforcing effect of walking as a means of heritage appreciation in everyday life. Although the distinction between utilitarian and recreational walking was not remarkable in the sample, it must be made because the two have different requirements for infrastructure provision and urban management. Of particular interest is the potential mutual influence between the two; for promoting active mobility, utilitarian walking bears more relevance, e.g., increasing the on-foot proportion in trip chains by walking an extra mile if the physical cost of walking is offset by the psychological benefit from urban heritage.

One of the study's limitations has to do with languages, or the multilingual landscape in Singapore. In addition to the English-language *Straits Times*, the Chinese-language counterpart—*Lianhe Zaobao*—with a comparable circulation was not utilised in the belief that there would be a large overlap of content and opinions; however, analysing a Chinese-language corpus is likely to provide additional insight into the symbolic and evocative dimension of heritage places that complements the physical dimension. Furthermore, alternative data sources would be required if specific themes or pathways were to be investigated, for example, heritage- and mobility-related policy documents for examining inter-agency relationships, questionnaires of retrospective longitudinal design (van de Coevering et al., 2015) for heritage trails users to survey possible travel pattern changes, and detailed documentation of physical and spatial elements in the built environment to corroborate perceived urban design qualities (Ewing et al., 2013) and place-related psychometric measures (Hernandez et al., 2014).

Chapter 7. The multivalent nexus of redevelopment and heritage conservation

A manuscript developed from this chapter is under review as Wang, Y., K. Yamaguchi, and Y.D. Wong. "Site-level public consultation on development control and urban design requirements in Macao: The multivalent nexus of redevelopment and heritage conservation." *Land Use Policy*.

7.1 Introduction

In recognition of the increasingly intricate interrelationships in the urban age among urban development and governance, and public participation in these processes, the New Urban Agenda (UN-Habitat, 2016) lists several heritage-related commitments, for example, to leveraging both tangible and intangible cultural heritage for sustainable urban development, to integrating cultural elements in planning instruments (master plans, building codes, etc.), and to promoting a more participatory, responsible citizenry for heritage conservation and management. While this all-encompassing, seemingly utopian agenda is a laudable institutional milestone, zooming in on specific localities inevitably paints a more nuanced, if not messy, picture of how economic, social and cultural forces, with diverse stakeholders being either the subjects or objects of these forces, struggle to reconcile urban development and conservation in the local policy arena. Tension is particularly high when heritage places are located in close proximity to residents or when captured within the broadening scope of urban heritage (EC, 2005), the vernacular building stock in inhabited historic towns receives heritage attention. Furthermore, in celebrating the outstanding universal value of heritage, the prestige from the UNESCO World Heritage inscription is not necessarily taken at face value, especially among those directly affected, mainly residents and landowners, in the same historic centres where the onslaught of visitors in an accompanying tourism boom is invariably depicted as being in conflict with local livelihoods (Zhang et al., 2015) and individual development rights.

Against the backdrop of the seemingly irreconcilable conflict between urban redevelopment and heritage conservation in built areas, the present study approaches this perennial dilemma by examining a recent public consultation practice on urban redevelopment in Macao, China. After the World Heritage inscription of the Historic Centre of Macao (UNESCO, 2005), the subsequent heritage conservation management and legislation preparation work culminated in the 2014 enactment of the Cultural

Heritage Protection Act and the Urban Planning Act⁴. Two major changes in the development control and construction approval procedures ensued: First, public consultation was mandated for each site under application for urban development. Second, the Cultural Affairs Bureau (*Instituto Cultural*, IC) was granted the new function of issuing legally binding urban design requirements for the sites within a conservation area. These changes have created a new dynamic of deliberating and legitimising the wider consequences of redevelopment activities in the public sphere. Thus, in the former Portuguese colony of Macao, it is at this juncture that urban conservation, which is supposedly charting a more decisive course under the involvement of the IC, has to navigate circumstances arising from a robust residential living and diverse local concerns. Focusing on Macao's public consultation exercise regarding site-level urban development, this study aims to investigate two interrelated aspects: (1) the intensity of public feedback, and (2) the diversity of argumentation in public comments.

The remainder of this chapter is structured as follows: The literature review draws from the institutional approach to collaborative planning (Healey, 1997) and the historic urban landscape approach to heritage conservation (Bandarin and Van Oers, 2012). The section of materials and data preparation provides an overview of the study area, the public consultation process in question and the dataset generated. With mixed methods (Johnson and Onwuegbuzie, 2004) employed for data analysis, the quantitative component and the qualitative component are presented sequentially. The general trend and spatial patterns of the uptake of public consultation are analysed globally and locally using logistic regression and its geographically weighted (GW) variant. Content analysis is then performed on the public comments submitted for a subset of applications. The discussion section engages with the complementarity of the regression and content analysis results alongside the implications for urban planning, after which this chapter concludes with further research suggestions.

⁴ Available at the Government Printing Bureau website. Both were gazetted on September 2, 2013, as Law no. 11/2013 (https://bo.io.gov.mo/bo/i/2013/36/lei11_cn.asp) and Law no. 12/2013 (https://bo.io.gov.mo/bo/i/2013/36/lei12_cn.asp), respectively.

7.2 Literature review

7.2.1 Collaborative planning versus, or subsumed under, agonistic planning

Collaborative planning theory (Healey, 1997) represents a democratic zeitgeist of consensus-building in the management of varying expectations or complex social relations in spatial planning, and on a smaller scale, development controls. One thrust of such deliberative and interpretative thinking about planning is “to rescue the concept of reason from ... narrow instrumental rationalism” (Healey, 1997, p.50), extending Habermas’ critical theory of communicative action. With argumentation in general viewed as a series of speech acts, the Habermasian notion of communicative action is differentiated from strategic action by the assertiveness of the means-end connection: The former pursues mutual understanding without immediately stipulating an objective to achieve, i.e., an *illocutionary* aim, whereas the latter expects concrete action to be taken as a result, i.e., *perlocutionary* effects (Habermas, 1984, p.285). Healey’s call for a more inclusionary planning regime therefore problematises the dominance of *instrumental-technical* reasoning, which has enjoyed currency in neo-liberal urban planning policies due to its positivist objectivity (Sager, 2011), by reviving the legitimacy of the other two types of reasoning: *moral-ethical* reasoning and *emotive-aesthetic* reasoning.

This tripartite typology of argumentation helps decipher the complexity of public opinion surrounding either regional master planning or local project-based developments. However, the acknowledgement of non-positivist claims is no guarantee that the collaboration process will materialise in an urban policy that is as equitable and inclusive as expected; for example, in case studies of zoning regulation drafting and campaigning, MacCallum (2008) highlights the importance of substantive rather than superficial empowerment through participation. The imbalanced power relations notwithstanding, residents may still continue to participate in consultative urban planning procedures, for instance, an English housing regeneration project (Aitken, 2017), “without aiming to fulfil individual goals”, which is emblematic of communicative action. Embracing such complexity and diversity in the discursive and motivational dimensions of participation thus requires a nuanced mindset from both those who consult and those who are consulted. In an ethnographic study of one community planner’s reflections on participatory practice (e.g., organising local meetings), Forester (2012) drew out not only the chasm between normalised theory and

improvised practice but also the key difference between an organiser and a leader, with the latter having the sensibility to “sound different calls” for engagement beyond winning a single issue at hand. Similarly, this sensibility expects participants, who are often depicted as ordinary citizens, to steer away from an antagonistic position, as extreme not-in-my-backyard (NIMBY) cases continue to be observed (Zhang et al., 2018), towards a deliberative, or alternatively, an agonistic position (Inch, 2015).

Arising from the same observation of, if not frustration over, the inadequacy of consensus-oriented instrumental rationalism, Mouffe (1999, 2000) proposes an agonistic theory of public participation in which consensus building to eradicate the paradoxical co-existence of opposing views and conflicting interests should not be attempted. To avoid the pitfall of consensus-building as a way of emasculating contentious issues (Brand and Gaffikin, 2007), more sympathy should instead be given to “agonistic confrontations” in which antagonists may turn into adversaries or, oxymoronically, “friendly enemies” (Mouffe, 2000, p.13). On a continuum of planning theories spanning from rationalistic to deliberative and to agonistic positions (Bäcklund and Mäntysalo, 2010; Legacy, 2017), perhaps some reflexivity can be employed herein to mitigate their conceptual incompatibility: Deliberative planning strives to build a consensus by paying due attention to ethics and morality, as well as passions and affects; agonistic planning focuses on the legitimisation of the moral-ethical and emotive-aesthetic aspects, although by its own pluralistic logic, the varying weightages among the aspects of tripartite typology, including the instrumental-technical aspect, should be equally legitimate.

7.2.2 Historic urban landscape approach in response to the authorised heritage discourse

The diversification of validity and legitimacy claims in planning discourse, when focusing on urban conservation and, more specifically, heritage designation, teases out the contestability inherent in the notion of outstanding universal value (Jokilehto, 2011) or the material stasis of heritage sites and assets (Smith, 2006). Formal and institutional narratives, or what Smith (2006) refers to as the authorised heritage discourse, about heritage values tend to gravitate towards historicity and monumentality, being biased towards an instrumental rationality in terms of the standardisation of physical urban conservation. However, this heritage discourse indoctrinated by international bodies is undergoing a de-authorising process from within. One by-product is that in assessment,

the self-contradiction between tangible and intangible heritage becomes apparent due to the socially constructed nature of heritage, and this contradiction manifests in the reluctance in professional conservation practice to address fluid, mutable meanings (Smith and Campbell, 2017).

The ascent of the historic urban landscape (HUL) approach is thus attributed in part to the acknowledgement of the right to the aesthetic enjoyment of heritage and the collective responsibility of conservation (UNESCO, 2011; Bandarin and Van Oers, 2012, p.10) and to the endeavours to make conservation practices interdisciplinary and value-based (Ginzarly et al., 2018). The false dilemma between conservation and development, which in the HUL approach is reframed as a problem of managing urban change, may then be exposed by realising the layering of time and space, and by normalising the co-existence of residents and visitors who have differing needs and experiences in urban settings (Bandarin and Van Oers, 2012). In this vein, tourism, which is often portrayed as a contemporary intrusion into local communities, can be viewed as yet another layer in the existing economic, cultural and political layering of historic towns (Smith, 2014).

7.2.3 Participatory urban conservation planning

A search in the diverse planning literature for urban conservation and public consultation shows that they continue to be embedded in urban planning practices, from regional master planning (Siririsak, 2009) to neighbourhood-scale urban renewal (Greenberg and Lewis, 2000; Nienhuis et al., 2011; Jung et al., 2015; Guo et al., 2017) and to the restoration and adaptive reuse of individual buildings (Cheung and Chan, 2014; Hlaváček et al., 2016). Greater citizen engagement is inevitably accompanied by a broadened range of rationales behind development and conservation decisions. Despite the economic success of an urban regeneration programme in South Korea, Jung et al. (2015), citing an earlier example of the Red Town project in Shanghai (Wang, 2009), cautions that cultural component is likely to co-opted for merely economic gains at the expense of the local community. Ascribing the ineffectiveness of policies in addressing local concerns to the disconnect of government officials and experts is understandable (Hlaváček et al., 2016); however, the observation that some on the consulting side are themselves local residents (Jung et al., 2015) points to the enmeshed web of relations across governance levels. In a survey comparing the attitudes of participants and non-participants in urban renewal planning, Nienhuis et al. (2011) reveal an association between a positive perception of the participation mechanism and a sense of belonging,

and they confirm an individualism-collectivism spectrum (Oyserman et al., 2002) of motivation to participate, echoing Habermas' distinction between the illocutionary aims and perlocutionary effects of speech acts.

Alongside the multiplicity of professional and social roles played by participants and the mixture of individualist and pluralist motivations for participation, the range of items over which input from the general public is purposely solicited or inadvertently gathered also varies in degrees of granularity. We emphasise this point in the next section, in which we describe the consultation subject of our study – site-level development controls and urban design requirements and characterise the corresponding public consultation process in Macao.

7.3 Materials and data preparation

7.3.1 Study area – Macao peninsula

Located in the estuary of the Pearl River in southern China, Macao is composed of a peninsular part (8.8 km²), which borders Zhuhai city to the north, and the islands of Taipa (8.2 km²) and Coloane (7.6 km²), which are now connected by the reclaimed land of Cotai (6 km²)⁵. Further reclamation to supply 3.5 km² for new town development is underway near the peninsula and Taipa areas (DSSOPT, 2015). Macao's population⁶ of 658,900 is unevenly distributed (DSEC, 2019), with a majority of 525,200, or a density of approximately 59,000 per square kilometre, being concentrated in the peninsular part, which is more than four times denser than Taipa (104,600 or 12,694/km²) and 16 times denser than Coloane (28,100 or 3,687/km²).

As a former Portuguese colony from the mid-16th century until 1999, when it was returned to Chinese sovereignty as a special administrative region (SAR), Macao retains a great number of religious and civic monuments, a salient Luso-Chinese architectural mix and a pre-industrial meshwork of “narrow, unpatterned streets” (Duncan, 1986), particularly on the peninsula. Currently, Macao is often described as the Las Vegas of the East, and this inter-city referencing (Bunnell, 2015) epitomises the economic boost since the watershed moment in 2002 when the gaming monopoly was broken and concessions were awarded to foreign companies (Sheng, 2017; Simpson, 2018). Despite

⁵ Statistics of 2018 provided by the Cartography and Cadastre Bureau (DSCC) of Macao. Retrieved from DSCC website https://www.dsc.gov.mo/CHT/knowledge/geo_statistic.html.

⁶ The total population includes 1,000 houseboat people. In the population statistics by district, Taipa includes a tract of 1-km² land that is leased to the Macao government for university campus use. Source: DSEC (2019).

a dip around 2014, Macao's economy remains resilient and was ranked third in the world, with a per capita gross domestic product of USD 81,152 in 2019⁷. In parallel with the rapid gaming-centric economic development, urban conservation reached a milestone with the 2015 inscription of the Historic Centre of Macao on the World Heritage list (UNESCO, 2005). As shown in Figure 7.1, the inscribed historic district is formed by an area covering iconic monuments and urban squares (Wang et al., 2018), such as the Ruins of St. Paul's and the Leal Senado Square, to the west and the Mount Fortress area to the east. In line with the recommendation of a heritage

Figure 7.1 Study area – Macao Peninsula, the Macao SAR of China (which borders Zhuhai, Guangdong Province, to the north). Boundary from the 2013 spatial dataset; conservation areas in 2013 and in 2018 after expansion, traced from the maps gazetted in conservation laws; basemap: OpenStreetMap as of November 2019.

management system by the International Council on Monuments and Sites (ICOMOS, 2005), its legal framework was strengthened by the concurrent enactment of the Cultural

⁷ According to dataset “GDP per capita, current prices (U.S. dollars per capita)” compiled by the International Monetary Fund. Retrieved from the IMF DataMapper website <https://www.imf.org/external/datamapper> as of December 4, 2019.

Heritage Protection Act and the Urban Planning Act in 2014, which granted the historic district the statutory status of conservation area. Two developments ensued after the legislation, both involving public consultation but at different levels: the formulation of a comprehensive scheme for conservation and management at the historic district level (IC, 2014, 2018) and the increased power of the IC in specifying development controls and urban design requirements at the individual site level. This study focuses on the latter, and the public consultation process, in which the IC plays a prominent role, is described in the next section.

7.3.2 Post-2014 urban condition plan (UCP) public consultation in Macao

The Urban Planning Act and the accompanying administrative regulations⁸ mandated the establishment of the Urban Planning Committee (*Conselho do Planeamento Urbanístico*, CPU). Half of the CPU's membership is composed of public sector representatives, namely the president of the Civic and Municipal Affairs Bureau (*Instituto para os Assuntos Cívicos e Municipais*, IACM) committee and the directors of the bureaus in charge of cultural affairs (IC), transport, environmental protection, legal affairs, and tourism. The other half is composed of private sector and civil society representatives who are experts in various fields. As a consultative body, the CPU is responsible for providing urban planning advice in general and for evaluating what is locally referred to as urban condition plans (UCPs) in particular (CPU, 2019). Based on cadastral maps and with input from relevant government agencies, UCPs determine development controls (e.g., building height limits, envelope controls, the plot ratio, plot coverage) and urban design requirements (e.g., retention of the façade, specifications for building materials and colours) that are applicable to urban development and redevelopment on a site basis.

As shown in Figure 7.2, the UCP public consultation process is activated by qualified stakeholders (i.e., landowners or leaseholders) who wish to carry out construction projects and apply for a UCP, which has a validity period of two years. Viewed as a development within a wider effort to improve transparency (Tang and Sheng, 2009), the Land, Public Works and Transport Bureau (*Direcção dos Serviços de Solos, Obras Públicas e Transportes*, DSSOPT) releases the draft UCP with an explanatory document and sets a two-week period for consultation. Public feedback is gathered through

⁸ Available at the Government Printing Bureau website, https://bo.io.gov.mo/bo/i/2014/08/regadm03_cn.asp.

comment forms filled in and submitted to the DSSOPT and subsequently relayed to the CPU for deliberation. The original anonymised comment forms are made available in conjunction with the announcement of CPU meetings. Members of the general public can apply to observe but are not allowed to speak at the CPU meeting venue. Deliberation about the draft UCPs tabled in the meeting mostly leads to endorsement by the CPU or, occasionally, postponement of decision until future meetings are

Figure 7.2 Procedures of the urban condition plan (UCP) application and public consultation. (Documents obtained and analysed are listed to the right.)

held or revised UCPs are consulted again. Upon the CPU's endorsement, the DSSOPT issues a finalised UCP that is valid for two years.

7.3.3 Data overview

As shown in Figure 7.2, the draft UCPs and their explanatory documents for the period between June 2014 (the first CPU meeting) and the end of 2018 were obtained from the CPU's website. The explanatory documents take a standard format that delineates the items of development control and urban design, and the public comment form for consultation follows this format. There were 890 records for the entire Macao SAR, with the majority (629) corresponding to the study area, i.e., the peninsular part, and the rest corresponding to Taipa (124), Coloane (70), Cotai (23) and the new towns under construction (44). As this research focuses on how IC involvement may influence the intensity and the range of argumentation in public consultation, variables of reasonable

relevance and prevalence were extracted from the documents. For each application, data processing was conducted at a site level. For the initial 629 records corresponding to the peninsula, the effective sample size was 562 applications after the duplicate records (i.e., the same draft UCP and public comments discussed in a second meeting onwards) were removed. For a small portion of repeat applications (35, 6.2%) after an earlier UCP expired, they were counted separately. In the case of multiple rounds of public consultation (21, 3.7%), variables concerning the presence of urban design requirements were aggregated. These variables served as the independent variables in the regression analysis. For more details regarding data preparation, see Appendix E.

The sample of UCP sites under application is summarised in Table 7.1 and Table 7.2. Over half of the sample was of private land ownership (329, 58.5%), under which some cases (19) where a site contains multiple cadastral lots of mixed freehold and leasehold land are categorised. There were 192 (34.2%) leasehold sites and 41 (7.3%) sites of state and other types of ownership. The highly fragmented nature of land lots in the densely built Macao Peninsula is reflected in the distribution of site areas in our sample (Table 7.1): The median site area was 111 m², and the third quartile was 479 m²; such sites were which are dwarfed by a few (13) large-scale development sites of over 1 hectare mainly near the periphery of the peninsula. In agreement with their small acreage, most of the sites were flexibly designated for non-industrial land use (470, 83.6%).

Table 7.1 Summary of the numeric variable – area, and the integer variable – number of public comment forms submitted ($n = 562$).

Name	Min	Lower Qu.	Median	Mean	Upper Qu.	Max
Area of site (m ²)	16	54	111	1160	479	135694
No. of public comment forms	0	1	1	7	2	918

Based on the building classification in the General Regulations of Urban Construction (*Regulamento Geral da Construção Urbana*, RGCU) (DSSOPT, 2009), the majority of sites are for M-class buildings (435, 77.4%), which have a height limit of 20.5 m. Residential buildings of this class, which are colloquially called *tong lau* in Cantonese, typically have a small footprint and no more than seven floors. Against the 2014 baseline of 63 (for a seven-month period from June or factored to an annual equivalent of 108), the number of applications increased to 144 in 2015 and to 159 in 2016, and it decreased to 97 in 2017 and to 99 in 2018. One-third of the sites were located within a conservation

area. Notably, a substantial portion of the sites were vacant or in a dilapidated condition (128, 22.8%).

The urban design requirements of interest applied at two levels: the building element level (i.e., façade, material, arcade, roof) and the general level (i.e., streetscape and urban fabric). More than one-third of the sample (223, 39.7%) was affected by one or more of these urban design requirements, with the relatively prevalent requirements pertaining to the choice of building materials (105, 18.7%; e.g., painted walls and colour-coated door and window frames) and the retention of façade (83, 14.8%).

Subsequently, the number of public comment forms for each UCP application was counted and processed for statistical modelling. A large proportion of the sample received zero forms (88, 15.7%) or only one form (321, 57.1%), whereas a smaller proportion received two forms (85, 15.1%) and between three and ten forms (49, 8.8%). There were six cases with over 100 forms; the maximum was 918 forms, which were for a historic middle school complex (*Instituto Salesiano*). Although Poisson regression was an apparent choice for modelling counts as the dependent variable—similarly, negative binomial regression given the long tail of the counts—an initial examination of the content in the forms revealed a distinction from the number of public comments per se; that is, one public comment form may represent the collective opinion of an organisation or an interest group, such as an alliance of condominium owners. On the other hand, a great number of public comments (e.g., intensity) does not equate to a diversity of claims and arguments because it was not uncommon for nearly identical forms to be submitted for the same application. These aspects will be further discussed in the content analysis section.

Therefore, as a composite proxy for the interrelated intensity and diversity of public comments, the binary variable of low feedback (0 or 1) and high feedback (≥ 2) was used (Table 7.2) in logistic regression. The cut-off point of 2 stemmed from the assumption of higher contestability with a confluence of opposing standpoints, e.g., pro-redevelopment versus pro-conservation.

Table 7.2 Summary of the categorical and ordinal variables extracted from UCP explanatory documents ($n = 562$). Variables in bold face are included in logistic regression model specification as independent variables.

Name	Description	Levels	Freq.	%
<i>Development control</i>				
Land type	Type of land ownership recoded	Freehold	329 (58.5)	
		Leasehold	192 (34.2)	
		Other	41 (7.3)	
Land use	Land use recoded into a binary variable	Non-industrial	470 (83.6)	
		Other	92 (16.4)	
Building class	Some were estimated by relevant information as available, such as height limit, terrain elevation and nearby observations. Typical height limit for each building type as per RGCU.	P (9 m)	34 (6.0)	
		M (20.5 m)	435 (77.4)	
		A1 (31.5 m)	18 (3.2)	
		A2 (50 m)	34 (6.0)	
		MA (set as 100 m in this study)	41 (7.3)	
<i>Site/application status</i>				
Within CA	Whether the site is within a conservation area at the time of application. This is redundant to whether there were legally binding requirements by the IC because they appeared in all UCP applications within a conservation area.	Yes	190 (33.8)	
		No	372 (66.2)	
Vacant	Whether the site was vacant or unoccupied	Yes	128 (22.8)	
		No	434 (77.2)	
Year	Year in which the first CPU meeting of the UCL application in question was held, recoded to numbers 1–5	2014 (= 1)	63 (11.2)	
		2015	144 (25.6)	
		2016	159 (28.3)	
		2017	97 (17.3)	
		2018 (= 5)	99 (17.6)	
<i>Urban design requirement presence</i>				
IC rec.	Recommendations by the IC	Yes	260 (46.3)	
		No	302 (53.7)	
Façade	Retention of façade	Yes	83 (14.8)	
		No	479 (85.2)	
Material	Type and colour of building materials (excluding roof)	Yes	105 (18.7)	
		No	457 (81.3)	
Arcade	Provision of arcade required	Yes	56 (10.0)	
		No	506 (90.0)	
Roof	Style and material of the roof	Yes	46 (8.2)	
		No	516 (91.8)	
Streetscape	Requirement of taking streetscape into consideration	Yes	88 (15.7)	
		No	474 (84.3)	
Urban fabric	Requirement of taking urban fabric into consideration	Yes	17 (3.0)	
		No	545 (97.0)	
<i>Dependent variable</i>				
Public feedback	Number of public comment forms recoded	≥ 2	153 (27.2)	
		0 or 1	409 (72.8)	

7.4 Quantitative component – global and geographically weighted logistic regressions

To explore the effects of development controls and urban design requirements on the likelihood of a high level of public feedback, two logistic regression analyses were performed: (1) global and (2) geographically weighted (GW). In the global logistic regression, all independent variables were first fed into the full model, and model selection was then performed by stepwise backward elimination against the Akaike information criterion (AIC). The reverse procedure of stepwise forward inclusion returned the same selection of variables. The issue of outliers was assessed graphically by using index plots of Cook's distance and hat-values, and iteratively by comparing the coefficients of significant variables until a change did not exceed 1% (for the diagnostic plots, see Appendix F).

The GW logistic regression is a generalised variant of the GW regression approach, which falls under exploratory spatial data analysis (Fotheringham et al., 2003), to analysing spatial variability by allowing the model parameters to vary spatially. The GW approach has recently been adopted in a growing variety of urban studies, such as regional tourism receipts (Jin et al., 2019), intraurban demographic shifts (Danko, 2019), the location of hotels (Fang et al., 2019) and whether a vacant land lot was developed during a certain period (Tong et al., 2019). In our study, for instance, one spatial dependency of interest is whether the requirement to retain the façade has a stronger effect within a conservation area or vice versa, i.e., triggering more feedback on the grounds that sites outside of a conservation area should not be subject to such requirements. The model specification is given below:

$$\log\left(\frac{P(D_i \geq 2)}{1 - P(D_i \geq 2)}\right) = \beta_{i0}(u_i, v_i) + \sum_k \beta_{ik}(u_i, v_i)x_{ik} + \varepsilon_i \quad (7.1)$$

where for the i -th observation, $P(D_i \geq 2)$ is the probability that the number of public comment forms D_i will be greater than or equal to 2, β_{i0} is the intercept, and β_{ik} is the set of k parameters for independent variables x_k . The notation (u_i, v_i) denotes that the parameter values vary with respect to geographical location, i.e., the projected coordinates of easting u_i and northing v_i . For GW model calibration, a distance-decay bisquare kernel function (Eq. 7.2) was used to compute geographical weights in an $n \times n$ matrix W .

$$w_{ij} = \begin{cases} \left[1 - \left(\frac{d_{ij}}{b}\right)^2\right]^2 & \text{if } |d_{ij}| < b, \\ 0 & \text{otherwise} \end{cases} \quad (7.2)$$

where w_{ij} is the j -th weight for the i -th observation, d_{ij} is the Euclidean distance between observations i and j , and b is the bandwidth. If the parameters are irrespective of geographical location (u_i, v_i) , then the model specification becomes that of conventional logistic regression (Eq. 7.1). In our study, the geographical centroids of the UCP sites were used (see Figure 7.1). The weights take a maximum value of 1 at the observation location and decrease exponentially as the other points become farther away up until the bandwidth, which was set to 1,500 m. The choice of bandwidth value was made to ensure that in the neighbourhood of each observation, there were reasonably enough points for model calibration, while the choice of bandwidth type (rather than an adaptive bandwidth, i.e., specifying a fixed number of nearest observations) was made due to the assumption that in a densely built environment such as peninsular Macao, the urban characteristics are highly localised and an adaptive bandwidth is likelier to include nearby locations that may belong to a drastically different urban setting. The regression analysis was performed in R software, mainly using the *car* package (Fox and Weisberg, 2018) and the *GWmodel* package (Gollini et al., 2015). While conventional and GW generalised regression can be further combined in a semi-parametric manner, i.e., as a mixture of spatially invariant and variant parameters (Nakaya et al., 2005; Jin et al., 2019), we deemed the comparison of global and GW logistic regression results to be sufficient for the exploratory purpose of developing thematic focuses in the subsequent content analysis and enhancing the complementarity of the results from the regression and content analyses.

7.4.1 Global logistic regression results

After model selection and outlier exclusion, the results of the global logistic regression are presented in Table 7.3. As expected, the area variable, entered as the base-2 logarithm, was statistically significant ($p < 0.001$); the doubling of UCP site area increases the odds of high public feedback (i.e., receiving more than 2 public comment forms) by 1.5 times. As with land types, compared with a site of other land use, the odds of a leasehold site increase 3.3 times ($p = 0.043$), and although non-significant, the odds of a freehold site increase by 1.9 times ($p = 0.269$). For the leasehold land type, this moderately significant result may be due to the higher urgency of redevelopment

perceived by stakeholders since unlike freehold and state-owned land, the land value decreases with the remaining lease.

Regarding IC-issued urban design requirements, although both mandatory requirements and “advisory” recommendations were entered into the full model, only the latter remained in the reduced model, with an odds ratio of 2.8 ($p < 0.001$). This result suggests that the urban design recommendations issued by the IC, chiefly from a heritage conservation standpoint, may stoke controversy due to the lack of a statutory status of conservation area. Moreover, such recommendations would automatically convert into legally binding requirements after the draft UCP and explanatory document are endorsed by the CPU and a consolidated UCP is issued by the DSSOPT (see Figure 7.2), prompting stakeholders to voice their concern in public consultation. While not reaching statistical significance, the variable for the presence of façade-related requirements (i.e., the retention or restoration of building façade) remained in the reduced model. Notably, such façade-related requirements do not necessarily mean a freeze on floor area during redevelopment, as additional floors are allowed given that the envelope control, among others, is adhered to (DSSOPT, 2009), which may offset the perceived constraints on development rights. The comparison of these two variables is better illustrated in the effect plots on the probability scale (Figure 7.3c & d). The presence of IC-issued recommendations increases the probability from 0.25 to 0.48, whereas the increase caused by façade-related requirements is noticeably smaller.

In line with the decline in the number of UCP applications in the second half of the study period (Table 7.2), the application year variable had a statistically significant negative coefficient; a 1-unit increase in year decreases the odds by 0.7 times, indicating a downward trend of the intensity of public feedback or the potentially diminishing contestability in UCP consultation (Figure 7.3e). The height limit with regard to the estimated building type was modelled as orthogonal polynomials of up to degree 2. A chi-square test to compare models of higher-degree polynomials confirmed that the inclusion of linear and quadratic polynomials sufficed. The significant quadratic effect ($p < 0.001$) indicates that the probability of high public feedback peaks at a building height limit of approximately 60 m (Figure 7.3f). Given that both the site area and building height limit directly affect the floor area and, hence, the benefits gained by the applicants through redevelopment and given that the majority of our sample had a height limit less than 50 m (Table 7.2), the upward portion of the curve agrees with the result

of the area variable, whereas the downward portion was probably due to low public feedback towards high-rise building projects.

Table 7.3 Global logistic regression results for the binary dependent variable (whether the number of public comment forms is greater than or equal to 2) and containing the explanatory variables selected by stepwise backward elimination ($n = 538$).

Variable	β (SE)	Odds ratio (95% CI)
$\log_2(\text{Area})$	0.423*** (0.067)	1.526 (0.002–0.075)
Land type (ref. Other)		
Leasehold	1.185* (0.585)	3.271 (1.074–10.748)
Freehold	0.662 (0.599)	1.939 (0.622–6.551)
Presence of IC-recommended requirement	1.028*** (0.310)	2.797 (1.518–5.131)
Presence of façade-related requirement	0.484 (0.303)	1.622 (0.887–2.917)
Year of application	–0.356*** (0.098)	0.701 (0.575–0.846)
Est. building type height limit		
Linear polynomial	0.968 (2.603)	
Quadratic polynomial	–7.474** (2.589)	
Intercept	–4.356*** (0.932)	
Residual deviance	497.55	
AIC	515.55	
McFadden's pseudo- R^2	0.193	

7.4.1 Geographically weighted logistic regression results

Similar to the global model, for GW logistic regression, model fitting began with the full model and the entire sample except geographical outliers to avoid errors returned by the fitting algorithm. The different treatments of outliers were due to the difference in the objective of analysis: The exclusion of influential outliers improved the robustness in the general trend identified in the global model, but these influential observations may

Figure 7.3 Effect plots of the four variables based on the global logistic regression results ($n = 538$): increasing effects of the presence of urban design recommendations by the Cultural Affairs Bureau (IC) or façade-related requirements, the decreasing trend over the years and the quadratic trend over the building height limit with regard to the estimated building type. The y-axis is the probability of the dependent variable, i.e., a site receiving two or more public comment forms; on the x-axis is a rug plot on the x-axis with horizontal jitter added to better display the distribution of a limited number of discrete values.

uncover distinct local patterns in the GW approach. However, the full model specification did not identify locally significant yet globally non-significant variables. Therefore, the same selection of variables was used. The local coefficients of GW logistic regression are summarised in Table 7.4. Coefficient surfaces were generated by inverse distance weighted interpolation of the exponentiated values (odds ratio) and overlaid with local t value contours as an indicative measure to differentiate significant areas from non-significant areas (Fotheringham et al., 2003; Matthews and Yang, 2012). The graphical results showing significant local variation—mainly the presence of IC recommendations, the year of application and the height limit with regard to the estimated building type and marginally the presence of façade-related requirements—are presented in Figure 7.4. The local coefficients of area were consistently significant. The GW results of land ownership type, though moderately significant in the global model, did not reveal any significant local pattern. Therefore, graphical presentation of these two variables is omitted.

The coefficient surfaces in Figure 7.4 demonstrate spatial variation as well as a heterogeneity of patterns across variables. For the presence of IC urban design recommendations, the significant area with more than two times the odds of high public feedback (Figure 7.4a) overlaps with the historic district in the north (Figure 7.1), indicating the potentially greater of such recommendations imposed on sites close to but outside of the conservation area. In contrast, the coefficient surface for the presence of façade-related regulations (Figure 7.4b), though non-significant except for near a single observation, is roughly divided into two-thirds in the south and one-third with higher odds in the north, where high-rise residential buildings are more common and façade-related requirements would thus seem incongruous and unnecessary. The declining trend of public feedback intensity over the years was found to be locally significant in the south, overlapping with the historic district, and some scattered localities in the northeast (Figure 7.4c). The quadratic trend of the height limit (Figure 7.4d) was found to be locally significant in the northern area, with some localities reaching a significance level of 0.01.

7.1 Qualitative component – content analysis

7.1.1 Methods

In addition to the intensity of public feedback, the diversity of what opinions the general public actually voiced is of equal interest in our study. A content analysis

Table 7.4 Summary of GW logistic regression results ($n = 550$)

Variable	Coefficient estimates				
	Min.	Q1	Median	Q3	Max.
$\log_2(\text{Area})$	0.030	0.227	0.279	0.304	0.701
Land type (ref. Other)					
Leasehold	-1.585	-0.494	-0.146	0.249	2.490
Freehold	-2.170	-1.089	-0.727	-0.187	2.415
Presence of IC-recommended requirement	-0.548	0.685	0.770	0.863	1.201
Presence of façade-related requirement	-0.573	0.419	0.524	0.636	2.172
Year of application	-0.666	-0.260	-0.199	-0.167	-0.011
Est. building type height limit					
Linear polynomial	0.035	0.069	0.088	0.132	0.188
Quadratic polynomial	-0.002	-0.001	-0.001	-0.001	0.000
<i>Intercept</i>	-8.909	-4.863	-3.660	-3.031	-1.525
<i>GW residual deviance</i>	512.25				
<i>AIC</i>	571.46				
<i>McFadden's pseudo-R^2</i>	0.195				

(Saldaña, 2016; Krippendorff, 2019) was performed on a subset of 55 UCP applications, focusing on three aspects: the range of opinion (i.e., agreement or disagreement with various development controls and urban design requirements), the diversity of argumentation (i.e., instrumental-technical, moral-ethical and/or emotive-aesthetic reasoning) and emerging standpoints (e.g., an eclectic mix of both pro-development and pro-conservation comments in one comment form). In addition, to examine how tension or controversy may arise from the IC's legally binding urban design requirements, which act as a potential countervailing force against rapid yet historically unconscious development, 25 UCP sites that were located within a conservation area and that had the most public comment forms were first selected. Then, another 25 sites in proximity (within a 200-m buffer) were randomly selected. Finally, by adding repeat applications at the same locations, the subset of 55 applications was generated. This selection procedure resulted in the inclusion of the maximum case (Table 7.1) and a total of 1,304 public comment forms, most of which were written in Chinese except for a few in English or Portuguese.

Coding of the public comments was guided by the “versus coding” principle (Saldaña, 2016), which is appropriate for strong conflicting perspectives, e.g., the protection of

Figure 7.4 Exponentiated coefficient (i.e., change in the odds ratio from yes to no, or by a 1-unit increase, for the independent variable) surfaces based on the GW logistic regression results ($n = 550$). The t values of 1.96 and 2.58 correspond to unadjusted p values of 0.05 and 0.01, respectively. See also Figure 7.3c–f for the global effects. Similar to Figure 7.3f, note that for the fourth variable of building height limit with regard to the estimated building type, due to its polynomial specification, the local peak value is shown instead.

individual interest versus that of public interests in the face of tighter development controls (Sager, 2010). Only explicitly expressed opinions, either positive (agree or suggest) or negative (disagree or discourage) and with or without supporting reasoning, were coded; neutral comments (e.g., “no comment”) were excluded. The selection of coding items followed the regression results. The coding presence was aggregated at the UCP application level, as illustrated in Figure 7.5. For more details regarding the coding descriptions, see Appendix G.

7.1.2 Content analysis results

In general, the range of conservation-related comments was wider than that of redevelopment-related comments (Figure 7.5a). Notably, façade-related positive comments were the most prevalent and were found in 15 cases, two-thirds of which were actually submitted for draft UCPs that did not contain façade-related requirements to retain or restore building façades. Such “unsolicited” suggestions to take into consideration Macao’s unique streetscape presumably signify that the notion of built heritage beyond designated monuments and sites percolated through wider segments of the general public. This result also contextualises the logistic regression model specification containing the non-significant façade variable, thereby suggesting an effect in the reverse direction such that the absence of façade-related requirements tends to trigger reaction from those who are conscious of heritage values. In addition to the specified items subject to urban design requirements in the draft UCPs, there were suggestions about conservation methods, such as calls to assess the building for its heritage values before reconstruction or to rebuild or restore the building in an authentic manner and calls for complete conservation and for cultural adaptive reuse.

Although in some cases, other development controls, such as the plot ratio or plot coverage, were specified, reactions to these controls were well aligned along the pro-redevelopment versus pro-conservation division and can thus be represented by the reactions to height limits (Figure 7.5b): The view that the specified height limit was too high, to the detriment of urban conservation, was found in 13 cases, whereas the opposite view, according to which the height limit hindered redevelopment potential, was as frequent and was found in 17 cases.

Divergent public feedback is reflected in the types of reasons given in the public comments arguing for or against development controls or urban design requirements (Figure 7.5c). Among the instrumental-technical reasons, the legality claim applied to

Figure 7.5 Presence of coding in public comments in redevelopment applications ($n = 55$). (a) Agreement or disagreement with various conservation and/or redevelopment matters; (b) reactions to the height limit, e.g., a reaction of voicing that the height limit as being too high is typically based on conservation grounds, and vice versa; (c) reasons given in the argumentation in favour of or against various conservation/redevelopment matters, divided into three categories in line with the framework of inclusionary argumentation for collaborative planning, namely, instrumental-technical, moral-ethical and emotive-aesthetic.

both sides: on the one hand, the protection of development rights for private properties to fend off IC recommendations; on the other hand, the expectation of thorough

conservation implementation in the spirit of the World Heritage status and the Cultural Heritage Protection Act. Disagreement with urban design requirements was found to be substantiated by highlighting the difficulties in restoration (e.g., due to the lack of skilled craftsmen or structural instability) and maintenance (e.g., to keep painted walls clean). Framed within the broader context of economic development and community needs, often cited were the effect of development controls with regard to disincentivising landowners from investing in redevelopment and the worsening impact on the housing shortage were frequently cited. This prevailing pro-development narrative is in agreement with Wang and Aoki's (2019) study of the redevelopment of a Tianjin historical neighbourhood in which residents' heritage perceptions were overshadowed by material concerns.

While the draft UCPs principally set out technical development parameters except for some instances of more generic streetscape and urban fabric guidance, the argumentation in public feedback was not bounded by instrumental rationality. Among the moral-ethical reasons, the attempt to disregard urban design requirements (e.g., the provision of an arcade that would decrease the floor area) by referring to the current design of one's own building or nearby buildings was essentially framed as a normative claim. This type of claim alludes to the perceived inequity of the ability to build despite the implicit knowledge of the different legislative frameworks before and after the conservation law was passed. Streetscape appeared as a familiar concept in the public comments but was deliberated in two disparate ways. The first was similar to the reference to nearby building conditions and was articulated, for example, in terms of the anticipated inconsistency in streetscape as a result of a single "sunk-in" building whose height limit was thought to be unduly lowered⁹. In the second way, a harmonious streetscape was mentioned to support conservation measures, ranging from the retention of façades or arcades to the use of traditional elements such as fascia¹⁰. This type of argumentation belongs to the emotive-aesthetic category because the perceived inherent values in streetscape and architecture are highly subjective. Feedback urging the government (or, more specifically, the IC) to give the architectural merit of vernacular buildings due consideration was often accompanied by commentators' accounts of their own experiences of enjoying the cultural atmosphere¹¹. In some cases, the commentator

⁹ UCP application for site 2006A086 as of May 26, 2015 (see #55 in Appendix H).

¹⁰ UCP application for site 2013A022 as of September 29, 2014 (see #154 in Appendix H).

¹¹ UCP application for site 88A022 as of July 16, 2015 (see #437 in Appendix H).

went to great lengths to explain the historical relevance of a building, for example, how Hotel Estoril served as the venue for a series of historical events, apart from being Macao's first casino¹². However, the reflexivity of non-instrumental-technical reasoning suggests that the same argument can be expressed in an opposite way. Another key element of debate regarding the Hotel Estoril site was the outdoor swimming pool with red tiles used in auxiliary structures such as the entrance, whose heritage value was dismissed by some as irrelevant. Additionally, take the case of Instituto Salesiano as an example: The proposal to conserve the façade of some school buildings was met with strong opposition on reasons pertaining to education infrastructure, accounting for much of the feedback in the 900-odd public comment forms¹³. Some questioned the legitimacy of heritage by pointing out past alterations to the structures, inadvertently drawing on the static notion of heritage.

With the examples of argumentative diversity shown above, as well as the general trend of and spatial variation in the intensity of feedback shown by the regression analyses, the next section provides further discussion that reflects upon the procedural inclusiveness of this study's public consultation exercise and then delves into the implications of incremental and district-level urban heritage management and inclusionary argumentation in collaborative planning.

7.2 Discussion

7.2.1 Reflection on the inclusiveness of Macao's UCP public consultation

Measured against Arnstein's (2019 [1969]) ladder of citizen participation from non-participation to empowerment, the UCP public consultation exercise lingers on the middle rung of consultation, between the one-way communication of informing and the placement of marginalised group representatives in decision-making bodies, thus granting participants limited influence on the final outcome. According to Tuler and Webler's (1999) normative objectives of consultation, the UCP consultation was easy to access without the need for meeting commitments, and the release of draft UCPs together with explanatory documents provided enough information for deliberation. The

¹² UCP application for site 90A382 as of July 25, 2016 (see #466 in Appendix H). The UCP consultation for the Hotel Estoril site, which was a high-profile case, garnered 126 public comment forms. While a case study of this site falls beyond the scope of this study, the factors contributing to the widespread public debate include its prime location, its historical relevance and the fact that it was vacant for years, as well as the vice that had been associated with it.

¹³ UCP application for site 97A028 (see #553 in Appendix H). Similar to former Hotel Estoril, the case of Instituto Salesiano, which garnered the most public comment forms (918), warrants a separate case study that includes other media sources.

power to influence the process or outcome was undermined by administrative expediency that limits the direction of communication by not mandating replies to public feedback and that limits the interaction in debate by not allowing observers of CPU meetings to speak (see Figure 7.2). One rarity concerns *Rua das Lorchas*¹⁴, where traditional shophouses line the coastal street. This small site (99 m²) underwent four rounds of public consultation in which vehement comments over the practical utility and heritage relevance of the arcade feature, among others, caused the DSSOPT and IC to lift the arcade clause in the second before reintroducing it in the third round. The rare occurrence of such multiple rounds of public consultation suggests that public feedback mostly did not lead to changes in the draft UCPs.

There has been an increasing application of digital technology, including virtual reality, in planning support systems leading to “immersive planning” (Gordon et al., 2011). Another major development in planning support systems is public participatory geographic information systems (GIS), which have been used, for example, to crowd-source georeferenced local knowledge for land use planning (Bamberg, 2013), to solicit evaluations of natural and urban environment experiences (Samuelsson et al., 2018), or to facilitate communication between planners and stakeholders (Wang et al., 2013). While the method of submitting public feedback forms by postal mail or e-mail in the case of Macao is a conventional consultation technique (Shipley and Utz, 2012), the content analysis of the comments detected some cases in which professional drawings and renderings were used to explain alternative development schemes or to assess heritage impact. In accordance with the principle of accessibility for citizen participation, there is scope for incorporating and adapting web-based techniques with regard to their emergence in UPC practice.

7.2.2 Historic urban landscape undergoing incremental redevelopment in relation to sites and stakeholders

The unit of analysis at the UCP site level in our study uncovered fine-grained patterns and, to different degrees, how development controls and urban design requirements are associated with an intensification of public feedback. This manifestation of the expression and confrontation of various economic interests and cultural values is at the core of the managerial focus of the HUL approach (Bandarin and Van Oers, 2012). Although UNESCO has noted the UCP instrument and the application of HUL

¹⁴ UCP application for site 2011A085 as of August 1, 2014 (see #128 in Appendix H).

principles alongside Macao's preparation of a comprehensive conservation management scheme (UNESCO, 2017, p.165; 2019, p.144), emphasis was placed on new urban development on reclaimed land (i.e., the new towns) and, in particular, how it might compromise the visual integrity of the Mount Fortress vista. In contrast, the intended construction activities in our sample were concentrated on the more densely built western part of peninsular Macao and would change the urban character or streetscape incrementally through urban design requirements that conform to context-sensitive infill development guidelines widely adopted across countries and regions (e.g., NSWGO and RAIA, 2005). More broadly, the discrepancy in scale between UNESCO's status reports on Macao and our "ground-truthing" of Macao's UCP exercise reflects the challenging transition "from international guidelines to contextualised local endeavours and policies" (Ginzarly et al., 2018).

The UCP public consultation has given rise to the agency of landowners and stakeholders to defend their development rights and, with the IC often being the contentious subject, to challenge the legitimacy of not only its recommendations but also its mandatory requirements. In turn, this agency is confronted from a moral-ethical perspective that highlights the responsibility of preserving cultural continuity (Smith, 2014) in Macao's historic streetscape as a public good. The drastically different spatial patterns of the itemised developmental effects on the likelihood of high public feedback (Figure 7.4) also indicate the waning relevance of "hard" conservation area boundaries and, by extension, the effectiveness and rigidity of zoning ordinances. This point is already substantiated by IC interventions transcending such hard boundaries through the UCP mechanism and, in some cases, prior to formal conservation listing, such as the architecturally rich thoroughfare *Avenida Almeida Ribeiro* (Pinheiro, 2017). Therefore, echoing the call for tailored urban management of cultural heritage for sustainable development (Guzmán et al., 2017), we argue that site-level UCP public consultation helps do justice to the circumstances of stakeholders and renders more visible in the public sphere the stakes of each case with regard to the collective heritage values perceived.

7.2.3 Inclusionary argumentation on the surface?

In addition to the nascent yet promising procedural inclusiveness and the increasing sensitivity to the variegated consequences of individual construction activities permitted by the UCPs, the matter of how to handle the argumentative quagmire, torn between

development and conservation and populated by conflicting interests and beliefs (Allmendinger and Haughton, 2012), is perhaps more important. One key element of Healey's (1997) institutionalist approach to collaborative planning is the "soft infrastructure of institutional capacity", which complements the hard infrastructure of regulations and policies and fosters rapport building and mutual learning. This soft infrastructure requires that moral and aesthetic grounds, as observed in our study (Figure 7.5c), cannot be simply dismissed in favour of instrumental rationality under the banner of economic development. Macao's existing UCP procedures lend some legitimacy to the claims to rightness (e.g., application of urban design requirements perceived as inconsistent and arbitrary) and truthfulness (e.g., aesthetic appreciation) by publishing them in an apparently unabridged manner in the public sphere. However, optimism in inclusionary argumentation should not be equated with blissful ignorance of a potential undercurrent of antagonism and polarising rhetoric, which tends to be a point of contention in agonistic planning theory (Mouffe, 2000; Bäcklund and Mäntysalo, 2010). Rather, experience has shown that tackling hot button issues during public consultation, e.g., through the use of mediation techniques (Forester, 2008), can be a worthwhile effort. Such negotiation and deliberation most likely take place behind the scene, for example, the aforementioned case of Instituto Salesiano case, which was widely reported in multiple media¹⁵ and was met with a high level of public mobilisation with regard to its UCP consultation.

Despite the downward trend of high public feedback and the tacit knowledge of the limited power to influence the final outcome, a positive signal from the continued use of the UCP platform was the eclectic standpoint that acknowledged the need for heritage conservation when proposing urban regeneration¹⁶. Together with the presence of illocutionary speech acts expounding Macao's history and heritage, which can be regarded as an example of Habermasian communicative action, the informal usage of the UCP platform nested within formal public consultation procedures can be further institutionalised by enhancing the transparency and accountability of the CPU's decision-making process and by bestowing a more participatory role on urban planners (Özdemir and Tasan-Kok, 2019) in the preparation of UCPs and other planning instruments.

¹⁵ See a compilation of news coverage and social media posts on the website *Jornal Cheng Pou*, <http://chengpou.blogspot.com/2016/12/07122015-httpwww.html>, accessed August 16, 2019.

¹⁶ UCP application for site 2012A020 as of October 30, 2015 (see #131 in Appendix H).

7.3 Chapter summary

This study adopted a mixed-methods approach to investigating two interrelated aspects of the UCP public consultation exercise at the site level in Macao: logistic regression for the intensity of public feedback and content analysis for the diversity of public feedback. In the former, both global and GW logistic regressions were used to explore the general trend of and spatial variation in the effects of development controls and urban design requirements. The quantitative and qualitative findings were corroborated to obtain insights into Macao's urban planning and heritage conservation, drawing from the literature on collaborative planning, citizen participation and HUL. Notably, the urban design recommendations issued by the IC, rather than the mandatory requirements enabled by the Cultural Heritage Protection Act, had a statistically significant and spatially varying positive effect on the likelihood of high public feedback (operationalised as whether a UCP application received two public comment forms or more). The contestability of IC recommendations, such as the retention of building façades or the choice of building materials, was confirmed in the content analysis, which revealed a discourse of multivalent reasoning at the nexus of redevelopment and heritage conservation.

At the site level, agonistic, if not adversarial, argumentation over development rights and conservation obligations mirrors the power relations underpinning the institutionalised informality seen in Macao's tourism-oriented mega-development (Lee, 2014). In this regard, one direction for investigating these localised power relations and governance implications would be to uncover how various objective, subjective and intersubjective arguments are debated down the public consultation process. In terms of the shift from heritage conservation to heritage management, although the subsequent expansion of conservation areas after Macao's World Heritage inscription (see Figure 7.1) seems to be a harbinger that built heritage will become a principal pillar of urban planning (Siririsak, 2009), ad hoc interventions at the discretion of the IC carry the risk of deepening the development-conservation divide if cross-referencing of and social learning through the UCP consultation practice are not promoted. Further research on how separate district-level public consultations on heritage management (IC, 2014, 2018) are linked with other public consultation exercises, such as the legal framework of urban regeneration (Macao SAR, 2019), may then derive more holistic insights that are compatible across local and regional geographical scales.

Chapter 8. Epilogue and prospects

This research was motivated by the potentiality of inclusive streets and urban heritage for promoting walking with the goal of advancing the field of urban and transport planning. With a mixed-methods approach adopted (see Figure 1.1), this research has derived multi-faceted findings on walking and walkability, both qualitative and quantitative, with regard to inclusive streets and urban heritage situated in a broader context of urban and transport planning. The interrelationships are illustrated in Figure 8.1 for brevity and clarity, which organises the connections made among the various research components in the following paragraphs.

The meta-narrative review (Chapter 2) identified six research traditions pertinent to the intersection of urban heritage and mobilities, namely, ecological model, new mobilities paradigm, heritage discourse, public life, rhythmanalysis and space syntax, which pertain to potential inherent heritage values and consequential aspects of society, such as the prevalence of pedestrian movement. Among these research traditions, three are mainly theoretical or conceptual: the ecological model highlights the indirect impact of the policy environment; the new mobilities paradigm revives interest in everyday mobilities such as walking; heritage discourse, which is undergoing a de-authorising process, expands the scope of heritage and elevates it to a mode of engagement and meaning-making. The other three are more methodological and instrumental: public life studies traditionally emphasise the observation of public space uses including pedestrian movement, whereas rhythmanalysis as a sociological mode of analysis introduces a taxonomy of urban rhythms that, to date, has mainly been used for qualitative analysis however, it has provided inspirational means of operationalisation in other disciplines. These narratives complement and support the development of the powerful analytic tool of space syntax in correlating the configurational properties of the urban layout with transport and public life data, particularly in an era when the spatiotemporal of such data resolution is drastically improving.

Of equal importance was the pedestrian-oriented shift in the inclusive street design paradigm that deviates from the once predominant tenet of vehicular traffic capacity. Focusing on the grey literature of street design guides that occupies a niche between planning and engineering, Chapter 3 explored the prevalence of and association among street design principles ranging from traditional prevailing ones, such as safety and accessibility, and neo-traditional reviving ones, such as adaptability and inclusiveness.

The findings are indicative of the global trend of incorporating traffic conduits and urban places in streets and set a comparative narrative of street design practices across regions and cities.

Both the multi-dimensionality of an inclusive street vision (Chapter 4) and the sociospatial, embodied walking experiences (Chapter 5) combine to inform a more holistic approach to urban and transport planning for active travel. Chapter 4 builds on the concept of street inclusiveness, of which the constituent dimensions remain malleable. From a visioning perspective, a street-intercept questionnaire survey ($n = 816$) was conducted to investigate perceived importance within an ecological set of six different inclusive street design dimensions in relation to transport modes. A comparison of the ratings mostly showed pairwise differences. Owing to the multivariate and graphical approach, a categorical canonical correlation analysis was performed that highlighted the elderly and motorcyclists as groups with potentially different perceptions. Then, univariate ordinal logistic regression models were fitted on the six dimensions separately; gender was non-significant, while age and certain transport modes were significant. Particularly, in addition to age, the car passenger transport mode was significant in five dimensions. As mobility needs and desirable street qualities vary across transport modes, with Singapore's urban transport undergoing rapid changes due to incremental improvement schemes and disruptive services (e.g., ride hailing and bicycle sharing), the results indicate that land use and transport systems should be planned or redeveloped collaboratively to incorporate users' aspirations.

With the increasing emphasis on vulnerable pedestrians and on the social aspects of active mobility such as walking, Chapter 5 examines the everyday mobility practices and perceptions of less mobile pedestrians, i.e., older adults ($n = 26$) and people with disabilities ($n = 7$), through mobile ethnographic interviewing. These semi-structured go-alongs, conducted in the participants' familiar localities in Singapore, generated rich qualitative data, covering topics ranging from travel patterns to perceptions about the built environment, and to attitudes towards space sharing. Interview transcripts, field notes and video footage enabled an in-depth analysis of both verbal and non-verbal aspects of the active mobility behavior embedded in social norms. The analysis unveiled emerging sociospatial themes including movement within an extended pedestrian network, such as detouring and taking shortcuts, and ambivalence about space sharing that is in part caused by both the complications of rights-of-way among active transport

modes and preconceptions of social norms in a local-foreign divide. These themes have implications for how to shape travel behavior from a more inclusive approach to urban planning and neighborhood design that instills a deeper humanistic understanding.

The salience of heritage and its relevance to active mobility was confirmed in the thematic analysis of Singapore's local press coverage (Chapter 6). Furthermore, the contentiousness of heritage conservation, as well as emerging the relevance of urban spatial heritage, was investigated in a study of Macao's public consultation exercise of site-level urban redevelopment (Chapter 7). These empirical studies call for more culturally relevant and locally sensitive framing of walking, heritage and the built environment as lived. In practice, this framing is oriented towards the auditing and redesign of both streets and public spaces that further feed into a participatory planning regime. For example, while case studies of historic districts abound, they are often predefined based on administrative boundaries. In turn, the order of analysis can be reversed by segmenting a city into smaller districts based on urban intensity and space syntactical measures and comparing them with perceived traditional and contemporary areas (Shen and Karimi, 2017; Karimi, 2018), which provides a critical linkage between macroscale and microscale properties of cities and regions. Analysis and comparison of this sort will also advance typologies of urban form which usually rest on a composite of qualitative and quantitative indices (Wheeler, 2015; Krehl and Siedentop, 2018). However, this reversal is not intended to undermine the behavioural impact of top-down heritage designation as suggested in the ecological model, but rather to advocate a rhythm-analytic and space syntactical approach that foregrounds spatial heritage (Tweed and Sutherland, 2007; Palaiologou and Griffiths, 2019) and, ultimately, can more effectively steer urban conservation in the direction of change management (Bandarin and Van Oers, 2012; Bianca, 2014).

At a personal level, walking trips are more than the utilitarian movement between origins and destinations; they also entail spatiotemporal entanglements with the built environment. As the literature on new mobilities in the context of tourism and the use of authorised heritage discourse to critically examine heritage-themed tourism development is growing, an equally significant type of mobility – resident tourists – warrants more attention. The trend of locals taking on the role of tourists can be observed in the increasing popularity of heritage trails, which were discussed in a special issue of *Journal of Heritage Tourism* (Boyd, 2017). In this light, revisiting the foundation of

spatial cognition that in part underpins space syntax may be useful. The complexity of pedestrian networks can either whet curiosity or cause a sense of danger, resulting in varied levels of walkability depending on pedestrians' familiarity with the network (Zacharias, 2001). The peripheralisation effect of pedestrian movement, where first-time visitors tended to choose to walk around the outside of a neighbourhood despite its porosity, was reported early (Hillier et al., 1993). If urban heritage is de-authorised to become a mode of engagement in which a potential resident tourist spontaneously decides to explore the built environment, and the exploratory behaviour acts as a trigger of the formation of routines (Knox, 2005; Lefebvre, 2013), then the installation of heritage markers accompanied by the expansion of heritage trails, and, in a broader view, the availability of background information in physical and virtual forms should be further investigated based on their behavioural manifestations. This investigation will offer insight into how an unfamiliar, if not labyrinthine, network can be modified to increase the multiplier effects of the urban context (Hillier, 1996) and promote walking as the major component of active mobility. In the face of intensifying tension between urban redevelopment and heritage conservation (Chua et al., 2018), the debate tends to gravitate towards the two ends—one concerns the physical dimension, including partial retention and adaptive reuse, and the other concerns the community (Orbasli, 2000). What lies between the two, namely, the spatial dimension, has not been as adequately addressed. As suggested by the central thesis of this research that a potential linkage exists between walking and urban heritage through place-environment interactions, the repositioning of urban heritage for active mobility holds promise for the further integration of urban and transport planning as well as day-to-day urban management.

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Appendix A. Literature search records

The literature searches and screening for this study were conducted between April and June, 2019, and Scopus was the primary academic database. **Table A.1** lists search strings used for generating the first selection as well as for expanding the literature for review along each research tradition until a reasonable number of articles was collected. Note that snowballing searches, namely forward and backward searches, are not listed herein. **Table A.2** lists the references categorized under each research tradition.

Table A.1 Search strings used in academic databases

#	Research tradition	Search string and limiters	Nos.	
EBSCO-0	Heritage & active mobility	AB ((urban N5 heritage) OR (historic N2 area)OR (historic N2 district)OR (historic N2 quarter)OR (historic N2 precinct)OR (historic N2 locality)OR (historic N2 neighbo#rhood)OR (historic N2 center)OR (historic N2 centre)) AND ("active mobility" OR "active transport*" OR "non-motori?ed transport*" OR walk* OR pedestrian OR cyclist OR cycling OR wheelchair)) <ul style="list-style-type: none"> Limiters - Scholarly (Peer Reviewed) Journals; Published Date: 20090101-20191231 Search modes - Boolean/Phrase 	26	20
Scopus-0	(Note: quotation marks behave differently: they search for loose phrases while curl brackets search for exact phrases)	TITLE-ABS-KEY ((urban W/5 heritage) OR (historic W/2 area) OR (historic W/2 district) OR (historic W/2 quarter) OR (historic W/2 precinct) OR (historic W/2 locality) OR (historic W/2 neighbo#rhood) OR (historic W/2 center) OR (historic W/2 centre)) AND TITLE-ABS-KEY ("active mobility" OR "active transport*" OR "non-motori?ed transport*" OR walk* OR pedestrian OR cyclist OR cycling OR wheelchair) AND PUBYEAR > 2008	115	
WoS-0		TS=((urban NEAR/5 heritage) OR (historic NEAR/2 area) OR (historic NEAR/2 district) OR (historic NEAR/2 quarter) OR (historic NEAR/2 precinct) OR (historic NEAR/2 locality) OR (historic NEAR/2 neighborhood) OR (historic NEAR/2 center) OR (historic NEAR/2 centre)) AND TS= ("active mobility" OR "active transport*" OR "non-motori?ed transport*" OR walk* OR pedestrian OR cyclist OR cycling OR wheelchair) <ul style="list-style-type: none"> 2009 ~ 2019 	128	
Scopus-1a	Ecological model	(TITLE-ABS-KEY ("ecological model" OR "ecological approach" OR "ecological perspective") AND TITLE-ABS-KEY ("physical environment" OR "built environment") AND TITLE-ABS-KEY (review))	23	6
Scopus-1b		An ecological approach to creating active living communities Sallis J.F., Cervero R.B., Ascher W., Henderson K.A., Kraft M.K., Kerr J. (2006) Annual Review of Public Health, 27 , pp. 297-322. Refined to: (heritage OR historic)	29	
Scopus-1c		Correlates of physical activity: Why are some people physically active and others not? Bauman A.E., Reis R.S., Sallis J.F., Wells J.C., Loos R.J.F., Martin B.W., Alkandari J.R., (...), Sarmiento O.L. Refined to: (historic OR heritage)	14	
Scopus-2a	New mobilities	Search within articles citing “The new mobilities paradigm” (Sheller and Urry, 2006)	376	10

#	Research tradition	Search string and limiters	Nos.	
		Refined to: (walking OR pedestrian) PUBYEAR > 2009		
Scopus-2b		Search within articles citing “Mobilities I: Catching up” (Cresswell, 2011) Refined to: (walking OR pedestrian)	66	
Scopus-2c		Search within articles citing “Walking: New forms and spaces for studies of pedestrianism” (Lorimer, 2011)	48	
Scopus-3a	Heritage discourse	Search within articles citing <i>Uses of Heritage</i> (Smith, 2006) Refined to: (walking OR pedestrian)	84	10
Scopus-3b		(TITLE-ABS-KEY ("authorized heritage discourse") AND TITLE-ABS-KEY (urban))	2	
Google Scholar-4a	Public life	Search within articles citing Life between buildings: using public space (heritage OR historic) + (walking OR pedestrian) + transport Since 2000	700	7
Scopus-5a	Rhythmanalysis	Citing The Production of Space (1991) Refined to: ((heritage OR historic) AND (walking OR pedestrian) AND transport*)	61	9
Scopus-5b		TITLE-ABS-KEY (rhythmanalysis)	124	
Scopus-6a	Space syntax	(TITLE-ABS-KEY ("space syntax" OR closeness OR [betweenness]) AND TITLE-ABS-KEY (walking OR pedestrian) AND TITLE-ABS-KEY (heritage OR historic OR organic OR traditional))	30	9
Scopus-6b		(TITLE-ABS-KEY ("space syntax") AND TITLE-ABS-KEY (meta-analysis))	2	

Table A.2 References of each research tradition preceded by the number of references (excluding supporting references)

#	Research tradition	Initial selection	Seminal work(s)	Literature expansion	Subtotal
1	Ecological model	2 (Geiger and Werner, 2009; Fillone and Mateo-Babiano, 2018)	2 (McLeroy et al., 1988; Sallis et al., 2006)	6 (Bauman et al., 2002; Alfonzo, 2005; Bauman et al., 2012; van Cauwenberg et al., 2014; Sallis and Owen, 2015; Bornioli et al., 2018)	10
2	New mobilities	2 (Hetherington, 2013; Barber, 2018)	3 (Urry, 2003; Hannam et al., 2006; Sheller and Urry, 2006)	10 (Keeling, 2007, 2008, 2009; Cresswell, 2010, 2011; Middleton, 2011; Bergeron et al., 2014; Cresswell, 2014; Manderscheid, 2014; Waitt et al., 2019)	15
3	Heritage discourse	2 (Hetherington, 2013; Wang and Kao, 2017)	1 (Smith, 2006)	10 (Turner, 2006; Dobson and Selman, 2012; Bieling and Plieninger, 2013; Pendlebury, 2013; Williamson, 2013; Nymoen Rørtveit and Setten, 2015; Jorgensen et al., 2017; Smith, 2017; Smith and Campbell, 2017; Berg, 2018)	13
4	Public life	2 (Özdemir and Selçuk, 2017; Lunecke and Mora, 2018)	2 (Gehl, 2011; Gehl and Svarre, 2013)	7 (Hamilton-Baillie, 2004; Southworth, 2005; Vojnovic, 2006; Sterrett et al., 2012; Carmona, 2015; Forsyth, 2015; Lai and Kontokosta, 2018)	11
5	Rhythmanalysis	2 (Hetherington, 2013; Tchoukaleyska, 2016)	2 (Lefebvre, 1991, 2013)	9 (Knox, 2005; Lin, 2012; Simpson, 2012; DeLyser and Sui, 2013; Sankalia, 2014; Murray and Doughty, 2016; Simonsen, 2016; Blue, 2017; Tartia, 2018)	13

#	Research tradition	Initial selection	Seminal work(s)	Literature expansion	Subtotal
6	Space syntax	3 (Chiang and Deng, 2017; Mansouri and Ujang, 2017; Saito et al., 2017)	3 (Hillier et al., 1987; Hillier et al., 1993; Hillier, 1996)	9 (Turner, 2007; Lerman and Omer, 2016; Li et al., 2016; Sharmin and Kamruzzaman, 2017; Shen and Karimi, 2017; Haq and Berhie, 2018; Jabbari et al., 2018; Lin et al., 2018; Pafka et al., 2018)	15

Appendix B. Thematic descriptions of street design guides

#	City	Streets for all – A vision reverberating throughout	Street typology – reviving the place function	Pedestrian – sidewalk subzoning	Cyclist – level of segregation of cycling infrastructure, parking provision	Transit rider	Motorist, motorcyclist, service provider - Redressing modal balance	People doing business, public space
	Singapore (URA & LTA 2018)	“Walking and cycling is a multi-purpose and multi-sensory experience. Hence, we envision Singapore to be a city that is safe, convenient, comfortable and delightful for all to walk and cycle.” (p. 6)	No mobility-activity typology at the street level. However, roadside typologies exist, and a distinction is made whether a street is located in the central area. Also, a sub-typology of off-road footpaths between developments (whether porous or non-porous).	Typically organized as the mobility portion (e.g., footpaths, cycling paths, shared paths) and non-mobility portion (e.g., planting verges, bus stops and other facilities). “To provide direct connections and reduce the need to make circuitous routes around large or elongated developments, ... paths located between developments ... are critical first- and last-mile walking and cycling links.” (p.71)	Segregated routes where feasible. All types of cycling path are on the roadside (i.e., not on the carriageway). Cycling paths, shared paths, park connector network (PCN) paths for shared use by pedestrians and cyclists. Bike parking facilities (e.g., racks and roadside parking zones). End-of-trips facilities (e.g., shower facilities).	Generic mentions of bus stops and localized adjustments of passing footpaths.	While users of motorized modes do not take central stage, traffic calming schemes such as Silver Zone and School Zone are described. “A two-stage crossing ... helps to accommodate pedestrians with a slower walking pace without overly affecting the delay to vehicular traffic.” (p.94)	
1	New York City (NYCDoT, 2015)	“Provide safe, accessible, convenient, and comfortable facilities for walking, bicycling, and transit, particularly on designated routes and at critical network connections.” (p. 20)	No mobility-activity street typology. Lane-level facilities such as bike lanes and bus lanes zones are introduced.	Not subdivided but sidewalks are typically either Full Sidewalks (pedestrian walkways and street furniture) or Ribbon Sidewalk (with a planting strip)	Bike Lane (Signal-Protected Path, Protected Path with Mixing Zones), Bike Path (Buffered Lane, Standard Lane), Bike Route (mentioned but not included in the manual) Generic mentions of bike racks.	Bus Lane, Busway Bus Stop, Bus Shelter in general. Bus Bulb also introduced. “Design streets to encourage physical activity for all ages and populations by	“The use of slip lanes should generally be avoided unless they produce a conflict-free crosswalk from the island that can provide an important pedestrian-safety	-

#	City	Streets for all – A vision reverberating throughout	Street typology – reviving the place function	Pedestrian – sidewalk subzoning	Cyclist – level of segregation of cycling infrastructure, parking provision	Transit rider	Motorist, motorcyclist, service provider - Redressing modal balance	People doing business, public space
					Bike share system.	making walking, bicycling, and transit attractive and convenient.” (p.21)	enhancement.” (p.53)	
2	Chicago (CDoT, 2013)	“All transportation projects and programs, from scoping to maintenance, will favor pedestrians first, then transit riders, cyclists, and automobiles.” (p.5)	“They (typologies) help in the selection of treatments which best reflect the surrounding environment, best accommodate all modes, best reflect regulatory strictures, and best affect desired outcomes: complete streets.” (p.27) 7 land uses (excluding parkland): Residential/local street, mixed-use street, downtown main street, commercial/pedestrian street, mixed-use street, industrial street; and 6 traffic capacity levels: Thoroughfare, minor arterial, avenue, residential/local street, service street, pedestrian passageway. Extended to an intersection typology.	Not subdivided, all parts such as walkways, door zones, sidewalk furniture are encapsulated in the pedestrian realm.	No bikeway or cycling facility details (limited mentions).	General mentions but no transit facility details.	“Creating project maps with typologies and multi-modal information is an important step in creating complete streets. This will move the agency away from decisions based solely on vehicle level of service.” (p.66)	-
3	Dallas (DCC, 2016)	“The vision of the Dallas Complete Streets Initiative is to build	“A new classification system for streets that takes into account the	Pedestrian Zone is not subdivided.	Bike Lane, Cycle Track, Shared Lane.	Curbside Bus Lane, Median Bus Transitway	“... there are benefits of both one-way and two-	“A majority of residents agree that the benefit

#	City	Streets for all – A vision reverberating throughout	Street typology – reviving the place function	Pedestrian – sidewalk subzoning	Cyclist – level of segregation of cycling infrastructure, parking provision	Transit rider	Motorist, motorcyclist, service provider - Redressing modal balance	People doing business, public space
		streets that are safe and comfortable for everyone: young and old; motorists and bicyclists; walker and wheelchair users; bus and train riders alike.” (p. 3)	street context and the future vision for accommodating all modes of travel ... is provided.” (p.16) 6 types: Thoroughfare, mixed-use, commercial street, residential street, industrial street, parkway		“Bicyclists should be considered and anticipated on all streets in Dallas where they are legally allowed to operate.” (p.147) Bike racks in general.	Bus Stop (Far-Side, Near-Side, Midblock), Bus Shelter, Bus Bulb	way streets, so the decision to convert a one-way street to two-way (or vice versa) is context sensitive.” (p.142)	gained from Complete Streets by having more convenient opportunities to walk and bike to destinations is worth a slightly longer (5 minutes) drive time.” (p.7)
4	San Diego (SDMAC, 2002)	“To offer guidelines for the design of streets that will create harmony and promote function for all users while respecting and supporting the needs of the surrounding community” (p.ii)	No mobility-activity street typology.	Frontage Zone, Throughway Zone, Furnishings Zone, Edge Zone	Bikeway, Bicycle Lane. Only brief specifications were provided.	No bus roadway facility introduced. Generic mentions of bus stops.	No such discussion engaged.	“Sidewalks are not merely thoroughfares for pedestrians. They are also important social spaces where people interact and walk together, catch a bus, window shop, or have a cup of coffee at a café.” (p.74)
5	Charlotte (CCC, 2007)	Such a vision statement was not found. “... the resulting streets are ‘complete’ streets – streets that provide for the safety and comfort of all users to the best extent possible.” (p.51)	“‘Pedestrian- and auto-oriented’ refer both to the design of the street itself and to the characteristics of the land uses located along the street.” (p.7) 5 types: Downtown main street (most pedestrian-oriented), avenue, thoroughfare, major arterial (most	Development Zone, Pedestrian Zone “crucial for safe, walkable neighborhoods”, Green Zone	“Different types of bicyclists have different perspectives or expectations related to their trips. Those expectations will vary according to the type of cyclist and the type of trip - experienced vs. casual cyclists and	Transit Stop, Bus Shelter “Riders’ security concerns may be more pronounced than those of other pedestrians because transit riders may perceive that they are more vulnerable once	“Support economic development and quality of life – by providing more transportation capacity, while creating more user-friendly streets overall.” (p.7)	-

#	City	Streets for all – A vision reverberating throughout	Street typology – reviving the place function	Pedestrian – sidewalk subzoning	Cyclist – level of segregation of cycling infrastructure, parking provision	Transit rider	Motorist, motorcyclist, service provider - Redressing modal balance	People doing business, public space
			auto-oriented), residential/local street		transportation vs. recreational trips.” (p.23) However, the statement was not substantiated with detailed of descriptions of cycle facilities. Only examples of Bike Lanes were given, and the treatment of shared outermost lanes was touched on. Bike racks in general.	they stop walking and start waiting.” (p.22)	“...this ‘need for speed’ usually translates into rapid acceleration and deceleration between intersections, often with minimal impact on a driver’s total travel time, but with significant impacts on pedestrians” (p.16)	
6	Memphis (MCC, 2015)	“Street design shall prioritize safety for all users, particularly more vulnerable groups (children, the elderly, persons with disabilities) and more vulnerable modes (walking, bicycling, and transit).” (p.4)	No mobility-activity street typology. The “roadway typology” was based traffic capacity only.	Frontage Zone, Pedestrian Zone, Curb Zone.	Protected (Buffered Bike Lane, Shared Use Path, Urban Greenway, Cycle Track, Trail), Separated (Bike Lane, Cycle Track, Buffered Bike Lane), Shared (Shared Lane, Marked Shared Lane, Bike Boulevard) “Quality bicycle facilities include spaces comfortably shared with traffic, clearly marked bike lanes (or	No bus priority roadway facility introduced. Bus Stop (Far-Side, Near-Side), Bus Pull-off, Midblock Curb Extension (i.e. bus bulb). “Bus stops should be designed to facilitate comfortable, easy passenger access. Bus stop areas should be clear from obstructions, allowing	“While automobile travel will always demand substantial accommodations in the built environment, the City of Memphis is a prominent community in the national movement toward a healthier, multimodal approach to planning and design.” (p.19)	-

#	City	Streets for all – A vision reverberating throughout	Street typology – reviving the place function	Pedestrian – sidewalk subzoning	Cyclist – level of segregation of cycling infrastructure, parking provision	Transit rider	Motorist, motorcyclist, service provider - Redressing modal balance	People doing business, public space
					appropriate separation based on speed and volume of vehicle traffic), adequate bicycle parking, intersection treatments and destinations accessible by bicycle.” (p.13) Bike Rack (on-street, sidewalk, off-street), Bike Share System	adequate room for waiting passengers who may be carrying parcels or baggage, or who may be traveling with bicycles.” (p.124)		
7	Boston (BTD, 2013)	“The Complete Streets approach places pedestrians, bicyclists, and transit users on equal footing with motor vehicle users, and embraces innovative designs and technologies to address climate change and promote active healthy communities.” (p. xiii)	“As the city continues to evolve, understanding how different streets interact with adjacent land uses and contexts is central to creating Complete Streets.” (p.1) 9 types: Downtown main street, commercial/pedestrian street, residential/local street, avenue, thoroughfare, industrial street, shared street, waterfront/parkside street.	Frontage Zone, Pedestrian Zone, Greenscape/Furnishing Zone, Curb Zone.	Cycle Track, Bicycle Lane, Left-Side Bicycle Lane, Buffered Bicycle Lane, Contra-Flow Bicycle Lane, Climbing Lanes, Marked Shared Lanes, Priority Shared Lanes Contra-flow cycle lanes are seen as a solution to indirect cycling routes. “The current pattern of street directions in Boston (i.e., two-way or one-way in one of two directions) has	Curbside Bus Lane, Median Bus Lane, Contra-Flow Bus Lane, Median Protected Busway Bus Stop, Bus Shelter “Bus stops are the most basic transit stops, and should be comfortable, safe, and accessible.” (p.84)	“Traditional policies, both written and unwritten, have focused primarily on reducing motor vehicle delay, which offers benefits of reducing vehicle emissions and fuel consumption; however, these policies prioritized motorists over other users. Moving forward, intersection design in Boston will equally address	“To encourage people to linger, sidewalks need to be safe, comfortable, and attractive, with facilities that provide accommodations for people of all ages and abilities.” (p. 18)

#	City	Streets for all – A vision reverberating throughout	Street typology – reviving the place function	Pedestrian – sidewalk subzoning	Cyclist – level of segregation of cycling infrastructure, parking provision	Transit rider	Motorist, motorcyclist, service provider - Redressing modal balance	People doing business, public space
					<p>been developed primarily to facilitate efficient movement of automobile traffic and has led to significant number of one-way streets.” (p.132)</p> <p>Bicycle Parking, Bicycle Rack (usually in Frontage or Greenscape Zones.)</p> <p>“Appropriately located bicycle racks and shelters are essential to encouraging people to ride by making parking more convenient.” (p.75)</p>		the safety, comfort, and convenience of all modes.” (p.141)	
8	Louisville (LMC, 2007)	“Louisville Metro’s commitment to a “complete streets” policy is intended to promote the design of transportation corridors that are safe and convenient for pedestrians, bicyclists, motorists, and bus riders of all ages and abilities.” (p.2)	No mobility-activity street typology. The “thoroughfare typology” was based on traffic capacity only.	Storefront Zone, Pedestrian Zone, Amenity Zone, Edge Zone	Bike Lane, Shared Use Path, Wide Curb Lane, Shoulder as a bicycle facility (essentially a cycle track). However, no details given. Generic mentions of bikeways and cycling parking facilities.	Dedicated Bus Lane, Transit shelter, Bus Pull-off	No such discussion engaged.	-

#	City	Streets for all – A vision reverberating throughout	Street typology – reviving the place function	Pedestrian – sidewalk subzoning	Cyclist – level of segregation of cycling infrastructure, parking provision	Transit rider	Motorist, motorcyclist, service provider - Redressing modal balance	People doing business, public space
9	San Francisco (SFB, 2010)	“The Plan does not generally focus on roadway or vehicle travel characteristics. ... San Francisco streets should be designed for ease of use and access to destinations for all populations, particularly those with visual or mobility impairments.” (p. i-iii)	“These street types are not intended to replace official functional transportation classifications (shown in the Transportation Element of the San Francisco General Plan) but instead are meant to serve as a guide for designing appropriate streetscape environments.” (p.55) 5 standard types (with some combined): Commercial/pedestrian street, downtown main street, neighborhood main street, residential/local street, avenue, mixed-use street. 6 special types: major arterial, waterfront/parkside street, thoroughfare, boulevard, laneway, shared street, pedestrian passageway.	Frontage Zone, Throughway Zone, Furnishing Zone, Edge Zone, Extension Zone	No details of cycle lanes/tracks though cycle parking facilities are well documented.	No bus roadway facility introduced. Transit Stop, Transit Shelter, Transit Boarding Island (in the median) “Support Muni and a transit-first city: Every transit trip begins and ends with a walking trip. Well designed streets that are safe and convenient for pedestrians and connect to important transit lines will encourage greater use of the transit system.” (p.i)	“Factors such as numbers of lanes, lane widths, design and posted speeds, number of directions (one-way or two-way), and how the roadway is split among different travel modes (transit, bicycles, vehicles) exert a great influence on pedestrian safety and quality.” (p.17)	-
10	NACTO (NACTO, 2016)	“Multimodal streets offer people options for safe, attractive, and convenient travel by foot, by cycle, on transit,	“Every city must identify the range of street typologies it encompasses. To ensure that new street designs are suitable for the	Frontage Zone, Clear Path, Street Furniture Zone, Buffer Zone	Cycle Lane, Cycle Track, Cycle Street “Cycle lanes and tracks should allow for social and conversational	Transit Lane (Side-Running, Center-Running), Transitway, Shared Transit Street	“One-way operation is well-suited for narrow streets and alleys where vehicle access is needed	“Well-designed streets connect people with their communities, providing opportunities to

#	City	Streets for all – A vision reverberating throughout	Street typology – reviving the place function	Pedestrian – sidewalk subzoning	Cyclist – level of segregation of cycling infrastructure, parking provision	Transit rider	Motorist, motorcyclist, service provider - Redressing modal balance	People doing business, public space
		as well as in motorized vehicles.” (p.14) “Design streets to be equitable and inclusive, serving the needs and functions of diverse users with particular attention to people with disabilities, seniors, and children. Regardless of income, gender, culture, or language, whether one is moving or stationary, streets must always put people first.” (p.54)	given context, existing streets must be documented and analyzed as part of the comprehensive public space network.” (p.190) Mainly 12 types: Commercial/pedestrian street; laneway; parklet; square; shared street; residential/local street; neighborhood main street, major arterial, minor arterial, avenue, waterfront/parkside street. Other special conditions, e.g. temporary closure, were addressed separately.		riding for everyday use as well as long commutes. They should be designed for all types of riders and all levels of comfort, from the 5-year-old to the 95-year-old cyclist.” (p.92) Cycle Rack, Cycle Corral, Cycle Share Station. Cycle-Protected Intersection, Cycle Box	In-Lane Stop, Island Stop, Median Stop, Pull-Out Stop. Placement: Near-Side, Far-Side, Midblock. Other public transport modes also covered.	but two lanes are not possible.” (p.169) “Motorists are people driving personal motor vehicles ... This includes drivers of private cars, for-hire vehicles, and motorized two-and three-wheelers. Streets and intersections must be designed to facilitate safe movement and manage interactions between motor vehicles, pedestrians, and cyclists.” (p.69) Motorcycle parking was mentioned.	meet people, see friends, and feel socially connected.” (p.13) “As public spaces, sidewalks serve as the front steps to the city, activating streets socially and economically.” (p.78)
11	London (TfL, 2016)	“Streets are places for people. Successful streetscapes are inclusive and provide for the competing requirements of their users, including pedestrians, cyclists, motorcyclists, bus operators, bus	“Look at streets not just as corridors that move people, but as places which contribute to the Capital as a key part of the public realm” (p.13, quoted from Road Task Force)	Not subdivided but interfacing and transitioning in terms of material use were elaborated. “Facilitate an increase in walking and cycling – ensure that walking and cycling are the	No shared use with pedestrians. Segregated Lane/Track, Stepped Track, Light Segregated Lane, Mandatory Cycle Lane, Shared	Bus Lane (briefly explained) Bus Stop (briefly explained, cycle lanes at bus stops also mentioned) Other public transport modes also covered.	“Create safer streets – slowing traffic speeds where appropriate, maintaining good visibility and reducing the likelihood of collisions.” (p.16)	“Facilitate social interaction – opportunities should be taken to encourage people to interact socially on the street and support stationary activities where

#	City	Streets for all – A vision reverberating throughout	Street typology – reviving the place function	Pedestrian – sidewalk subzoning	Cyclist – level of segregation of cycling infrastructure, parking provision	Transit rider	Motorist, motorcyclist, service provider - Redressing modal balance	People doing business, public space
		passengers, private vehicle owners, and freight vehicle operators.” (p.2)	3 land use levels (regional, district, neighborhood) and 3 traffic capacity levels (strategic, distributor, local): Major arterial, thoroughfare, minor arterial, downtown main street, neighborhood main street, avenue, commercial/pedestrian street, mixed-use street, residential/local street.	most competitive transport modes for short and medium length journeys.” (p.15)	Bus Lane, Advisory Cycle Lane “Proposals for cycling should reflect the place function of a street within a wider area – the street’s character and the uses and activities that take place within it – rather than be determined solely by the movement of other vehicles.” (p.114) Sheffield Cycle Stand, Cycle Hire Docking Station “It (cycle parking) must also allow for all types of cycle to be securely parked, ensuring that any cycle user with a physical, sensory or cognitive impairment should enjoy access to good quality cycle parking” (p.217)		“The removal of any unnecessary road markings will help to reduce visual clutter and maintenance costs, and in most cases contribute to improved legibility.” (p.109) “(Motorcycles) have become particularly popular for business use in central London. This has increased pressure on ourselves and the boroughs to deliver more motorcycle parking facilities where they are most needed.” (p.185)	appropriate.” (p.15)
12	Birmingham, West Midlands (BH, 2005)	In the context of heritage conservation. “English Heritage supports the aim of	No mobility-activity street typology.	Sidewalk not subdivided.	Generic mentions of bikeways and cycling parking facilities..	Bus Lane, Bus Stop, Bus Shelter (briefly explained)	Recommends against installation of guardrail	“Such an approach offers new opportunities to combine good

#	City	Streets for all – A vision reverberating throughout	Street typology – reviving the place function	Pedestrian – sidewalk subzoning	Cyclist – level of segregation of cycling infrastructure, parking provision	Transit rider	Motorist, motorcyclist, service provider - Redressing modal balance	People doing business, public space
		making our streets and spaces accessible for everyone. ... These place a greater emphasis on walking and cycling, on the value of public transport, on provision for the safety of children, and on accessibility for all.” (p.5-6)					“Only use guardrails where other safety measures are inappropriate and use designs that relate to the townscape” (p.37)	urban design principles with safety in traffic engineering and should be used where appropriate but ensuring that historic streetscape character and layout is not lost.” (p.6)
13	Leeds	“However the emphasis should be on “people movement” based on the following hierarchy of consideration, with the needs of the disabled, the elderly, and children to be taken into account for all modes: ...” (p.3)	No mobility-activity street typology.	Sidewalk not subdivided.	Generic mentions of bikeways and cycling parking facilities.	No specific transit-related facilities introduced..	“The City Council is prepared to apply a much greater degree of flexibility in some areas ... The amendment will only be allowed if it ... does not contravene UDP policy T2 (namely that ‘it will not create or materially add to problems of safety, environment or efficiency on the highway network’).” (pp.4-5)	-

#	City	Streets for all – A vision reverberating throughout	Street typology – reviving the place function	Pedestrian – sidewalk subzoning	Cyclist – level of segregation of cycling infrastructure, parking provision	Transit rider	Motorist, motorcyclist, service provider - Redressing modal balance	People doing business, public space
14	Glasgow, Scotland (TSG, 2010)	“Street design should provide good connectivity for all modes of movement and for all groups of street users, respecting diversity and inclusion.” (p.13)	No mobility-activity street typology.	Sidewalk not subdivided.	Generic mentions of bikeways and cycling parking facilities.	No specific bus priority facilities introduced. “Bus stops should be placed near junctions so that they can be accessed by more than one route on foot, or near specific passenger destinations.” (p.28)		-
15	Sydney (CoSC, 2013)	Such a vision statement was not found. “Street design must include a universal design approach to provide inclusive access and use for people of all ages and abilities” (p.20)	“Promote the ‘place’ function of streets by clearly defining the role of individual Sydney street types” (p.21) 7 types: Thoroughfare, downtown main street, residential/local street, laneway, residential/local street, shared street, transit street.	A sidewalk typology corresponding the street typology is in place.	Generic mentions of bikeways and cycling parking facilities.	No bus roadway facility introduced. Bus stops are mentioned but not in detail.	Arterial road - “Support a high balance of function for vehicular traffic and public transport, whilst providing for adequate and safe movement functions for pedestrians and cyclists” (p.75)	-
16	Brisbane (BCC, 2013b)	The selected documents do not contain an overall statement.	The street typology is used for sidewalk design guidance. “With ongoing population growth and increasing pressure on our lifestyle, Brisbane City Council must plan for a quality	Sidewalk not subdivided.	No bikeway or cycle parking facility details.	No specific transit-related facilities introduced.	No such discussion engaged.	-

#	City	Streets for all – A vision reverberating throughout	Street typology – reviving the place function	Pedestrian – sidewalk subzoning	Cyclist – level of segregation of cycling infrastructure, parking provision	Transit rider	Motorist, motorcyclist, service provider - Redressing modal balance	People doing business, public space
			public domain. The public footway is a significant and under appreciated asset“ (p.5) 7 types: Major arterial, downtown main street, residential/local street, industrial street, laneway, pedestrian passageway.					
17	Adelaide (CoA, 2016)	“This design guidance places pedestrians, cyclists, and public transport users on equal footing with vehicles, and embraces innovative designs and technologies to address climate change and promote active healthy communities, establishing a new standard for street design.” (p.8)	10 types (except streets inside parks): Boulevard, transit street, waterfront/parkside street, downtown main street, neighborhood main street, residential/local street, square, laneway, pedestrian passageway.	“Maintain comfort and ease of movement with dedicated facilities for catching public transport, which also encourage walking and cycling activities” (p.35) Interface Zone, Pedestrian Zone, and Furnishing/Activity Zone, Edge/Extension Zone that “facilitate various types of activity and ensure the accessibility of all ages and abilities” (p.90).	Bikeway (Full Separation, Stepped Separation, Light Separation), Dedicated Cycle Lane, Shared Facility “People who ride bikes have varying degrees of skill and levels of comfort in using a street environment, which results in a wide range of speeds and behaviours.” (p.84) “Bike racks encourage and maximise the potential for bike usage by providing a secure and convenient facility to store and lock bikes.” (p.183)	“Safety, comfort and movement is important on a Transit Boulevard for an easy pedestrian transition.” (p.36)	“At the same time each street must accommodate the need for services, parking, loading, car accessibility and understand and plan for the environment of walkers, public transport users, bike riders and all age and mobility capabilities.” (p.28)	“The approaches in the Adelaide Design Manual will help the city to address urban challenges that have a significant impact on public space ...” (p.8)

#	City	Streets for all – A vision reverberating throughout	Street typology – reviving the place function	Pedestrian – sidewalk subzoning	Cyclist – level of segregation of cycling infrastructure, parking provision	Transit rider	Motorist, motorcyclist, service provider - Redressing modal balance	People doing business, public space
18	Gold Coast (CoGC, 2014)	Such a vision statement was not found.	No mobility-activity street typology.	Not subdivided.	No bikeway or cycle parking facility details.	No specific transit-related facilities introduced.	No such discussion engaged.	-

Appendix C. Categorical canonical correlation analysis results

The categorical canonical correlation analysis results returned by the homals package on the R platform are presented in the table below, namely category quantifications, category scores and category centroids (the centres of gravity of object scores) on the two dimensions.

Variable	Level	Quantification (single)	Score Dim1	Dim2	Centroid Dim1	Dim2
<i>Set 1 – Importance ratings</i>						
O1	2	-0.239	0.079	0.022	0.067	0.066
	3	-0.132	0.044	0.012	0.040	0.026
	4	-0.038	0.013	0.004	0.015	-0.004
	5	-0.015	0.005	0.001	0.006	-0.001
	6	-0.005	0.002	0.000	0.001	0.001
	7	0.042	-0.014	-0.004	-0.015	-0.001
O2	2	-0.289	0.098	0.051	0.084	0.078
	3	-0.120	0.040	0.021	0.036	0.030
	4	-0.023	0.008	0.004	0.013	-0.007
	5	-0.023	0.008	0.004	0.010	0.001
	6	-0.008	0.003	0.001	0.000	0.006
	7	0.047	-0.016	-0.008	-0.016	-0.008
O3	1	-0.083	0.028	-0.033	0.026	-0.035
	2	-0.037	0.013	-0.015	0.016	-0.012
	3	-0.036	0.013	-0.015	0.007	-0.019
	4	-0.031	0.011	-0.012	0.010	-0.013
	5	-0.027	0.009	-0.011	0.009	-0.010
	6	0.029	-0.010	0.012	-0.008	0.013
	7	0.059	-0.020	0.024	-0.023	0.021
O4	1	-0.220	0.086	-0.014	0.084	-0.027
	2	-0.061	0.024	-0.004	0.024	-0.003
	3	-0.059	0.023	-0.004	0.025	0.008
	4	-0.039	0.015	-0.002	0.014	-0.013
	5	-0.038	0.015	-0.002	0.016	0.001
	6	0.029	-0.011	0.002	-0.011	0.004
	7	0.030	-0.012	0.002	-0.012	-0.001
O5	1	-0.046	0.010	-0.013	-0.014	-0.016
	2	-0.046	0.010	-0.013	-0.006	-0.029
	3	-0.046	0.010	-0.013	0.010	-0.015
	4	-0.046	0.010	-0.013	0.011	-0.012
	5	-0.003	0.001	-0.001	0.005	0.003
	6	0.035	-0.007	0.009	-0.007	0.010
	7	0.048	-0.010	0.013	-0.017	0.008
O6	1	-0.062	0.006	-0.017	-0.012	-0.023

Variable	Level	Quantification (single)	Score Dim1	Dim2	Centroid Dim1	Dim2
	2	-0.062	0.006	-0.017	-0.012	-0.024
	3	-0.055	0.005	-0.015	-0.008	-0.020
	4	-0.033	0.003	-0.009	0.011	-0.006
	5	-0.005	0.001	-0.001	0.008	0.001
	6	0.033	-0.003	0.009	-0.006	0.008
	7	0.054	-0.005	0.015	-0.014	0.012
<i>Set 2 – Respondent characteristic</i>						
Gender	F	-0.037	0.000	-0.005	0.000	-0.005
	M	0.033	0.000	0.004	0.000	0.004
Age	<20	-0.016	0.004	-0.005	0.008	-0.002
	20-29	-0.008	0.002	-0.003	-0.001	0.000
	30-39	-0.008	0.002	-0.003	0.002	-0.005
	40-49	-0.008	0.002	-0.003	0.006	-0.007
	50-59	0.020	-0.006	0.006	-0.012	0.001
	>=60	0.150	-0.042	0.048	-0.040	0.050
Car_dri	No	-0.019	0.004	0.006	0.004	0.006
	Yes	0.064	-0.014	-0.021	-0.014	-0.021
Car_pas	No	-0.028	0.009	0.003	0.009	0.003
	Yes	0.044	-0.014	-0.005	-0.014	-0.005
Bus	No	-0.057	-0.010	-0.013	-0.010	-0.013
	Yes	0.021	0.004	0.005	0.004	0.005
Train	No	-0.060	-0.019	-0.014	-0.019	-0.014
	Yes	0.020	0.006	0.005	0.006	0.005
Bicycle	No	-0.015	0.000	0.001	0.000	0.001
	Yes	0.081	0.001	-0.006	0.001	-0.006
PMD	No	-0.009	0.001	0.001	0.001	0.001
	Yes	0.134	-0.011	-0.013	-0.011	-0.013
MC	No	-0.004	0.001	-0.001	0.001	-0.001
	Yes	0.314	-0.066	0.047	-0.066	0.047
<i>Area (scaled, but not used in the loss minimisation)</i>						
Area	A	-0.020	-0.005	-0.004	-0.004	-0.004
	B	0.025	0.006	0.005	0.010	-0.001
	C	-0.079	-0.018	-0.015	-0.014	-0.020
	D	-0.014	-0.003	-0.003	-0.005	-0.001
	E	0.005	0.001	0.001	0.002	-0.001
	F	0.001	0.000	0.000	-0.007	0.009
	G	0.009	0.002	0.002	-0.013	0.019
	H	0.042	0.009	0.008	0.013	0.004
	I	0.043	0.010	0.008	0.013	0.004

Appendix D. Supplementary materials to the thematic analysis

Table D.1 Codebook of thematic analysis

Theme / Subtheme	Description
T1 – Transport	Pedestrian-oriented urban and transport planning
Accessibility	Accessibility issues of heritage places in other transport modes than walking
Car-lite	The vision of a car-lite society
Pedestrian-friendly	The property of the urban environment being friendly to pedestrians, including moves such as pedestrianization
T2 – Art	Synergy between heritage and arts including heritage buildings converted to art facilities and the programming of heritage-themed art events
Art facilities	Art facilities in historic districts or converted from heritage buildings
Art programming	Heritage-themed art programming of events and activities
T3 – Broadening scope	The broadening scope of urban/built heritage, which concerns the types of buildings or structures that qualify, as well as the preconceptions about what qualifies as urban heritage
Unconventional	Unconventional types of heritage such as public libraries, public housing blocks and playgrounds, private strata-titled buildings, industrial structures and even some old bus stops and tree-canopy roads, etc.
Stereotype	The typical image of heritage perceived to be static and inaccessible, e.g., artefacts showcased in museums or mechanical lectures of history
T4 – Sensitivity & perception	Sensitivity to and perception of urban heritage
Knowledge or cultural understanding	Knowledge of or curiosity about the historical/social relevance of architectural or urban design to the place, and cultural understanding of heritage places or historic districts
Overlooking	People not paying attention to certain elements in the built environment that may have heritage value, or lack of interest in it
Sentiment	The ability of urban heritage to inflict sentiments (e.g., sense of loss) or arouse passers'-by interest
Whetting passers'-by interest	The quality of the built environment in general (e.g., building design) to arouse interest of people walking past
T5 – Kinaesthetic learning	Heritage trails and tours for kinaesthetic learning, i.e., learning while walking
Heritage trails or walking tours	General mentions of heritage trails and walking tours
Mobile apps	Mobile apps for heritage trails and walking tours, either guided or self-guided
Physical efforts	The physical efforts walking requires on users (e.g., of heritage trails) such as physical strength, overcoming hot weather, etc.
Locals and tourists	Explicit mentions of the type of participants, visitors, members of the general public that a certain facility or event is intended for
T6 – Walking	Descriptions of walking experiences in urban environments for various purposes (utilitarian, recreational etc.)
T7 – Maintaining relevance	Maintaining everyday relevance of heritage places which is supported by robust residential living or having routines incorporated in people's daily lives
Everyday relevance	Efforts such as education, innovative ways of communication, and maintenance/upkeep to keep heritage places relevant to people's everyday lives
Residential living	Geographical community, long-time inhabitants in a certain area

Table D.2 Bibliography and indexing of selected newspaper articles

#	Ref	Date	Author	Section	Length	Headline	T1	T2	T3	T4	T5	T6	T7
1	1996a	1996-07-11	Allison Lim	-	747	Towards a great metropolis: S'pore to get new waterfront	N	N	N	Y	Y	Y	N
2	1996b	1996-07-27	Stephanie Yeo	-	1614	Fullerton Building to be made a heritage complex	N	N	N	Y	N	N	N
3	1996c	1996-08-18	-	-	640	Walk -to discover interesting facts about Singapore's history	N	N	N	Y	Y	Y	N
4	1997a	1997-07-10	Koh Boon Pin	-	707	Architects get incentives for conservation	Y	N	N	N	Y	N	N
5	1997b	1997-10-22	Janet Ho	-	1199	Listen, these exhibits can talk, act	N	N	Y	Y	Y	N	Y
6	1998a	1998-11-22	-	-	437	THE \$ 97.5-MILLION PLAN: To give Chinatown a facelift	N	Y	N	Y	Y	N	N
7	1998b	1998-12-02	-	-	417	Permanent heritage trail to be launched	N	N	N	N	Y	Y	Y
8	1998c	1998-12-05	-	-	360	Maintain life and soul of Chinatown	N	N	N	Y	Y	N	Y
9	1998d	1998-12-12	-	-	1643	Plans enhance Chinatown	Y	N	N	Y	Y	N	Y
10	1999a	1999-03-14	M. Nirmala	-	529	National Library building to go	N	N	N	Y	N	N	N
11	1999b	1999-03-26	Tuminah Sapawi	-	1395	Honey, you know why you have to do that?	N	N	N	N	Y	N	Y
12	1999c	1999-03-26	Tuminah Sapawi	-	454	Istana Kampong Glam: Perfect venue	N	N	N	N	N	N	N
13	1999d	1999-04-25	Zuraidah Ibrahim and Zusanita Zakaria	-	1398	At home with a royal family	N	N	N	Y	N	N	N
14	1999e	1999-07-30	-	-	260	History lesson at first Heritage Trail	N	N	N	N	Y	Y	N
15	1999f	1999-08-01	Sharmilpal Kaur	-	306	Taking a Walk back in time	N	N	N	N	Y	N	Y
16	1999g	1999-08-30	Natalie Soh	-	305	Old Parliament House to hear strains of music	N	Y	N	N	N	N	N
17	1999h	1999-08-30	Natalie Soh	-	481	On the trail of surprises	N	N	N	Y	Y	Y	N
18	2000a	2000-03-07	Lydia Lim	-	570	National Library building to go	N	N	N	Y	N	N	N
19	2000b	2000-07-23	Susan Long	-	627	Geylang Serai made a historic district	N	N	N	N	Y	N	N
20	2001a	2001-03-07	Tan Shzr Ee	-	1065	See Me, Feel Me, Hold Me, Touch Me; Hands-On Heritage	N	N	Y	Y	Y	Y	N
21	2001b	2001-06-23	Arti Mulchand	-	1369	Arts, Interrupted?; Art not forsaken for MRT	Y	Y	N	N	N	N	N
22	2001c	2001-11-04	-	-	613	Treespotting	N	N	Y	N	N	N	N

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23	2002a	2002-04-12	-	-	251	Keep old place names, protect local heritagebyLEE KIP LEE/by	N	N	N	N	Y	N	N
24	2002b	2002-04-20	Karamjit Kaur Goh Chin Lian	-	422	The nightmare ends today;Chinatown shops hope customers will return as the banging and digging ends and a stretch of New Bridge Road reopens after four years	N	N	N	N	N	N	N
25	2002c	2002-04-26	Ginnie Teo	-	1063	Walk, stop and breathe in history;For the first time since the Civic District Trail was launched, three new buildings have been added. We take a look at these and other monuments that line the heritage trail	N	N	N	Y	Y	Y	N
26	2002d	2002-07-28	-	-	1729	MRT stations: Get names back on track	N	N	Y	Y	Y	N	N
27	2002e	2002-09-24	Sim Chi Yin	-	381	Plan to save old and rare trees bears fruit	N	N	Y	Y	N	N	N
28	2002f	2002-12-08	Neo Hui Min	-	652	Push for a trust to preserve historic homes;Conservationists say it could keep memory of inspirational S'poreans, like calligrapher Pan Shou, alive	N	N	N	N	Y	N	Y
29	2003a	2003-12-04	Goh Chin Lian	-	681	Tunnel mining of road link saves trees;Burrowing through Fort Canning Hill to build an underground road instead of excavating from above will preserve 22 trees at least	N	N	Y	Y	N	N	N
30	2005a	2005-01-26	Joyce Teo	-	519	Heritage roads;Ambience of selected scenic roads are to be preserved	N	N	Y	Y	N	N	N
31	2005b	2005-10-29	Lee Sze Yong	-	1765	Building on the past;Not everything is being bulldozed into dust as developers build brand new homes. Some private residential developments are built with their former owners in mind	N	N	N	Y	N	N	N
32	2005c	2005-11-08	Goh Chin Lian	-	243	8 Circle Line station names set	N	N	N	N	N	N	N
33	2007a	2007-03-09	Tan Hui Yee, Housing Correspondent	-	432	2 plots, 13 shophouses in Kg Glam auctioned; Six parties snap up the properties with bids as high as \$3 million	Y	N	N	N	N	N	N
34	2007b	2007-08-04	Tay Suan Chiang	Life! - Life Design	438	Old soul; Architect Fumihiko Maki has a soft spot for heritage buildings but says cities need a mix of old and new	N	N	N	Y	N	N	N
35	2008a	2008-01-06	Adeline Chia	-	370	A new whirl of dance, MRT art and hip museum; By all indications, 2008 is going to be an exciting year. Lifestyle predicts which trends, events or faces will replace those which made waves last year.	N	Y	Y	N	N	N	N
36	2008b	2008-01-15	John Gee	Review - Others	1574	The Samsui women of today	N	N	N	N	N	Y	N

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37	2008c	2008-06-07	Tan Hui Yee	-	2025	Going, going, gone; Modern buildings of Singapore as an emerging nation deserve closer look before they go under the wrecker's ball or replaced quietly	N	N	Y	Y	N	N	Y
38	2008d	2008-09-19	-	-	515	Four areas, many nights out	N	Y	N	Y	N	N	N
39	2008e	2008-09-30	-	Life! - Life Travel	802	\$8m boost for heritage projects Helping hand; NHB giving out grants to schemes that promote Singapore's cultural and ethnic heritage	N	N	N	N	Y	N	N
40	2008f	2008-10-04	Tay Suan Chiang	-	570	Twelve iconic structures; The URA has extended its conservation efforts to cover towers, bridges and structures other than buildings for the first time.	N	N	Y	Y	N	N	N
41	2009a	2009-02-04	Tan Hui Yee, Correspondent	-	1778	Loosen up and let the energy in; Architect feels there should be more 'chaotic order' as in Geylang and Little India to bring vibrancy to Singapore	N	Y	N	Y	N	Y	Y
42	2009b	2009-02-26	Stephanie Yap	Life! - Life Arts	915	Sleaze is not all bad; No one wants to live near a red-light district, but sometimes that's the price of history	N	N	N	Y	N	N	N
43	2010a	2010-03-28	Goh Chin Lian	-	498	Marina malls gear up for Circle Line; New stations will cut walking time to shops; museums around Bras Basah will benefit too	Y	N	N	N	N	Y	N
44	2010b	2010-06-28	Andrew Meier	Forum	235	Connect, extend existing off-road paths for cyclists	N	N	N	N	N	N	N
45	2010c	2010-09-17	Magdalen Ng	Life! - Life News	504	Heritage walks on your phone; Learn about Kampong Glam, Chinatown, Little India and Boat Quay on walks to these places	N	N	N	Y	Y	Y	N
46	2010d	2010-09-25	Tessa Wong	-	734	Little India's big traffic woes; Jams, rampant jaywalking and lack of parking are some woes plaguing businesses, residents	Y	N	N	N	N	Y	N
47	2011a	2011-01-13	Ang Swee Hoon, For The Straits Times	Review - Others	794	Playing the name game with MRT stations	N	N	N	Y	Y	N	Y
48	2011b	2011-02-20	Melissa Lin	-	455	Joo Chiat is first Heritage Town; Judges' unanimous decision nets town \$100,000 to develop heritage activities	N	Y	Y	Y	Y	N	N
49	2011c	2011-04-09	Tay Suan Chiang	Life! - Life Design	2305	Heritage houses are hot; Traditional shophouses, with their rich history and quaint style, are gaining popularity among real-estate hunters	N	N	N	N	N	Y	Y
50	2011d	2011-04-17	Eunice Quek and Lua Jia Min	Lifestyle - Taste	2739	Nostalgic nosh; Family-run old-school eateries are still a hit for those looking for handmade comfort food	N	N	N	Y	N	N	N

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51	2011e	2011-07-23	Tay Suan Chiang	Life!; Life Design	1874	Walk this way; Historical landmarks such as reservoirs and the old Kallang Gasworks on heritage trails give insights into Singapore's past	N	N	Y	Y	Y	Y	N
52	2011f	2011-08-16	Jessica Lim and Daryl Chin	Singapore	623	Malay Village redevelopment welcomed; Leaders, tenants look to revitalising area; aim to modernise yet retain elements of culture	N	N	N	Y	N	Y	N
53	2011g	2011-11-17	Terence Chong and Chua Ai Lin, For The Straits Times	Review; Others	840	Saving Bukit Brown	N	N	N	Y	N	Y	N
54	2011h	2011-12-29	Akshita Nanda	Life!; Life Arts	512	Walk this way and learn	N	N	N	Y	Y	N	N
55	2012a	2012-02-01	Maria Almenoar, Transport Correspondent	Singapore	561	Jalan Besar shopkeepers divided over safety poles; Some fear metal props will make tourists think area is unsafe, others call them a good move	N	N	N	N	Y	N	N
56	2012b	2012-02-19	-	Lifestyle; Hot	867	Going on trail by app; Cheryl Faith Wee tries out a new mobile phone app that pinpoints significant World War II sites here	N	N	N	Y	Y	Y	N
57	2012c	2012-05-04	Miranda Yeo	Singapore	357	Students revive old Kg Glam in 3-D; Project gets permanent spot at heritage centre	N	N	N	Y	Y	Y	N
58	2012d	2012-05-31	Stacey Chia	Singapore	417	Heritage trails go high-tech; App sends site-specific info, queries to enhance students' experience	N	N	N	N	Y	N	Y
59	2012e	2012-07-13	-	Life!; Life News; Guiding Stars	706	River tour makes a splash; Think you know Singapore? Well, not until you have poked around in Joo Chiat's back alleys, hung out with some Chinese opera singers and heard some swinging tales about Singapore's sultans. Tours of Singapore are not just for tourists. Four local guides tell LYDIA VASKO why	N	N	N	Y	Y	N	Y
60	2012f	2012-07-13	-	Life!; Life News; Guiding Stars	839	A forgotten sultan, a stolen throne; Think you know Singapore? Well, not until you have poked around in Joo Chiat's back alleys, hung out with some Chinese opera singers and heard some swinging tales about Singapore's sultans. Tours of Singapore are not just for tourists. Four local guides tell LYDIA VASKO why	N	N	N	Y	Y	N	Y
61	2012g	2012-08-31	rachel chan	Life!; Life Arts	582	Night-time fun at the museums; Join the revelry in the arts and heritage civic district during the Night Fest starting tonight	Y	Y	N	N	N	N	N

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62	2012h	2012-12-15	melissa tan	Money	479	More hotels to meet demand; Analysts optimistic about outlook as area undergoes transformation	Y	N	N	Y	N	N	N
63	2013a	2013-02-06	Huang Lijie	Life!; Life Arts	427	Heritage in highlight; A second community museum and blockbuster shows are some activities to look forward to	N	N	Y	Y	Y	N	Y
64	2013b	2013-03-08	Lisabel Ting	Life!	2098	App-titude for history; Want a spot of Singapore history or culture? Download a walking tour app on your mobile phone	N	N	Y	Y	Y	Y	N
65	2013c	2013-03-29	Kezia Toh	Life!; Life News	2416	Lead and learn; The number of volunteer guides at museums, parks and wildlife reserves here is rising	N	N	N	N	N	N	N
66	2013d	2013-03-30	Stacey Chia	Singapore	451	Heritage tour for Tamil festival; Language promotion bodies take new tack after joining Heritage Board	N	N	N	Y	Y	N	Y
67	2013e	2013-08-08	Janice Tai	Singapore	533	More heritage sites get on mobile app bandwagon; Apps serve as virtual tour guides to direct and educate visitors	N	N	N	N	Y	N	N
68	2013f	2013-10-05	Natasha Ann Zachariah	Life!	2654	Spiralling success; Shophouse with a stunning staircase is among winners at this year's Architectural Heritage Awards	N	Y	N	Y	N	Y	Y
69	2013g	2013-10-11	Melody Zaccheus	Singapore	590	URA portal on heritage buildings proves a hit; Site shares wealth of info like archive photos, significance of buildings	N	N	N	Y	Y	Y	Y
70	2013h	2013-11-25	Christopher Tan Senior Correspondent	Top of the News	829	Journey towards a 'car-light' Singapore; URA plan will see people commuting less, and walking and cycling more	Y	N	N	N	Y	Y	N
71	2013i	2013-12-20	Melody Zaccheus	Singapore	687	Heritage by the water's edge	N	N	Y	Y	Y	N	Y
72	2014a	2014-02-07	Lydia Vasko	Life!	2193	We Remember; A series of public tours to World War II sites in Singapore has been launched to mark the 72nd anniversary of the Japanese invasion	N	N	N	Y	N	Y	N
73	2014b	2014-04-11	Rachel Au-Yong	Singapore	775	Big plans for Little India lane; Quiet Campbell Lane set to become heartbeat of ethnic enclave	Y	N	N	Y	N	N	N
74	2014c	2014-04-20	Kezia Toh	Lifestyle; Hot	2005	History gets funky; Heritage venues such as the former Tanjong Pagar railway station are being rented for weddings and fashion and art shows	Y	N	N	N	N	N	N
75	2014d	2014-05-02	Lydia Vasko	Life!	1384	Discovery walks; Volunteer-led tours around Singapore neighbourhoods are gaining popularity among Singaporeans and tourists	N	N	Y	Y	Y	Y	N
76	2014e	2014-07-15	Corrie Tan	Life!; Life Arts	590	What Bukit Ho Swee was like before fire; Heritage trails and a performance tour of the former squatter area explore issues of resettlement	N	N	N	N	Y	N	N

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77	2014f	2014-08-09	Lydia Vasko	Life!; Life Design	2633	Going for gold; A roof and veil of gold panels to cover the National Gallery Singapore are among its stunning features	N	Y	N	Y	N	N	N
78	2014g	2014-08-17	Melody Zaccheus	News; Home	532	Down Toa Payoh's memory lane; Self-guided heritage trail of Singapore's first HDB estate launches today	N	N	Y	N	Y	N	N
79	2014h	2014-08-18	-	Singapore	207	Heritage trail for historic Toa Payoh	N	N	Y	N	Y	N	N
80	2014i	2014-09-19	-	Life!	634	An Hour @ The Museum; In this weekly column, we visit museums and art spaces and highlight what you should see if you have only an hour to spare	N	Y	N	N	N	N	N
81	2014j	2014-09-26	Nabilah Said	Life!	2701	Heritage at your doorstep; Nine out of 12 trails developed by the National Heritage Board explore older housing estates	N	N	Y	N	Y	N	Y
82	2014k	2014-10-04	Natasha Ann Zachariah	Life!; Life Design	2086	Star structures; A restored shophouse, a new terrace house, a church and an office headquarters are among this year's architectural winners	N	N	N	Y	N	Y	Y
83	2014l	2014-11-14	Melody Zaccheus	Singapore	396	NHB to document history of 10 towns; Distinct local histories of places like Bishan make up larger Singapore story	N	N	Y	Y	Y	N	N
84	2015a	2015-01-18	-	Lifestyle; Hot; American Express Heritage Series	1217	Riding the change; Amex is celebrating its 90th year here, alongside Singapore's 50th birthday celebrations, with a series of heritage-themed articles. In the third of a 10-part series in which card members reflect on local heritage and the past, AUDREY NG talks to entrepreneurs Frederick and Velda Yap	N	N	N	Y	N	N	N
85	2015b	2015-02-01	-	Lifestyle; Hot; American Express Heritage Series	1097	Tiffin dinner for dad; Amex is celebrating its 90th year here, together with Singapore's 50th birthday, with a series of heritage-themed articles. In the fifth of a 10-part series in which card members reflect on local heritage and the past, AUDREY NG talks to actor, show host and comedian Gurmit Singh	N	N	N	Y	N	Y	N
86	2015c	2015-03-08	-	Lifestyle; Live; American Express Heritage Series	1323	Heart for the arts; Amex is celebrating its 90th year here, together with Singapore's 50th birthday, with a series of heritage-themed articles. In the 10th part of a series in which card members reflect on local heritage and the past, AUDREY NG talks to playwright Michael Chiang	Y	Y	Y	N	N	N	N
87	2015d	2015-03-13	Akshita Nanda, Arts Correspondent	Singapore	565	\$740m plan to revitalise civic district; Highlights include a Jubilee Walk featuring works of local artists	N	Y	N	N	Y	N	N
88	2015e	2015-03-15	-	Lifestyle; Hot; American	1319	A journey of change; Amex is celebrating its 90th year here, together with Singapore's 50th birthday, with a series of	N	N	N	N	N	N	N

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				Express Heritage Series		heritage-themed articles. In the final part of a series in which card members reflect on local heritage and the past, AUDREY NG talks to Mr Bruno Wildermuth, a key figure behind the MRT							
89	2015f	2015-04-25	Natasha Ann Zachariah Design Reporter	Life!; Life Design	1241	Is Raffles losing its shine'; Experts suggest greening the public areas of the shopping arcade and improving F&B choices	N	N	N	N	Y	N	Y
90	2015g	2015-04-26	Amelia Teng	News; Home	340	On the trail of Geylang Serai's heritage	N	N	N	N	Y	N	N
91	2015h	2015-04-28	Deepika Shetty,arts Correspondent	Life!; Life Arts	2259	Giving back to the museums; The Patron of Heritage awards honour those who gave a total of \$8.5 million last year to help the arts, culture and heritage	N	Y	Y	Y	N	N	N
92	2015i	2015-05-23	Feng Zengkun Environment Correspondent	Singapore	441	New guidebook for Botanic Gardens; It will sell book at its shop, give it to schools after Unesco bid results are out	N	N	N	N	Y	N	N
93	2015j	2015-06-22	Melody Zaccheus	Singapore	548	In S'pore, all roads led to the General Post Office; Artist's chance find of stone marker leads NHB to chart milestone system	N	N	Y	N	N	N	N
94	2015k	2015-11-06	Nabilah Said	Life	697	Walk down memory lane - by joining tours; Monumental Walking Tours, organised by the National Heritage Board, take people to historically important buildings and sites to learn about their past	N	N	Y	Y	Y	N	N
95	2015l	2015-11-27	Nabilah Said	Life	1969	SG50 ends with a bang; Here are some arts, heritage and community events marking the end of the Golden Jubilee	N	N	Y	N	Y	N	N
96	2016a	2016-01-07	Melody Zaccheus	Community	745	Step out to learn about Singapore's heritage; The Ministry of Culture, Community and Youth's activities and highlights during Singapore's Golden Jubilee last year will continue well into 2016.	N	N	Y	N	Y	N	N
97	2016b	2016-02-25	Melody Zaccheus	Home	879	Parts of heritage site Palmer House to be cleared for MRT; Tanjong Pagar site includes Parsi grave ruins, historical buildings	N	N	Y	Y	N	N	N
98	2016c	2016-04-02	Lea Wee	Life	1227	Crowning glory; The new tree trail in the Civic District joins four other tree trails showcasing heritage trees	N	N	Y	N	N	Y	N
99	2016d	2016-04-15	Huang Lijie	Top of the News	364	\$3m push for more activities in heritage areas	Y	Y	N	Y	Y	N	N
100	2016e	2016-04-26	-	Opinion	480	Breathing life into Civic District	N	N	N	Y	Y	Y	Y

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101	2016f	2016-04-29	Gurveen Kaur	Life	3208	Meet some of the people behind Singapore HeritageFest; The Singapore HeritageFest this year will take visitors to Tanglin Halt and Pulau Ubin	N	N	N	N	Y	N	N
102	2016g	2016-05-20	Gurveen Kaur	Life	2145	Street life thrives in car-free zones; Pedestrianised streets are gaining a foothold as more events are held on roads closed off temporarily to cars	Y	Y	N	Y	N	Y	Y
103	2016h	2016-06-06	Melody Zaccheus	Home	798	Heritage trails marred by rise in no-shows; Bad practice wastes valuable resources, robs other people of a chance to enjoy the tours	N	N	N	N	Y	N	N
104	2016i	2016-07-22	Nabilah Said	Life	601	Indian Heritage Centre explores role of Chinese in Little India for CultureFest; This year's Indian Heritage Centre CultureFest will feature gigs with Chinese and Indian musicians	N	Y	N	Y	N	N	N
105	2016j	2016-08-04	Melody Zaccheus	Community	907	Chong Wen Ge: 1850s pavilion where the written word was revered; From places of worship to educational institutions to former residences of prominent figures, 72 buildings here have been gazetted as national monuments. This is the first of a weekly series revisiting these heritage gems. Each of their stories is a yarn that is woven into the rich tapestry of Singapore's history.	N	N	N	N	N	N	Y
106	2016k	2016-08-06	Natasha Ann Zachariah	Life	1904	Read and shop in style at Beach Road; The hip quotient at Beach Road has been raised, thanks to a new public reading room and trendy shops	N	N	N	Y	N	N	N
107	2016l	2016-08-18	Melody Zaccheus	Top of the News	738	North-South Corridor tunnel works to affect Ellison Building; Three units in Ellison Building, a conserved structure, to be torn down, then rebuilt	N	N	N	Y	N	N	N
108	2016m	2016-11-11	Nabilah Said	Life	2397	Murals spread colourful cheer to businesses and HDB estates; Artworks in different styles are adorning the walls of not only heritage and hipster areas, but also those of shops and housing estates	N	Y	N	Y	N	N	N
109	2016n	2016-12-19	Jalelah Abu Baker	Home	953	Little India isn't messy - it's authentic; Locals, heritage experts say the enclave should be kept the way it is	Y	N	N	Y	Y	Y	Y
110	2017a	2017-01-14	Melody Zaccheus	Home	561	Heritage trail marks fall of S'pore in 1942; New guided tour of Labrador, Alexandra tells story of area's rich maritime, colonial history	N	N	Y	Y	Y	Y	N

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111	2017b	2017-01-25	Melody Zaccheus	Home	823	Take a walk through Little India's rich history; New heritage trail aims to give visitors an insight into the 200-year-old enclave's past	N	N	N	N	Y	Y	Y
112	2017c	2017-03-23	Raynold Toh YK	Community	702	Asian Civilisations Museum a living symbol of Singapore's history; From places of worship and educational institutions to the former residences of prominent figures, 72 buildings here have been gazetted as national monuments. This is the 34th part in a weekly series revisiting these heritage gems. Each is a yarn woven into the rich tapestry of Singapore's history.	N	N	N	N	N	N	Y
113	2017d	2017-04-15	-	Forum	329	Improve Botanic Gardens with clever landscaping, fewer carparks	Y	N	N	N	N	Y	N
114	2017e	2017-04-25	Nabilah Said	Life	1555	Singapore Heritage Festival showcases different locations in Singapore; Singapore Heritage Festival kicks off its SHF Takes Over! programme by shining the spotlight on the site of Singapore's broadcast history	N	N	Y	Y	Y	N	N
115	2017f	2017-04-27	Melody Zaccheus	Community	758	Oldest Hindu temple in Singapore; From places of worship and educational institutions to the former residences of prominent figures, 72 buildings here have been gazetted as national monuments. This is the latest in a weekly series revisiting these heritage gems. Each is a yarn woven into the rich tapestry of Singapore's history.	N	N	N	Y	Y	Y	Y
116	2017g	2017-05-06	Melody Zaccheus	Home	838	Playing tourist on home ground; More tours are giving locals a chance to experience S'pore's history, culture anew	N	N	N	N	Y	Y	N
117	2018a	2018-01-09	Olivia Ho	Life	2257	Curators tell stories through their exhibits; Peek behind the scenes and find out how curators put together exhibitions, from blockbuster shows to niche displays	N	Y	Y	N	N	N	N
118	2018b	2018-01-29	Aw Cheng Wei	Top of the News	366	Junk springs a mural surprise on Car-Free Sunday	Y	Y	N	N	Y	N	N
119	2018c	2018-02-04	Melody Zaccheus	Top of the News	1218	Fort Canning Park to host bicentennial showcase next year; Site will also be spruced up, with new heritage gallery, re-creation of three historical gardens	Y	N	N	N	Y	N	N
120	2018d	2018-02-14	Toh Wen Li	Life	590	Design week spills into living rooms; Go on tours highlighting heritage and architecture, meet global leaders and explore play in design at SingaPlural	N	N	N	N	Y	N	N
121	2018e	2018-04-03	Olivia Ho	Life	1906	Relive the old days of Jurong and Jalan Besar at Singapore Heritage Festival; This year's festival highlights Jurong and	N	N	Y	Y	Y	N	N

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						Jalan Besar for their industrial history as well as the leisure activities for which they were famous							
122	2018f	2018-05-12	Venessa Lee	Life	1251	A walk through heritage and history along Bukit Timah Heritage Trail; Three thematic routes along the refreshed Bukit Timah Heritage Trail offer Singaporeans insights into the country's past, such as kampung life	N	N	Y	N	Y	N	Y
123	2018g	2018-06-24	Melody Zaccheus	Top of the News	995	Is that building ugly, or a vital part of heritage'; Public may not share experts' sentiments on importance of some old structures: Study	N	N	N	N	Y	N	N
124	2018h	2018-07-24	Low De Wei	Home	269	Car-free event back on Sunday with fitness theme	Y	N	N	N	Y	N	N
125	2018i	2018-08-30	Michelle Ng	Home	467	Orchard Heritage Trail offers glimpse into past	N	N	N	N	Y	Y	N
126	2018j	2018-09-14	Mike Hou, For The Straits Times	Opinion	1004	For heritage sites to have a future, they must be present in people's lives; Relevance and utility are key to the public's appreciation of important landmarks of the past	Y	N	N	Y	N	N	Y

Appendix E. Summary of the variables extracted from the urban condition plan (UCP) explanatory documents

As with the data extraction and processing in our study, Appendix E provides specifications of the full model of logistic regression:

$$DV \sim \log_2(\text{area}) + \text{landuse2} + \text{landtype2} + \text{vacant} + \text{year_f} + \text{redev_full} + \text{subdivision} + \text{poly}(\text{bldgtype_h}, 2) + \text{ic_reg2} + \text{ic_reg3} + \text{height_req} + \text{arcade} + \text{facade} + \text{material} + \text{roof} + \text{streetscape} + \text{urban_fabric} + \text{prior_app} + \text{prior}$$

Both stepwise backward elimination and stepwise forward inclusion based on the AIC criterion returned the same selection of independent variables:

$$DV \sim \log_2(\text{area}) + \text{landtype2} + \text{year_f} + \text{poly}(\text{bldgtype_h}, 2) + \text{ic_reg3} + \text{facade}$$

Table E.1 Summary of the variables extracted from UCP explanatory documents (n = 562). Codes in bold face refer to the variables included in the final model specification.

Code	Short name	Description	Levels	Freq. %
ref	Reference	A unique alphanumeric string for each UCP site	(string)	
loc_cn, loc_pt	Address	UCP site address in Chinese and Portuguese	(string)	
x, y	Coordinate	Site centroid coordinates based on the projected coordinate system of Universal Transverse Mercator (UTM) zone 49N (EPSG code: 32649)	(numeric)	
first		First CPU meeting for the UCP application	(date)	
last		Last CPU meeting, if any	(date)	
<i>Development control</i>				
landtype	Land (raw)	type The majority of UCP sites had a single land ownership type (1 through 5).	1. Freehold	310 (55.2)
			2. Leasehold	63 (11.2)
			3. Long-term leasehold	126 (22.4)
			4. State	26 (4.6)
			5. Other	15 (2.7)
		However, a small proportion is of mixed ownership types (6 through 8).	6. 1&3	17 (3.0)
			7. 2&3	3 (0.5)
			8. 1&2	2 (0.4)
landtype2	Land type	Type of land ownership recoded	Freehold	329 (58.5)
			Leasehold	192 (34.2)
			Other	41 (7.3)
landuse	Land (raw)	use Land use specified for the UCP site	1. Non-industrial	470 83.6
			2. Industrial	5 0.9
			3. Office	3 0.5
			4. Residential	5 0.9
			5. Public housing	6 1.1
			6. Bungalow	14 2.5
			7. Civic facility	6 1.1
			8. Commercial-residential	6 1.1
			9. Other	47 8.4
landues2	Land use	Land use recoded into a binary variable	Non-industrial	470 (83.6)
			Other	92 (16.4)
bldgtype_est,	Building class	Some were estimated by relevant information as available, such as height	P (9 m)	34 (6.0)
			M (20.5 m)	435 (77.4)

Code	Short name	Description	Levels		Freq. %
bldgtype_h		limit, terrain elevation and nearby observations. Typical height limit for each building type according to Urban Construction Regulations.	A1	(31.5 m)	18 (3.2)
	A2		(50 m)	34 (6.0)	
	MA		(set as 100 m in this study)	41 (7.3)	
height_req		“Semi-official” height requirements in the sense that it was specific to the plan and indicated as “suggestion in this draft UCP”, “according to IC’s regulations” or occasionally, according to the Education Bureau for school premises, which presented a certain level of discretion exercised by the authorities.	Yes		260 (46.3)
	No			302 (53.7)	
redev_full		Whether the UCP site is allowed to achieve full development potential according to the building type. This is determined by comparing the representative height limit (height_rep) and the threshold specified in Urban Construction Regulations. Details of the interim steps are provided below†.	Yes		274 (48.8)
	No			288 (51.2)	
Site/application status					
within_ca	Within CA	Whether the site is within a conservation area at the time of application	Yes		190 (33.8)
			No		372 (66.2)
ic_reg2	IC requirement	This is redundant to whether there were legally binding requirements by the IC because they appeared in all UCP applications within a conservation area.	Yes		190 (33.8)
			No		372 (66.2)
vacant	Vacant	Whether the site was vacant or unoccupied. This was judged by the photos included in the explanatory documents. If true, one of the following conditions apply: <ul style="list-style-type: none">• Completely vacant;• In a dilapidated state with limited structure remaining;• Used as a makeshift parking lot without proper facilities.	Yes		128 (22.8)
			No		434 (77.2)
year_f	Year	Year in which the first CPU meeting of the UCL application in question was held, recoded to numbers 1–5	2014	(= 1)	63 (11.2)
			2015		144 (25.6)
			2016		159 (28.3)
			2017		97 (17.3)
			2018	(= 5)	99 (17.6)
prior_doc	Prior plan	Whether a cadastral map or UCP has been issued before for the site	Yes		378 (67.3)
			No		184 (32.7)
prior_app	Prior application	Whether an application has been made before during the study period (2014–18)	Yes		35 (6.2)
			No		527 (93.8)
subdivision		Number of subdivisions in the UCP site under application. Intended as a proxy for the complexity of development control and urban design requirements.	1		511 (90.9)
	2			33 (5.9)	
	3			10 (1.8)	
	4			6 (1.1)	
	6			2 (0.4)	
Urban design requirement presence					

Code	Short name	Description	Levels	Freq. %
façade	Façade	Retention of façade	Yes	83 (14.8)
			No	479 (85.2)
material	Material	Type and colour of building materials (excluding roof)	Yes	105 (18.7)
			No	457 (81.3)
arcade	Arcade	Provision of arcade required	Yes	56 (10.0)
			No	506 (90.0)
roof	Roof	Style and material of the roof	Yes	46 (8.2)
			No	516 (91.8)
streetscape	Streetscape	Requirement of taking streetscape into consideration	Yes	88 (15.7)
			No	474 (84.3)
urban_fabric	Urban fabric	Requirement of taking urban fabric into consideration	Yes	17 (3.0)
			No	545 (97.0)
Dependent variable				
fbr2	Public feedback	Number of public comment forms recoded	≥ 2	153 (27.2)
			0 or 1	409 (72.8)

† Due to the inconsistency in the format of building height limits (building height, altitude and the mix of the two), the following interim steps were taken to estimate whether a site achieves full development potential:

- Derive height limit by non-IC and IC
 - When the height limit type is building height, extract the height limit separately: those set by the default agency (i.e., DSSOPT) and those by the IC;
 - When the height limit type is altitude, similar to step 1, but subtract the terrain elevation (estimated from the GIS layer produced by DSCC);
 - When the height limit type is mixed, consider a) and b), and take the smaller value;
 - When the height limit type is not applicable, which means no building is allowed (e.g., on forested areas), indicate “NA”.
- Derive representative height limit, i.e., the smaller of the height limits set by IC and others, where applicable.
- For UCP sites with a representative height limit but without a building type being explicitly specified in the UCP, assign building type based on which range the representative height limit falls in according to typical building height thresholds in the General Regulations of Urban Construction (*Regulamento Geral da Construção Urbana*, RGCU)
 - P if ≤ 9
 - M if ≤ 20.5
 - A1 if ≤ 31.5
 - A2 if ≤ 50
 - MA if > 50
- For UCP sites without a representative height limit, assign the building type of the nearest neighbour.
- Binary variable of whether full development potential is achieved:
 - Yes: Reaches the height limit threshold of the corresponding to the building type;
 - No: Fails to reach the threshold.

Note that the surface elevations were also estimated from the digital elevation model (DEM) of the Shuttle Radar Topography Mission (SRTM) whose 1 arc-second resolution translates into approximately 30 meters along the equator. The DEM dataset was downloaded from the website of the Earth Resources Observation and Science (EROS) Center website (<https://earthexplorer.usgs.gov/>) as of September 23, 2014 (tile reference no. N22E113). However, despite its higher resolution, this data was less suitable compared with the DSCC dataset because for our exploratory data analysis, a rough estimation of whether a UCP site is located on hills was sufficient.

Appendix F. Outliers in the global logistic regression

For the global logistic regression model, after model selection, outlier diagnostics was performed in an iterative, heuristic manner using the index plots of Cook's distance and hat-values. High-values observations were removed one by one or by groups of clustered points until changes in the coefficients for the significant variables were marginal ($< 1\%$), which resulted in the exclusion of 24 observations: #7 51 87 143 173 184 268 292 304 353 361 365 402 431 465 468 472 483 507 515 523 524 540 560.

Figure F.1 Index plots of Cook's distance and hat-values

Model comparison before and after outlier exclusion () shows that the variable significance results did not change. However, the amplitude of coefficients increased and the model fit (e.g., McFadden's pseudo- R^2) improved.

Table F.1 Comparison of coefficient values between Model 1 (entire dataset) and Model 2 (after outlier exclusion)

	Model 1	Model 2	Diff.	Change
$\log_2(\text{Area})$	0.301***	0.423***	0.122	41%
Land type (ref. Other)				
Leasehold	0.458	1.185*	0.727	158%
Freehold	-0.061	0.662	0.723	-1186%
Presence of IC-recommended requirement	0.713*	1.028***	0.316	44%
Presence of façade-related requirement	0.459	0.484	0.024	5%
Year of application	-0.218*	-0.356***	-0.138	63%
Est. building type height limit				
Linear polynomial	1.658	0.968	-0.630	-38%
Quadratic polynomial	-7.132**	-7.474**	-1.013	14%
<i>Intercept</i>	-3.020***	-4.356***	-1.335	44%
<i>Residual deviance</i>	564.66	497.55		
<i>AIC</i>	582.66	515.55		
<i>McFadden's pseudo-R^2</i>	0.142	0.193		

Appendix G. Descriptions of the nodes used in content analysis

This is a supplement to Figure 7.5 that gives further descriptions of the content analysis nodes as necessary.

Table G.1 Descriptions of the nodes used in content analysis

Code	Node	Description
Position on conservation/redevelopment matters (i.e., agree/suggest versus disagree/disacourage)		
<i>Urban design requirement</i>		
facade_pos facade_neg	Façade	Same as in Appendix E.
material_pos material_neg	Material	
arcade_pos arcade_neg	Arcade	
roof_pos roof_neg	Roof	
streetscape_pos streetscape_neg	Streetscape	
urban_fabric_pos urban_fabric_neg	Urban fabric	
<i>Conservation method</i>		
assess_pos assess_neg	Assessment	Suggestion of assessing the building for heritage designation
areawise_con_pos areawise_con_neg	Areawise conservation	-
rebuild_restore_pos rebuild_restore_neg	Rebuild or restoration	-
complete_con_pos complete_con_neg	Complete conservation	Complete conservation of the existing building.
adaptive_reuse_pos adaptive_reuse_neg	Adaptive reuse	Conversion of building for cultural or art uses.
<i>Redevelopment method</i>		
beautify_pos beautify_neg	Beautification	Redevelopment that takes on traditional Portuguese or Chinese architecture design
agglomerate_pos agglomerate_neg	Land agglomeration	Agglomeration of small land lots to achieve greater redevelopment potential.
areawise_redev_pos areawise_redev_neg	Areawise redevelopment	-
<i>Reaction to height limit</i>		
too_high	Too high	Height limit perceived as too high and thus detrimental to the urban landscape
too_hlow	Too low	Height limit perceived as too low and thus impeding the ability to redevelop
Reasons given in public comments		
<i>Instrumental-technical</i>		
legal	Legality	Laws and regulations, e.g., <ul style="list-style-type: none"> Individual development rights that should be respected;

Code	Node	Description
		<ul style="list-style-type: none"> Whether a UCP site is located within a conservation area as per the Cultural Heritage Protection Act
bldg_con	Building conditions	Existing building conditions making it impractical to conserve or follow urban design requirements, e.g., <ul style="list-style-type: none"> Deterioration or structural instability; Maintenance difficulties.
needs	Community needs	General argument for the public interest, which includes: <ul style="list-style-type: none"> Economic development; Housing shortage due to land scarcity; Need for healthcare facilities, etc.
disincentivize	Disincentive	Strict development control or urban design requirements disincentivising investment.
living_env	Living environment	The need to ensure liveable standards of air ventilation, sunlight, and more broadly, safety and hygiene, etc.
<i>Moral-ethical</i>		
ext_nb_con	Existing or nearby conditions	Cite the existing conditions of the UCP site or nearby sites as reasons for staying in the status quo, implying that it would otherwise be considered unfair.
inconsistent_streetscape	Inconsistent streetscape	A similar argument to the citation of existing or nearby conditions but turning the notion of streetscape over to support higher construction intensity.
heritage_legitimacy	Heritage legitimacy	The perceived uniqueness and integrity of buildings, streetscape or urban fabric that should be regarded as heritage in its own right irrespective of formal heritage designation.
profiteer	Profiteering	Prevent developers from profiteering through redevelopment.
<i>Emotive-aesthetic</i>		
harmonious_street_scape	Harmonious streetscape	-
architectural_merit	Architectural merit	-
historical_relevance	Historical relevance	-

Appendix H. List of urban condition plan (UCP) applications

#	ref	loc_cn	loc_pt	first	last
1	2000A001	位於望廈山之土地(旅遊學院) - 澳門	Terreno situado na Colina de Mong Há (Instituto de Formação Turística) - Macau	2016-04-20	NA
2	2000A006	位於鄰近士多烏拜斯大馬路之土地(高美士中葡中學及得勝體育中心) - 澳門	Terreno junto à Avenida de Sidónio Pais (Escola Secundária Luso-Chinese de Luís Gonzaga Gomes e Centro Desportivo da Vitória) - Macau	2016-10-31	NA
3	2000A018	桔仔街 81、83 及 85 號 - 澳門	Rua do Matapau nos 81, 83 e 85 - Macau	2018-03-29	NA
4	2000A024	青洲大馬路 480 及 496 號, 青洲東街 11, 63 及 69 號及蓮花巷 30 號 - 澳門	Avenida do Conselheiro Borja nos 480 e 496, Rua Leste da Ilha Verde nos 11, 63 e 69 e Travessa dos Lótus nº 30 - Macau	2016-01-20	NA
5	2000A031	鵝眉街 4A-4B 號 - 澳門	Rua de Inácio Baptista nos 4A-4B - Macau	2016-05-10	NA
6	2000A042	位於鄰近友誼大馬路之土地 外港-“漁人碼頭” - 澳門	Terreno junto à Avenida da Amizade Porto Exterior – “Fisherman’s Wharf” - Macau	2014-08-01	2015-08-11
7	2001A006	收容所街 35-79 號及石仔堆巷 38 號 (北區中葡小學) - 澳門	Rua do Asilo nos 35-79 e Travessa das Pedrinhas nº 38 (Escola Primária Luso-Chinesa do Bairro Norte) - Macau	2016-07-25	NA
8	2001A020	白朗古將軍大馬路 14 號 - 澳門	Avenida do General Castelo Branco nº 14 - Macau	2016-12-30	NA
9	2001A031	鮑公馬路 20D-20E 號 - 澳門	Estrada de D. João Paulino nos 20D-20E - Macau	2017-09-27	NA
10	2001A033	位於鄰近何鴻燊博士大馬路之土地-南灣-C 區域-C7 地段 - 澳門	Terreno junto à Avenida Doutor Stanley Ho Baía da Praia Grande-Zone C-Lote C7 - Macau	2016-09-05	NA
11	2001A034	士多烏拜斯大馬路 36 號 - 澳門	Avenida de Sidónio Pais nº 36 - Macau	2018-08-29	NA
12	2002A008	巴素打爾古街 347 號及十月初五日街 12 號 - 澳門	Rua do Visconde Paço de Arcos nº 347 e Rua de Cinco de Outubro nº 12 - Macau	2016-04-20	NA
13	2002A030	羅理基博士大馬路 263-263A 號 - 澳門	Avenida do Dr. Rodrigo Rodrigues nos 263-263A - Macau	2014-10-15	NA
14	2003A028	東北大馬路 488-500 號及東北巷 46-102 號 - 澳門	Avenida do Nordeste nos 488-500 e Travessa do Nordeste nos 46-102 - Macau	2018-05-09	NA
15	2003A043	吳家園 2 號及大街 102A 號 - 澳門	Pátio do Abridor nº2 e Rua dos Mercadores nº102 - Macau	2014-10-15	NA
16	2003A047	十月初五日街 137 號及寶塔巷 18 號 - 澳門	Rua de Cinco de Outubro nº 137 e Travessa do Pagode nº 18 - Macau	2017-11-29	NA
17	2003A051	爹美刁施拿地大馬路 94-99 號 - 22A 碼頭 - 澳門	Avenida de Demétrio Cinatti nos 94-99 - Ponte Cais nº 22A - Macau	2017-07-26	2017-09-27
18	2003A058	罈些喇提督大馬路 129D 號 - 澳門	Avenida do Almirante Lacerda nº 129D - Macau	2017-09-27	NA
19	2004A017	快艇頭街 35-41 號及快艇頭里 9 號 - 澳門	Rua dos Faiões nos 35-41 e Beco dos Faiões nº 9 - Macau	2015-10-30	NA
20	2004A037	位於鄰近蘇亞利斯博士大馬路及澳門商業大馬路之土地 - 澳門	Terreno junto à Avenida Doutor Mário Soares e Avenida Comercial de Macau - Macau	2015-01-22	NA
21	2004A044	位於鄰近美副將大馬路之土地 - 澳門	Terreno junto à Avenida do Coronel Mesquita - Macau	2016-02-24	NA
22	2004A063	苦力園 17 號 - 澳門	Pátio dos Cules nº 17 - Macau	2015-09-15	2015-09-15
23	2004A063	苦力園 17 號 - 澳門	Pátio dos Cules nº17 - Macau	2018-10-24	2018-10-24
24	2005A009	馬忌士園 7-11 號 - 澳門	Pátio de Lourenço Marques nos 7-11 - Macau	2014-07-17	NA
25	2005A010	馬忌士園 17-19 號 - 澳門	Pátio de Lourenço Marques nos 17-19 - Macau	2014-07-17	NA
26	2005A020	位於鄰近關前正街之土地 - 澳門	Terreno junto à Rua dos Ervanários - Macau	2015-01-22	NA
27	2005A022	位於鄰近工廠街之土地 - 澳門	Terreno junto à Rua da Fábrica - Macau	2015-06-10	2015-11-27

#	ref	loc_cn	loc_pt	first	last
28	2005A026	果欄街 42 號	Rua da Tercena no42	2014-12-12	NA
29	2005A028	大街 80-82 號 - 澳門	Rua dos Mercadores nos 80-82 - Macau	2015-01-22	2016-04-20
30	2005A033	通商新街 37-39 號 - 澳門	Rua Nova do Comércio nos 37-39 - Macau	2016-05-10	NA
31	2005A034	通商新街 47-51 號 - 澳門	Rua Nova do Comércio nos 47-51 - Macau	2016-05-10	NA
32	2005A035	海邊新街 309 號 - 澳門	Rua do Guimarães n° 309 - Macau	2017-05-31	NA
33	2005A044	位於鄰近沙梨頭街之土地 - 澳門	Terreno junto à Rua do Patane - Macau	2017-02-23	NA
34	2005A054 a	位於鄰近工業園北街之土地 - 澳門	Terreno junto à Rua Norte do Parque Industrial - Macau	2015-11-27	NA
35	2005A055	位於鄰近工業園新街之土地-珠澳跨境工業區(澳門園區)B2 地段-B2b 地塊 - 澳門	Terreno junto à Rua Nova do Parque Industrial - Parque Industrial Transoronteirço Zhuhai - Macau (Zona de Macau) Lote B2 - Parcela B2b - Macau	2016-07-25	NA
36	2005A063	轎夫巷 2-4 號 - 澳門	Travessa dos Cules Nos 2-4 - Macau	2014-11-13	2014-11-13
37	2005A063	轎夫巷 2-4 號 - 澳門	Travessa dos Cules nos 2-4 - Macau	2018-12-19	2018-12-19
38	2005A064	轎夫巷 5-7 號 - 澳門	Travessa dos Cules nos 5-7 - Macau	2014-11-13	2014-11-13
39	2005A064	轎夫巷 5-7 號 - 澳門	Travessa dos Cules nos 5-7 - Macau	2018-12-19	2018-12-19
40	2005A066	石街 22 號 - 澳門	Rua da Pedra n° 22 - Macau	2016-04-20	2016-04-20
41	2005A066	石街 22 號 - 澳門	Rua da Pedra n° 22 - Macau	2018-12-19	2018-12-19
42	2005A067	賣草地街 17 號 - 澳門	Rua da Palha n° 17 - Macau	2015-11-27	NA
43	2005A069	金龍巷 7 號 - 澳門	Travessa do Fogo n° 7 - Macau	2015-11-27	NA
44	2005A079	十月初五日街 114 號及康公廟前地 2 號 - 澳門	Rua de Cinco de Outubro n° 114 e Largo do Pagode do Bazar n° 2 - Macau	2017-09-27	NA
45	2005A095	亞利鴉架街 11 號 - 澳門	Rua de Manuel de Arriaga n° 11 - Macau	2016-05-10	NA
46	2005A106	德香里 1-3 號(實地門牌 3 號) - 澳門	Beco da Romã nos 1-3 (no local no 3) - Macau	2015-05-12	NA
47	2006A029	羅理基博士大馬路 145-159 號 - 澳門	Avenida do Dr. Rodrigo Rodrigues nos 145-159 - Macau	2016-06-28	NA
48	2006A032	新維里 4-8 號 - 澳門	Beco do Cisne nos 4-8 - Macau	2015-05-26	NA
49	2006A033	三巴仔街 13 號及三層樓上街 12 號 - 澳門	Rua de S.José n° 13 e Rua do Barão n° 12 - Macau	2016-02-24	NA
50	2006A041	蓬萊新街 21-35 號及火船頭街 179 號 - 澳門	Rua do Bocage nos 21-35 e Rua das Lorchas no 179 - Macau	2014-08-01	NA
51	2006A045	位於鄰近海邊馬路之土地 - 澳門(澳門檢察院臨時辦公大樓)	Terreno junto à Estrada de Cacilhas - Macau	2016-07-25	NA
52	2006A066	高士德大馬路 10-12 號及文第士街 9 號 - 澳門	Avenida de Horta e Costa nos 10-12 e Rua de Silva Mendes n° 9 - Macau	2016-09-05	2016-10-31
53	2006A081	位於鄰近桔仔街之土地 - 澳門	Terreno junto à Rua do Matapau - Macau	2015-07-29	NA
54	2006A082(A)	火船頭街 243-245 號及 249 號 - 澳門	Rua das Lorchas nos 243-245 e no249 - Macau	2014-09-12	2016-09-05
55	2006A086	得勝馬路 6 號 - 澳門	Estrada da Vitória no6 - Macau	2015-05-26	NA
56	2006A090	太平里 5 號 - 澳門	Beco do Canto n°5 - Macau	2015-07-29	NA
57	2007A005	大頭針圍 3 號 - 澳門	Pátio do Alfinete no3 - Macau	2014-10-28	NA
58	2007A011	興華街 22A 號 - 澳門	Rua dos Cavaleiros n°22A - Macau	2015-05-12	NA
59	2007A027	馬忌士街 28 號 - 澳門	Rua de Eduardo Marques no 28 - Macau	2015-06-30	NA
60	2007A036	田螺石級 7 號 - 澳門	Escada do Caracol n° 7 - Macau	2015-07-16	2016-12-30
61	2007A042	海邊新街 233-237 號及十月初五日街 120-122 號 - 澳門	Rua do Guimarães nos233-237 e Rua de Cinco de Outubro nos120-122 - Macau	2015-02-13	2015-10-30

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62	2007A043	爹美刁施拿地大馬路 40-41 號, 沙梨頭海邊街 1-3 號及魚鰓巷 6 號 - 澳門	Avenida de Demétrio Cinatti nos 40-41, Rua da Ribeira do Patane nos 1-3 e Travessa da Guelra nº 6 - Macau	2016-03-16	NA
63	2007A044	河邊新街 25-33A 號及三層樓上街 7-9 號 - 澳門	Rua do Almirante Sérgio nos 25-33A e Rua do Barão nos 7-9 - Macau	2015-05-26	NA
64	2007A067	慕拉士大馬路 181-183 號 - 澳門	Avenida de Venceslau de Moraes nos 181-183 - Macau	2014-09-12	NA
65	2007A069	脂花巷 7 號 - 澳門	Travessa do Goivo no 7 - Macau	2014-10-15	NA
66	2007A082	位於鄰近青洲河邊馬路之土地 - 澳門	Terreno junto à Estrada Marginal da Ilha Verde - Macau	2016-06-28	NA
67	2008A002	戀愛巷 9-11 號 - 澳門	Travessa da Paixão nos 9-11 - Macau	2016-06-02	NA
68	2008A003	陳樂巷 24-26 號 - 澳門	Travessa de Chan Loc nos 24-26 - Macau	2016-12-30	NA
69	2008A006	快艇頭街 26 - 28 號及永安下巷 8 號 - 澳門	Rua dos Faitiões nos 26 - 28 e Travessa do Pau no 8 - Macau	2015-08-11	NA
70	2008A009	罽累巷 2B 號 - 澳門	Travessa do Enleio nº 2B - Macau	2016-06-28	NA
71	2008A010	爛鬼樓巷 17A 號及玫瑰里 29-31 號 - 澳門	Travessa do Armazém Velho nº 17A e Beco da Rosa nos 29-31 - Macau	2018-08-29	NA
72	2008A016	高園里 1 號及 2-4 號 - 澳門	Beco da Cacatua nº 1 e nos 2-4 - Macau	2016-12-30	NA
73	2008A021	公局新市東街 19-21 號 - 澳門	Rua Leste do Mercado de S.Domingos nos 19-21 - Macau	2015-06-30	NA
74	2008A025	惠愛街 79 - 81 號及銅錢巷 3 號 - 澳門	Rua da Alegria nos 79 - 81 e Travessa das Sapecas no 3 - Macau	2015-08-11	2018-08-29
75	2008A033	幸運圍 6 號 - 澳門	Pátio da Fortuna no 6 - Macau	2018-03-29	NA
76	2008A043	關前正街 64-68 號及草堆街 89-89B 號 - 澳門	Rua dos Ervanários nos 64-68 e Rua das Estalagens nos 89-89B - Macau	2018-06-13	2018-07-18
77	2008A047	連丁里 6 號 - 澳門	Beco da Carpideira no 6 - Macau	2015-05-26	NA
78	2008A053	河邊新街 275 - 275A 號 - 澳門	Rua do Almirante Sérgio nos 275 - 275A - Macau	2015-08-11	NA
79	2008A060	草堆街 46-50 號及手肘里 1 號 - 澳門	Rua das Estalagens nos 46-50 e Beco dos Cotovelos nº 1 - Macau	2016-06-02	NA
80	2008A068	西望洋馬路 425-431 號 - 澳門	Estrada da Penha nos 425-431 - Macau	2016-06-02	NA
81	2008A072	位於鄰近祐漢新邨第八街之土地 - 澳門	Terrenos junto à Rua Oito do Bairro Iao Hon - Macau	2016-02-24	NA
82	2008A109	位於鄰近何賢紳士大馬路之土地 - 澳門	Terreno junto à Avenida do Comendador Ho Yin - Macau	2016-01-20	NA
83	2008A113	巴素打爾古街 255-259 號 - 澳門	Rua do Visconde Paço de Arcos nos 255 a 259 - Macau	2016-07-25	NA
84	2009A003	擔桿里 3-5 號 - 澳門	Beco da pinga nos 3-5 - Macau	2015-05-12	NA
85	2009A012	連安圍 19-19A 號 - 澳門	Pátio da Pomba nos 19-19A - Macau	2016-01-20	NA
86	2009A017	下環街 5 號及聖祿杞里 10-12 號 - 澳門	Rua da Praia do Manduco nº 5 e Beco de S. Roque nos 10-12 - Macau	2016-10-31	NA
87	2009A026	位於鄰近青洲大馬路之土地—巴坡沙坊 A, D 座及台山街市市政綜合大樓 - 澳門	Terreno junto à Avenida do Conselheiro Borja—Bairro Tamagnini Barbosa Blocos A, D e Complexo Municipal do Mercado de Tamagnini Barbosa - Macau	2016-10-31	NA
88	2009A031	位於鄰近蘇亞利斯博士大馬路之土地 - 澳門	Terreno junto à Avenida Doutor Mário Soares - Macau	2016-03-16	NA
89	2009A042	水坑尾街 302 號 - 澳門	Rua do Campo nº 302 - Macau	2015-09-15	NA
90	2009A052	聖祿杞街 39 - 43 號 - 澳門	Rua de S.Roque nos 39 - 43 - Macau	2015-08-11	NA
91	2009A055	顯榮圍 13 號 - 澳門	Pátio do Amparo nº 13 - Macau	2015-09-15	NA
92	2009A061	十月初五日街 101 號 - 澳門	Rua de Cinco de Outubro nº 101 - Macau	2017-09-27	NA

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93	2009A067	關前正街 5 號及關前後街 6 號 - 澳門	Rua dos Ervanários n° 5 e Rua de Nossa Senhora do Amparo n°6 - Macau	2015-03-11	NA
94	2009A071	位於鄰近新填巷之土地 - 澳門	Terreno junto à Travessa do Aterro Novo - Macau	2016-10-31	NA
95	2009A074	綠豆圍 7-31 號 - 澳門	Pátio do Mungo nos 7-31 - Macau	2016-03-16	NA
96	2009A076	位於鄰近羅若翰神父街之土地 - 澳門	Terreno junto à Rua do Padre João Clímaco - Macau	2017-09-27	NA
97	2009A082	位於鄰近石街及金龍巷之土地 - 澳門	Terreno junto à Rua da Pedra e Travessa do Fogo - Macau	2014-10-28	NA
98	2009A083	惠愛里 3 號 - 澳門	Beco da Alegria n° 3 - Macau	2015-07-16	NA
99	2009A086	位於鄰近孫逸仙大馬路之土地 - 澳門科學館 - 澳門	Terreno junto à Avenida Dr. Sun Yat-Sen – Centro de Ciência de Macau - Macau	2016-09-05	NA
100	2009A091	玫瑰里 8 號 - 澳門	Beco da Rosa n° 8 - Macau	2017-05-31	NA
101	2010A001	新勝街 3A 號 - 澳門	Rua de Tomás Vieira n° 3A - Macau	2018-08-29	NA
102	2010A005	擔桿里 7A-7B 號 - 澳門	Beco da Pinga nos 7A-7B - Macau	2014-09-12	NA
103	2010A015	位於鄰近石街之土地	Terreno junto à Rua da Pedra	2014-06-19	NA
104	2010A016	罽累巷 2A 號 - 澳門	Travessa do Enleio no 2A - Macau	2014-08-01	2017-02-23
105	2010A019	商人巷 6 號 - 澳門	Travessa dos Mercadores n° 6 - Macau	2018-01-24	NA
106	2010A020	位於鄰近羅憲新街及水坑尾街之土地 - 澳門	Terreno junto à Rua de Tomás da Rosa e Rua do Campo - Macau	2018-06-13	2018-07-18
107	2010A032	日頭街 3A 號 - 澳門	Rua do Sol n° 3A - Macau	2016-09-05	NA
108	2010A053	亞美打利庇盧大馬路 135 號 - 澳門	Avenida de Almeida Ribeiro no 135 - Macau	2015-07-29	NA
109	2010A055	火船頭街 101 號 - 澳門	Rua das Lorchas no 101 - Macau	2014-08-01	2014-08-01
110	2010A055	火船頭街 101 號 - 澳門	Rua das Lorchas n° 101 - Macau	2017-11-29	2017-11-29
111	2010A071	賈伯樂提督街 138 號及區華利街 1A 號 - 澳門	Rua do Almirante Costa Cabral n°138 e Rua de Jorge Álvares n°1A - Macau	2017-07-26	NA
112	2010A072	高冠街 31 號 - 澳門	Rua de Mitra n° 31 - Macau	2016-10-31	NA
113	2010A079	爹美刁施拿地大馬路 5-7 號 - 澳門	Avenida de Demétrio Cinatti nos 5-7 - Macau	2015-10-30	NA
114	2010A080	大纜巷 38-40B 號及大興街 50-56 號 - 澳門	Travessa da Corda nos 38-40B e Rua de João de Araújo nos 50-56 - Macau	2015-07-16	NA
115	2010A081	青洲大馬路 122 號 - 澳門	Avenida do Conselheiro Borja n° 122 - Macau	2018-12-19	NA
116	2010A082	沙梨頭海邊街 54 號及罽累巷 23 號 - 澳門	Rua da Ribeira Patane no54 e Travessa do Enleio no23 - Macau	2015-07-29	NA
117	2010A083	黑沙環馬路 20 號 - 澳門	Estrada da Areia Preta no20 - Macau	2015-06-10	2015-06-10
118	2010A083	黑沙環馬路 20 號 - 澳門	Estrada da Areia Preta n° 20 - Macau	2018-01-24	2018-01-24
119	2011A010	河邊新街 167 號 - 澳門	Rua do Almirante Sérgio n° 167 - Macau	2017-04-05	2017-05-31
120	2011A023	亞美打利庇盧大馬路 507 號 - 澳門	Avenida de Almeida Ribeiro no 507 - Macau	2015-07-29	2015-11-27
121	2011A032	河邊新街 209-219 號, 沙井天巷 2-22 號, 光復圍 1-13C 號及 2-32 號 - 澳門	Rua do Almirante Sérgio nos 209-219, Travessa da Assunção nos 2-22, Pátio da Claridade nos 1-13C e nos 2-32 - Macau	2016-12-30	NA
122	2011A033	蛤巷 23 號 - 澳門	Travessa do Búzio n° 23 - Macau	2018-06-13	NA
123	2011A035	快艇頭街 34 號 - 澳門	Rua dos Faitiões no34 - Macau	2015-03-11	2016-07-25
124	2011A039	關前正街 38-40 號 - 澳門	Rua dos Ervanários nos 38-40 - Macau	2016-06-28	NA
125	2011A056	位於鄰近西灣湖景大馬路之土地 - 澳門	Terreno junto à Avenida Panorâmica do Lago Sai Van - Macau	2017-07-26	NA

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126	2011A078(a)	位於鄰近羅理基博士大馬路之土地 - 澳門	Terreno junto à Avenida do Dr. Rodrigo Rodrigues - Macau	2016-07-25	NA
127	2011A079	橋巷 8 號 - 澳門	Travessa da Ponte n° 8 - Macau	2018-06-13	NA
128	2011A085	火船頭街 87-91 號 - 澳門	Rua das Lorchas nos 87-91 - Macau	2014-08-01	2016-10-31
129	2011A097	十月初五日街 170 號 - 澳門	Rua de Cinco de Outubro no 170 - Macau	2015-04-27	2015-06-10
130	2012A010	海邊新街 264-268 號及貢士旦甸奴街 9-11 號(海傍區衛生中心) - 澳門	Rua do Guimarães nos 264-268 e Rua de Constantino Brito nos 9-11 (Centro de Saúde do Porto Interior) - Macau	2018-06-13	NA
131	2012A020	大碼頭街 31-31A 號 - 澳門	Rua do Teatro nos 31-31A - Macau	2015-10-30	NA
132	2012A023	高可寧紳士街 4C-4E 號 - 澳門	Rua do Comendador Kou Hó Neng nos 4C-4E - Macau	2016-07-25	NA
133	2012A025	草堆街 12-12A 號 - 澳門	Rua das Estalagens nos 12-12A - Macau	2014-08-15	NA
134	2012A028	魯子高街 10 號 - 澳門	Rua do Noronha n° 10 - Macau	2015-11-27	NA
135	2012A029	罈些喇提督大馬路 118 號及雅廉訪大馬路 147 號 - 澳門	Avenida do Almirante Lacerda n° 118 e Avenida do Ouvidor Arriaga n° 147 - Macau	2018-10-24	NA
136	2012A044	惠愛街 61-63 號及罈些喇提督大馬路 30A-30C 號 - 澳門	Rua da Alegria nos 61-63 e Avenida do Almirante Lacerda nos 30A-30C - Macau	2015-04-27	NA
137	2012A049	位於鄰近苦力圍之土地 - 澳門	Terreno junto ao Pátio dos Cules - Macau	2018-03-29	NA
138	2012A050	媽閣上街 7 號—澳門	Rua de S. Tiago da Barra no 7—Macau	2018-07-18	NA
139	2012A053	位於鄰近十月初五日街之土地 - 澳門	Terreno junto à Rua de Cinco de Outubro - Macau	2015-03-27	NA
140	2012A058	陳家里 6-8 號 - 澳門	Beco do Chá nos 6-8 - Macau	2016-05-10	NA
141	2012A060	工匠圍 10 號 - 澳門	Pátio do Socorro no 10 - Macau	2015-05-26	NA
142	2012A068	牧羊巷 8A 號 - 澳門	Travessa do Pastor n° 8A - Macau	2015-06-10	2016-06-28
143	2012A070	鄰近罈些喇提督大馬路之土地-紅街市 - 澳門	Terreno junto à Avenida do Almirante Lacerda-Mercado Municipal Almirante Lacerda - Macau	2018-12-19	NA
144	2012A075	麻子街 85 號 - 澳門	Rua da Palmeira No85 - Macau	2014-09-03	2015-05-26
145	2012A076	渡船街 1A 號及亞利鴉架街 28 號 - 澳門	Rua da Barca n° 1A e Rua de Manuel de Arriaga n° 28 - Macau	2018-01-24	2018-05-09
146	2012A077	位於鄰近苦力圍之土地 - 澳門	Terreno junto ao Pátio dos Cules - Macau	2018-03-29	NA
147	2012A078	位於鄰近庇山耶街及小新巷之土地 - 澳門	Terreno junto à Rua de Camilo Pessanha e Travessa dos Alfaiates - Macau	2014-11-13	2014-11-13
148	2012A078	位於鄰近庇山耶街及小新巷之土地 - 澳門	Terreno junto à Rua de Camilo Pessanha e Travessa dos Alfaiates - Macau	2018-03-29	2018-03-29
149	2012A094	草地圍 23-25 號 - 澳門	Pátio da Cabaia nos 23-25 - Macau	2014-07-03	NA
150	2013A009	十月初五日街 5 號 - 澳門	Rua de Cinco de Outubro no 5 - Macau	2015-07-29	NA
151	2013A013	大碼頭街 27 號 - 澳門	Rua do Teatro n° 27 - Macau	2017-04-05	NA
152	2013A014	亞婆井街 16 號 - 澳門	Rua do Lilau n° 16 - Macau	2016-07-25	NA
153	2013A020(A)	大碼頭街 12-14 號 - 澳門	Rua do Teatro nos 12-14 - Macau	2017-11-29	NA
154	2013A022	火船頭街 253-259 號及蓬萊新街 3 號 - 澳門	Rua das Lorchas nos 253-259 e Rua do Bocage no3 - Macau	2014-09-29	2016-09-05
155	2013A023	麻子街 43-45 號 - 澳門	Rua da Palmeira nos 43-45 - Macau	2017-05-31	NA
156	2013A026	馬忌士街 20 號 - 澳門	Rua de Eduardo Marques no 20 - Macau	2015-06-30	NA
157	2013A028	位於鄰近墨山街之土地 - 澳門	Terreno junto à Rua de Martinho Montenegro - Macau	2015-07-29	NA

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158	2013A030	位於鄰近媽閣上街之土地，嘉路一世船塢 - 澳門	Terreno junto à Rua de S. Tiago da Barra, Doca de D. Carlos I - Macau	2016-07-25	NA
159	2013A053	聖祿杞街 49 號 - 澳門	Rua de S. Roque nº 49 - Macau	2016-05-10	NA
160	2013A057	麻子街 36D-38 號 - 澳門	Rua da Palmeira nos 36D-38 - Macau	2018-12-19	NA
161	2013A059	海邊新街 289 號 - 澳門	Rua do Guimarães no 289 - Macau	2015-06-30	NA
162	2013A066	聖美基街 30 號 - 澳門	Rua de S. Miguel nº 30 - Macau	2017-07-26	NA
163	2013A067	爛鬼樓巷 22-22A 號 - 澳門	Travessa do Armazém Velho nos 22-22A - Macau	2018-01-24	NA
164	2013A073	河邊新街 189 號 - 澳門	Rua do Almirante Sérgio no 189 - Macau	2014-09-03	NA
165	2013A077	關前正街 31 號 - 澳門	Rua dos Ervanários no 31 - Macau	2014-08-15	NA
166	2013A080	興華街 12-14 號 - 澳門	Rua dos Cavaleiros nos 12-14 - Macau	2015-10-30	NA
167	2013A087	十月初五日街 42 號 - 澳門	Rua de Cinco de Outubro no 42 - Macau	2015-04-27	NA
168	2013A092	瘋堂新街 18 號 - 澳門	Rua Nova de S. Lázaro nº 18 - Macau	2017-09-27	NA
169	2013A111	麻子街 39 號 - 澳門	Rua do Palmeira nº 39 - Macau	2017-09-27	NA
170	2013A112	爹美刁施拿地大馬路 37 號 - 澳門	Avenida de Demétrio Cinatti nº 37 - Macau	2016-04-20	NA
171	2013A113	意那韶白的士打巷 8 號	Travessa de Inácio Baptista no. 8	2014-06-19	2014-06-19
172	2013A113	意那韶白的士打巷 8-10 號 - 澳門	Travessa de Inácio Baptista nos 8-10 - Macau	2015-09-15	2015-09-15
173	2013A114	媽閣上街 9-11 號 - 澳門	Rua de S. Tiago da Barra nos 9-11 - Macau	2017-05-31	NA
174	2014A001	南灣大馬路 381 - 393 號 - 澳門	Avenida da Praia Grande nos 381-393 - Macau	2014-09-03	NA
175	2014A003	亞美打利庇盧大馬路 515 號 - 澳門	Avenida de Almeida Ribeiro no 515 - Macau	2014-07-03	NA
176	2014A008	東望洋街 1 號 - 澳門	Rua de Ferreira do Amaral no 1 - Macau	2014-10-15	2014-10-28
177	2014A008	東望洋街 1 號 - 澳門	Rua de Ferreira do Amaral nº 1 - Macau	2018-06-13	2018-07-18
178	2014A010	美麗街 16-16A 號	Rua Formosa nos 16-16A	2014-07-03	2014-07-03
179	2014A010	美麗街 16-16A 號 - 澳門	Rua Formosa nos 16-16A - Macau	2017-05-31	2017-05-31
180	2014A012	亞美打利庇盧大馬路 558-566 號 - 澳門	Avenida de Almeida Ribeiro nos 558-566 - Macau	2015-03-11	NA
181	2014A013	亞美打利庇盧大馬路 360 號及平線里 2 號 - 澳門	Avenida de Almeida Ribeiro nº 360 e Beco do Paralelo nº 2 - Macau	2015-03-27	NA
182	2014A020	關前正街 27 號 - 澳門	Rua dos Ervanários no 27 - Macau	2014-10-28	NA
183	2014A025	鏡湖馬路 30 號 - 澳門	Estrada do Repouso no 30 - Macau	2014-09-29	2014-09-29
184	2014A025	位於鄰近鏡湖馬路之土地 - 澳門	Terreno junto à Estrada do Repouso - Macau	2017-09-27	2017-09-27
185	2014A026	鍾家里 26-38 號 - 澳門	Beco das Caixas nos 26-38 - Macau	2014-11-13	2014-11-13
186	2014A026	鍾家里 26-38 號 - 澳門	Beco das Caixas nos 26-38 - Macau	2017-09-27	2017-09-27
187	2014A029	連勝馬路 121-121A 號 - 澳門	Estrada de Coelho do Amaral nos 121-121A - Macau	2014-12-12	NA
188	2014A030	通商新街 9 號 - 澳門	Rua Nova do Comércio no 9 - Macau	2014-10-15	NA
189	2014A031	沙欄仔街 18 號及蛋巷 7 號 - 澳門	Rua do Tarrafeiro no 18 e Travessa dos Ovos no 7 - Macau	2014-11-27	2015-07-16
190	2014A032	惠愛街 116 號 - 澳門	Rua da Alegria nº 116 - Macau	2014-11-27	NA
191	2014A034	羅沙達街 38-40 號及巴士度街 1 號 - 澳門	Rua de Alves Roçada nos 38-40 e Rua de António Basto nº 1 - Macau	2015-01-22	NA
192	2014A035	仁安里 4-4A 號 - 澳門	Beco da Arruda nos 4-4A - Macau	2017-11-29	NA

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193	2014A037	商人巷 26 號 - 澳門	Travessa dos Mercadores nº 26 - Macau	2015-06-30	NA
194	2014A038	鏡湖馬路 9 號 - 澳門	Estrada do Repouso no 9 - Macau	2015-02-13	NA
195	2014A042	賣菜巷 2-2B 號及新勝街 3 號 - 澳門	Travessa da Mosca nos 2-2B e Rua de Tomás Vieira no 3 - Macau	2015-06-10	NA
196	2014A043	祿號里 5 號 - 澳門	Beco da Carapinha no 5 - Macau	2015-01-22	NA
197	2014A044	盧九街 5 號 - 澳門	Rua do Lu Cao nº 5 - Macau	2015-02-13	NA
198	2014A045	仁慕巷 11 號 - 澳門	Travessa da Saudade no 11 - Macau	2014-12-12	NA
199	2014A046	土庫圍 1-3 號 - 澳門	Pátio do Godão nos 1-3 - Macau	2015-03-11	NA
200	2014A048	漁翁街 120-158 號 - 澳門	Rua dos Pescadores nos 120-158 - Macau	2015-05-26	NA
201	2014A049	惠愛街 30 號 - 澳門	Rua da Alegria nº 30 - Macau	2015-11-27	NA
202	2014A050	庇山耶街 25 號 - 澳門	Rua de Camilo Pessanha nº 25 - Macau	2015-03-11	2015-03-11
203	2014A050	庇山耶街 25 號 - 澳門	Rua de Camilo Pessanha nº 25 - Macau	2018-06-13	2018-06-13
204	2014A051	苦力圍 8 號 - 澳門	Pátio dos Cules no 8 - Macau	2015-03-11	NA
205	2014A054	刀里 13 號 - 澳門	Beco da Faca nº 13 - Macau	2015-01-22	NA
206	2014A055	得勝斜路 40 號 - 澳門	Calçada da Vitória nº 40 - Macau	2015-06-30	NA
207	2014A057	桔仔街 118 號 - 澳門	Rua do Matapau no 118 - Macau	2015-05-12	NA
208	2014A059	常春藤圍 4 號 - 澳門	Pátio da Hera no 4 - Macau	2015-03-11	NA
209	2014A067	美基街 14 號 - 澳門	Rua de Miguel Aires nº 14 - Macau	2015-03-27	NA
210	2014A070	柯利維喇里 21 號 - 澳門	Beco de Marques de Oliveira no 21 - Macau	2015-06-30	NA
211	2014A072	聚龍舊社 8-10 號 - 澳門	Beco Central nos 8 - 10 - Macau	2015-09-15	NA
212	2014A078	位於鄰近青洲大馬路之土地 - 澳門	Terreno junto à Avenida do Conselheiro Borja - Macau	2015-06-30	2015-06-30
213	2014A078	台山中街 200 號 - 澳門	Rua Central de T'oi Sán no 200 - Macau	2018-03-29	2018-03-29
214	2014A079	鍾家里 5 號 - 澳門	Beco das Caixas nº 5 - Macau	2015-06-30	2016-09-05
215	2014A081	位於鄰近黑沙環馬路之土地 - 澳門	Terreno junto à Estrada da Areia Preta - Macau	2015-05-26	NA
216	2014A082	關前正街 27-31 號 - 澳門	Rua dos Ervanários nos 27-31 - Macau	2015-06-10	NA
217	2014A085	大三巴圍 6 號及果欄街 51A - 53 號 - 澳門	Pátio de S. Paulo no 6 e Rua da Tercena nos 51A - 53 - Macau	2015-07-29	NA
218	2014A086	吉慶一圍 6B 號 - 澳門	Pátio do Mestre no 6B - Macau	2015-06-30	NA
219	2014A087	卑第圍 5 號 - 澳門	Pátio do Padre Narciso nº 5 - Macau	2015-07-16	NA
220	2014A090	草堆街 100 號 - 澳門	Rua das Estalagens no 100 - Macau	2015-06-10	2015-06-10
221	2014A090	草堆街 100 號 - 澳門	Rua das Estalagens no 100 - Macau	2018-03-29	2018-03-29
222	2014A091	位於鄰近青洲河邊馬路之土地 - 澳門	Terreno junto à Estrada Marginal da Ilha Verde - Macau	2016-06-28	NA
223	2014A094	草堆街 58 號 - 澳門	Rua das Estalagens nº 58 - Macau	2016-03-16	NA
224	2014A095	通商新街 45 號 - 澳門	Rua Nova do Comércio no 45 - Macau	2015-07-29	2016-06-02
225	2014A096	美副將巷 2-8 號 - 澳門	Travessa do Coronel Mesquita nos 2-8 - Macau	2017-04-05	NA
226	2014A098	關前正街 27-33 號 - 澳門	Rua dos Ervanários nos 27-33 - Macau	2015-09-15	2015-10-30
227	2014A099	常春藤圍 2 號 - 澳門	Pátio da Hera no 2 - Macau	2015-07-29	NA
228	2014A100	庇山耶街 24-26 號 - 澳門	Rua de Camilo Pessanha nos 24-26 - Macau	2015-07-16	NA
229	2014A101	位於鄰近新勝街之土地 - 澳門	Terreno junto à Rua de Tomás Vieira - Macau	2015-06-30	2016-06-02

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230	2014A102	新填巷 2, 6A 號及桔仔街 122 號 - 澳門	Travessa do Aterro Novo nos 2, 6A e Rua do Matapau nº 122 - Macau	2015-07-16	NA
231	2014A103	快艇頭街 43 號 - 澳門	Rua dos Faltões no 43 - Macau	2015-07-29	NA
232	2014A104	關前正街 42 號 - 澳門	Rua dos Ervanários nº 42 - Macau	2015-08-11	NA
233	2014A105	白灰街 35-39 號 - 澳門	Rua da Cal nos 35-39 - Macau	2015-07-16	NA
234	2015A001	惠愛街 8 - 8A 號及渡船街 111 號 - 澳門	Rua da Alegria nos 8 - 8A e Rua da Barca no 111 - Macau	2015-07-29	NA
235	2015A002	風順堂街 6B 號 - 澳門	Rua de S. Lourenço no 6B - Macau	2015-07-29	NA
236	2015A003	肥利喇亞美打巷 5 - 7 號 - 澳門	Travessa do Conselheiro Ferreira de Almeida nos 5 - 7 - Macau	2015-08-11	NA
237	2015A005	吉慶巷 18 - 20 號 - 澳門	Travessa dos Becos nos 18 - 20 - Macau	2015-08-11	NA
238	2015A008	位於鄰近渡船街之土地 - 澳門	Terreno junto à Rua da Barca - Macau	2015-09-15	NA
239	2015A010	菖蒲園 11 號 - 澳門	Pátio da Espadana nº 11 - Macau	2015-10-30	NA
240	2015A013	麻子街 27 號 - 澳門	Rua da Palmeira no 27 - Macau	2015-08-11	NA
241	2015A019	大碼頭街 9-11 號 - 澳門	Rua do Teatro nos 9-11 - Macau	2017-07-26	NA
242	2015A020	大街 78 號 - 澳門	Rua dos Mercadores nº 78 - Macau	2016-04-20	NA
243	2015A021	商人巷 46 號 - 澳門	Travessa dos Mercadores nº 46 - Macau	2016-02-24	NA
244	2015A022	桔仔街 106 號 - 澳門	Rua do Matapau nº 106 - Macau	2016-01-20	NA
245	2015A024	連勝街 2C 號 - 澳門	Rua de Coelho do Amaral nº 2C - Macau	2015-11-27	NA
246	2015A025	沙欄仔街 35 號 - 澳門	Rua do Tarrafeiro nº 35 - Macau	2015-11-27	NA
247	2015A027	位於鄰近友誼橋大馬路及勞動節街之土地 - 澳門	Terreno junto à Avenida da Ponte da Amizade e Rua 1º de Maio - Macau	2017-11-29	NA
248	2015A029	位於鄰近馬忌士圍之土地 - 澳門	Terreno junto ao Pátio de Lourenço Marques - Macau	2015-10-30	2015-10-30
249	2015A029	位於鄰近馬忌士圍之土地 - 澳門	Terreno junto ao Pátio de Lourenço Marques - Macau	2018-12-19	2018-12-19
250	2015A030	通商新街 46 號 - 澳門	Rua Nova do Comércio nº 46 - Macau	2015-10-30	NA
251	2015A034	柯高街 7 號 - 澳門	Rua de Horta e Costa nº 7 - Macau	2015-11-27	NA
252	2015A035	商人巷 25 號 - 澳門	Travessa dos Mercadores nº 25 - Macau	2016-02-24	NA
253	2015A037	美基街 12 號 - 澳門	Rua de Miguel Aires nº 12 - Macau	2015-11-27	NA
254	2015A038	教師里 11-13 號 - 澳門	Beco do Professor nos 11-13 - Macau	2016-01-20	NA
255	2015A039	庇山耶街 54 號 - 澳門	Rua de Camilo Pessanha nº 54 - Macau	2016-02-24	NA
256	2015A040	位於鄰近沙梨頭海邊街之土地 - 澳門	Terreno junto à Rua da Ribeira do Patane - Macau	2016-01-20	2016-07-25
257	2015A042	商人巷 28 號 - 澳門	Travessa dos Mercadores nº 28 - Macau	2016-01-20	NA
258	2015A051	士多烏拜斯大馬路 36-38A 號 - 澳門	Avenida de Sidónio Pais nos 36-38A - Macau	2016-03-16	NA
259	2015A052	趙家巷 11 號 - 澳門	Travessa da Porta nº 11 - Macau	2016-02-24	NA
260	2015A053	沙梨頭口巷 5-7 號及何林圍 19-21 號 - 澳門	Travessa da Palanchica nos 5-7 e Pátio de Além-Bosque nos 19-21 - Macau	2016-03-16	NA
261	2015A055	菖蒲園 8 號 - 澳門	Pátio da Espadana nº 8 - Macau	2016-03-16	NA
262	2015A056	沙梨頭北街 270 號, 沙梨頭北巷 102 號及收容所街 38 號 - 澳門	Rua Norte do Patane nº 270, Travessa Norte do Patane nº 102 e Rua do Asilo nº 38 - Macau	2016-05-10	2016-05-10
263	2015A056	沙梨頭北街 270 號, 沙梨頭北巷 102 號及收容所街 38 號 - 澳門	Rua Norte do Patane nº 270, Travessa Norte do Patane nº 102 e Rua do Asilo nº 38 - Macau	2018-10-24	2018-10-24

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264	2015A057	小新巷 5 號 - 澳門	Travessa dos Alfaiates nº 5 - Macau	2016-03-16	NA
265	2015A058	桔仔街 90 號 - 澳門	Rua da Matapau nº 90 - Macau	2016-04-20	NA
266	2015A061	蠔里 19 號 - 澳門	Beco da Ostra nº 19 - Macau	2016-04-20	NA
267	2015A062	銀和里 11 號及錦葵里 4 號 - 澳門	Beco da Prata nº 11 e Beco da Malva nº 4 - Macau	2016-05-10	NA
268	2015A064	位於鄰近何賢紳士大馬路之土地 - 澳門	Terreno junto à Avenida do Comendador Ho Yin - Macau	2016-09-05	NA
269	2015A068	風順堂街 6B 號及意那韶白的士打巷 5 號 - 澳門	Rua de S.Lourenço nº 6B e Travessa de Inácio Baptista nº 5 - Macau	2016-05-10	NA
270	2015A069	罈些喇提督大馬路 121A-121B 號 - 澳門	Avenida do Almirante Lacerda nos 121A-121B - Macau	2018-06-13	2018-07-18
271	2015A070	位於鄰近馬忌士圍之土地 - 澳門	Terreno junto ao Pátio de Lourenço Marques - Macau	2016-06-02	NA
272	2015A071	果欄街 40 號 - 澳門	Rua da Tercena nº 40 - Macau	2016-12-30	NA
273	2015A073	祿號里 5 號及仁慕巷 11 號 - 澳門	Beco da Carapinha nº 5 e Travessa da Saudade nº 11 - Macau	2016-06-28	NA
274	2015A074	沙欄仔街 18 號及蛋巷 7-7A 號 - 澳門	Rua do Tarrafeiro nº 18 e Travessa dos Ovos nos 7-7A - Macau	2016-06-02	NA
275	2015A076	大三巴街 8 號 - 澳門	Rua de S. Paulo nº 8 - Macau	2016-12-30	2016-12-30
276	2015A076	大三巴街 8 號 - 澳門	Rua de S. Paulo nº 8 - Macau	2017-07-26	2017-07-26
277	2015A081	賣菜街 1A 號及賣菜巷 4 號 - 澳門	Rua da Estrela nº 1A e Travessa da Mosca nº 4—Macau	2016-06-02	NA
278	2015A082	位於鄰近劄狗環巷之土地 - 澳門	Terreno junto à Travessa da Praia - Macau	2016-07-25	NA
279	2015A083	位於鄰近劄狗環巷及菜園巷之土地 - 澳門	Terreno junto à Travessa da Praia e Travessa das Hortas - Macau	2016-07-25	NA
280	2015A085	黑沙環馬路 20 號及位於鄰近黑沙環馬路之土地 - 澳門	Estrada da Areia Preta nº 20 e terreno junto à Estrada da Areia Preta - Macau	2016-07-25	NA
281	2015A086	關前後街 25 號及李家圍 12 號 - 澳門	Rua de Nossa Senhora do Amparo nº 25 e Pátio da Mina nº 12—Macau	2016-07-25	NA
282	2015A087	關前正街 18 號 - 澳門	Rua dos Ervanários nº 18 - Macau	2016-07-25	NA
283	2015A088	關前正街 16 號 - 澳門	Rua dos Ervanários nº 16 - Macau	2016-07-25	NA
284	2015A089	大街 39B 號及公局新市西街 10 號 - 澳門	Rua dos Mercadores nº 39B e Rua Oeste do Mercado de S. Domingos nº 10—Macau	2016-07-25	NA
285	2016A001	沙梨頭街 91 號 - 澳門	Rua do Patane nº 91 - Macau	2016-09-05	NA
286	2016A002	小新巷 18 號 - 澳門	Travessa dos Alfaiates nº 18 - Macau	2016-07-25	NA
287	2016A003	美基街 12-14 號 - 澳門	Rua de Miguel Aires nos 12-14 - Macau	2016-07-25	NA
288	2016A004	樹木巷 3 號及水手里 5 號 - 澳門	Travessa da Árvore nº 3 e Beco do Marinheiro nº 5—Macau	2016-10-31	NA
289	2016A012	草蓆圍 3 號 - 澳門	Pátio da Esteira nº 3 - Macau	2016-09-05	NA
290	2016A013	媽閣斜巷 2 號 - 澳門	Calçada da Barra nº 2 - Macau	2016-09-05	2016-09-05
291	2016A013	媽閣斜巷 2 號 - 澳門	Calçada da Barra nº 2 - Macau	2017-11-29	2017-11-29
292	2016A016	東望洋新街 348 號及家辣堂街 11-25 號 (聖羅撒中學) - 澳門	Rua Nova à Guia nº 348 e Rua de Santa Clara nos 11-25 (Colégio de Santa Rosa de Lima) - Macau	2017-05-31	NA
293	2016A018	沙梨頭街 89-89A 號 - 澳門	Rua do Patane nos 89-89A - Macau	2016-10-31	NA
294	2016A021	福慶街 2 號 - 澳門	Rua da Figueira nº 2 - Macau	2016-09-05	NA
295	2016A022	十月初五日街 5 號及位於鄰近十月初五日街之土地 - 澳門	Rua de Cinco de Outubro nº 5 e terreno junto à Rua de Cinco de Outubro - Macau	2016-10-31	NA
296	2016A025	日頭街 17-19 號及連安後巷 10-12 號 - 澳門	Rua do Sol nos 17-19 e Travessa de D. Quixote nos 10-12 - Macau	2016-10-31	NA

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297	2016A027	河邊新街 80 號 - 澳門	Rua do Almirante Sérgio n° 80 - Macau	2016-10-31	NA
298	2016A028	火船頭街 67-73 號 - 澳門	Rua das Lorchas nos 67-73 - Macau	2016-12-30	NA
299	2016A030	鄰近黑沙環馬路與慕拉士大馬路的交匯處 - 澳門	Confluência entre a Estrada da Areia Preta e a Avenida de Venceslau de Moraes - Macau	2017-04-05	NA
300	2016A031	位於鄰近染布巷及田畔街之土地 - 澳門	Terreno junto à Travessa dos Tingidores e Rua de Entre-Campos - Macau	2017-02-23	NA
301	2016A032	位於鄰近快艇頭里之土地 - 澳門	Terreno junto ao Beco dos Fatiões - Macau	2017-04-05	NA
302	2016A033	位於鄰近孫逸仙大馬路之土地(南灣湖-C15 及 C16 地段) - 澳門	Terrenos junto à Avenida Dr. Sun Yat-Sen (Lago Nam Van-Lotes C15 e C16) - Macau	2016-09-05	NA
303	2016A034	桔仔街 110 號 - 澳門	Rua do Matapau n° 110 - Macau	2016-10-31	NA
304	2016A035	肥利喇亞美打大馬路 95A-95B 號 - 澳門	Avenida do Conselheiro Ferreira de Almeida nos 95A-95B - Macau	2017-02-23	NA
305	2016A036	渡船街 62 號 - 澳門	Rua da Barca n° 62 - Macau	2016-10-31	NA
306	2016A037	惠愛街 84 號 - 澳門	Rua da Alegria n° 84 - Macau	2016-10-31	NA
307	2016A038	夜嘢斜巷 9 號 - 澳門	Calçada do Gamboa n° 9 - Macau	2016-10-31	NA
308	2016A039	玫瑰里 12 號 - 澳門	Beco da Rosa n.º 12 - Macau	2016-10-31	NA
309	2016A040	河邊新街 122-144 號, 貨倉巷 2 號 及比厘喇馬忌士街 89-103 號 - 澳門	Rua do Almirante Sérgio nos 122-144, Travessa dos Armazéns n° 2 e Rua do Dr. Lourenço Pereira Marques nos 89-103 - Macau	2018-08-29	NA
310	2016A041	快艇頭街 23-25 號 - 澳門	Rua dos Fatiões nos 23-25 - Macau	2016-12-30	NA
311	2016A044	河邊新街 289C-291 號及媽閣斜巷 32-42 號 - 澳門	Rua do Almirante Sérgio nos 289C-291 e Calçada da Barra nos 32-42 - Macau	2017-05-31	NA
312	2016A045	江沙路里 16 號 - 澳門	Beco do Gonçalo no 16 - Macau	2016-12-30	NA
313	2016A046	小販巷 27 號 - 澳門	Travessa dos Vendilhões n° 27 - Macau	2017-05-31	NA
314	2016A047	柯利維喇街 44 號及墨山街 25 號(昔日門牌柯利維喇街 19 號) - 澳門	Rua de Marques de Oliveira no 44 e Rua de Martinho Montenegro no 25 (Antiga Rua de Marques de Oliveira no 19) - Macau	2016-12-30	NA
315	2016A048	位於鄰近海邊馬路之土地 - 澳門	Terreno junto à Estrada de Cacilhas - Macau	2017-04-05	NA
316	2016A049	惠愛里 9 號 - 澳門	Beco da Alegria n° 9 - Macau	2016-12-30	NA
317	2016A050	位於鄰近青洲河邊馬路之土地 - 澳門	Terreno junto à Estrada Marginal da Ilha Verde - Macau	2017-02-23	NA
318	2016A052	大碼頭街 16 號 - 澳門	Rua do Teatro n° 16 - Macau	2017-09-27	NA
319	2016A053	鮑公馬路 21-21A 號 - 澳門	Estrada de D. João Paulino nos 21-21A - Macau	2017-02-23	NA
320	2016A058	西望洋馬路 16-16A 號 - 澳門	Estrada da Penha nos 16-16A - Macau	2017-04-05	NA
321	2016A059	茨林園第二巷 15 號 - 澳門	Travessa Segunda do Pátio do Espinho n° 15 - Macau	2017-04-05	NA
322	2016A060	沙欄仔街 16-18 號及蛋巷 7-7A 號 - 澳門	Rua do Tarrafeiro nos 16-18 e Travessa dos Ovos nos 7-7A - Macau	2017-04-05	NA
323	2016A063	鹹魚街 2 號 - 澳門	Rua do Peixe Salgado n° 2—Macau	2017-05-31	NA
324	2016A065	民國街 133 號 - 澳門	Rua da República n° 133 - Macau	2017-04-05	NA
325	2016A066	民國街 129 號 - 澳門	Rua da República n° 129 - Macau	2017-05-31	NA
326	2016A067	民國街 101 號 - 澳門	Rua da República n° 101 - Macau	2017-04-05	NA
327	2016A068	民國街 95 號 - 澳門	Rua da República n° 95 - Macau	2017-05-31	NA
328	2016A069	民國街 123 號 - 澳門	Rua da República n° 123 - Macau	2017-05-31	NA
329	2016A070	民國街 125 號 - 澳門	Rua da República n° 125 - Macau	2017-04-05	NA

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330	2016A071	木瓜圍 15 號 - 澳門	Pátio da Papaia n° 15 - Macau	2017-05-31	NA
331	2016A072	銀針圍 5 號 - 澳門	Pátio da Agulha n° 5 - Macau	2017-05-31	NA
332	2017A001	渡船街 60D 號 - 澳門	Rua da Barca n°60D - Macau	2017-07-26	NA
333	2017A002	十月初五日街 127-129 號及木橋街 6 號 - 澳門	Rua de Cinco de Outubro nos127-129 e Rua do Pagode n°6 - Macau	2017-07-26	NA
334	2017A003	河邊新街 78 號 - 澳門	Rua do Almirante Sérgio n° 78 - Macau	2017-05-31	NA
335	2017A004	火水巷 1 號 - 澳門	Travessa do Petróleo n° 1 - Macau	2017-09-27	NA
336	2017A005	果欄圍 11-13 號 - 澳門	Pátio da Tercena nos11-13 - Macau	2017-07-26	NA
337	2017A008	十月初五日街 181 號 - 澳門	Rua de Cinco de Outubro n° 181 - Macau	2017-11-29	NA
338	2017A011	海邊新街 192 號 - 澳門	Rua do Guimarães n° 192 - Macau	2017-09-27	NA
339	2017A012	趙家巷 6 號 - 澳門	Travessa da Porta n°6—Macau	2017-07-26	NA
340	2017A013	鳳仙園 5-7 號 - 澳門	Pátio do Sal nos 5-7 - Macau	2017-11-29	NA
341	2017A015	位於海邊馬路之土地 - 澳門	Terreno junto à Estrada de Cacilhas - Macau	2018-12-19	NA
342	2017A018	永安圍 6 號 - 澳門	Pátio da Canja n°6 - Macau	2017-07-26	NA
343	2017A019	連勝街 67-71 號 - 澳門	Rua de Coelho do Amaral nos67-71 - Macau	2017-07-26	NA
344	2017A020	竹里 12 號 - 澳門	Beco do Bambu n°12 - Macau	2017-07-26	NA
345	2017A022	伯多祿局長街 24A-26 號 - 澳門	Rua de Pedro Nolasco da Silva nos24A-26 - Macau	2017-07-26	NA
346	2017A023	十月初五日街 20-20A 號及位於鄰近十月初五日街及工匠巷之土地 - 澳門	Rua de Cinco de Outubro nos 20-20A e terreno junto à Rua de Cinco de Outubro e Travessa dos Colonos - Macau	2017-09-27	NA
347	2017A024	立法會前地一幅土地 - 澳門	Terreno junto a Praça da Assembleia Legislativa - Macau	2017-07-26	NA
348	2017A026	大街 113 號 - 澳門	Rua dos Mercadores n° 113 - Macau	2017-11-29	NA
349	2017A028	黑沙環街 1-9 號，騎士圍 2-10 號及黑沙環馬路 47-49 號 - 澳門	Rua da Areia Preta nos 1-9, Pátio dos Cavaleiros nos 2-10 e Estrada da Areia Preta nos 47-49 - Macau	2017-09-27	NA
350	2017A029	位於鄰近民國大馬路之土地 - 澳門	Terreno junto à Avenida da República - Macau	2017-11-29	NA
351	2017A030	位於鄰近民國大馬路之土地 - 澳門	Terreno junto à Avenida da República - Macau	2017-11-29	NA
352	2017A031	位於鄰近民國大馬路之土地 - 澳門	Terreno junto à Avenida da República - Macau	2017-11-29	NA
353	2017A032	民國大馬路 28-34 號及位於鄰近 西望洋馬路之土地 - 澳門	Avenida da República nos 28-34 e terreno junto à Estrada da Penha - Macau	2018-06-13	2018-07-18
354	2017A033	亞婆井斜巷 2 號 - 澳門	Calçada do Lilau no 2 - Macau	2017-11-29	NA
355	2017A043	位於鄰近煙草里之土地 - 澳門	Terreno junto ao Beco do Tabaco - Macau	2018-06-13	2018-07-18
356	2017A044	珊瑚里 7 號 - 澳門	Beco do Coral no 7 - Macau	2018-03-29	2018-10-24
357	2017A045	珊瑚里 11 號 - 澳門	Beco do Coral n° 11 - Macau	2018-06-13	2018-07-18
358	2017A047	俾利喇街 151-157 號 - 澳門(非工業—郵電局)	Rua da Madre Terezina nos 1C,1D e 1E e terreno junto à Rua da Madre Terezina - Macau	2017-11-29	NA
359	2017A048	十月初五日街 197-199 號 - 澳門	Rua de Cinco de Outubro nos 197-199 - Macau	2018-06-13	2018-07-18
360	2017A051	媽閣街 4 號 - 澳門	Rua da Barra n° 4 - Macau	2018-01-24	NA
361	2017A052	祐漢新村第八街 37A-39 號，永定街 27-39 號及看台街	Rua Oito do Bairro Iao Hon nos 37A-39, Rua da Serenidade nos 27-39 e Rua da Tribuna nos 88A-100—Macau	2017-11-29	NA

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362	2017A053	白頭馬路 2 號—澳門	Estrada dos Parses no 2—Macau	2018-07-18	2018-10-24
363	2017A054	十月初五日街 196 號及火船頭街 111 號 - 澳門	Rua de Cinco de Outubro no 196 e Rua das Lorchas no 111 - Macau	2018-03-29	NA
364	2017A055	位於鄰近火水巷及生雪巷之土地 - 澳門	Terreno junto à Travessa do Petróleo e Travessa do Gelo - Macau	2018-08-29	NA
365	2017A056	羅若翰神父街 30-34 號 - 澳門	Rua do Padre João Clímaco nos 30-34 - Macau	2018-06-13	2018-07-18
366	2017A058	美麗街 5-7 號 - 澳門	Rua Formosa nos 5-7 - Macau	2018-03-29	NA
367	2017A059	庇山耶街 11-13 號及陳家里 2 號 - 澳門	Rua de Camilo Pessanha nos 11-13 e Beco do Chá n° 2 - Macau	2017-11-29	NA
368	2017A061	公局市場巷 20 號 - 澳門	Travessa do Mercado Municipal n° 20 - Macau	2018-01-24	NA
369	2017A062	仁慈堂右巷 4-10 號及羅結地巷 5-9 號(實地門牌仁慈堂右巷 4-10 號及羅結地巷 5-9B 號) - 澳門	Travessa da Misericórdia nos 4-10 e Travessa do Roquete nos 5-9 (no local Travessa da Misericórdia nos 4-10 e Travessa do Roquete nos 5-9B) - Macau	2018-03-29	NA
370	2017A063	位於鄰近苦力圍之土地 - 澳門	Terreno junto ao Pátio dos Cules - Macau	2018-01-24	NA
371	2017A067	位於鄰近眼鏡里之土地—澳門	Terreno junto ao Beco dos Óculos—Macau	2018-07-18	NA
372	2017A069	關前正街 25-33 號 - 澳門	Rua dos Ervanários nos 25-33 - Macau	2018-05-09	NA
373	2017A071	黑沙環第五街 3-3B 號及黑沙環第六街 5 號 - 澳門	Rua Cinco do Bairro da Areia Preta nos 3-3B e Rua Seis do Bairro da Areia Preta no 5 - Macau	2018-03-29	NA
374	2017A075	風爐匠巷 6 號 - 澳門	Travessa do Fogueiro n° 6 - Macau	2018-06-13	2018-07-18
375	2017A076	位於鄰近罌累巷之土地 - 澳門	Terreno junto à Travessa do Enleio - Macau	2018-03-29	NA
376	2017A078	吉慶巷 4 號 - 澳門	Travessa dos Becos n° 4 - Macau	2018-05-09	NA
377	2017A080	比厘喇馬忌士街 55 號 - 澳門	Rua do Dr. Lourenço Pereira Marques no 55 - Macau	2018-03-29	NA
378	2017A081	關前後街 12 號 - 澳門	Rua de Nossa Senhora do Amparo n° 12 - Macau	2018-06-13	NA
379	2017A083	庇山耶街 28 號 - 澳門	Rua de Camilo Pessanha n° 28 - Macau	2018-05-09	NA
380	2018A034	位於亞堅奴前地之土地—澳門	Terreno situado no Largo do Aquino—Macau	2018-07-18	NA
381	2018A041	亞美打利庇盧大馬路 570 號—澳門	Avenida de Almeida Ribeiro no 570—Macau	2018-07-18	NA
382	2018A042	位於鄰近飛能便度街之土地 - 澳門	Terreno junto à Rua de Fernão Mendes Pinto - Macau	2018-10-24	NA
383	2018A043	得勝馬路 28B 號 - 澳門	Estrada da Vitória n° 28B - Macau	2018-08-29	NA
384	2018A050	何子英西圍 6 號 - 澳門	Pátio Oeste de Hó Chi Iêng n° 6 - Macau	2018-08-29	NA
385	2018A052	草堆街 16 號 - 澳門	Rua das Estalagens n° 16 - Macau	2018-06-13	NA
386	2018A055	商人巷 18 號 - 澳門	Travessa dos Mercadores n° 18 - Macau	2018-08-29	NA
387	2018A060	康公廟前地 10 號 - 澳門	Largo do Pagode do Bazar n°10 - Macau	2018-10-24	NA
388	2018A075	關前正街 54 號 - 澳門	Rua dos Ervanários n° 54 - Macau	2018-12-19	NA
389	2018A076	惠愛里 7-9 號 - 澳門	Beco da Alegria nos 7-9 - Macau	2018-12-19	NA
390	2018A079	商人巷 27 號 - 澳門	Travessa dos Mercadores n° 27 - Macau	2018-12-19	NA
391	2018A081	草堆街 86 號 - 澳門	Rua das Estalagens n° 86 - Macau	2018-10-24	NA
392	2018A090	天台圍 2 號 - 澳門	Pátio do Terrado n° 2 - Macau	2018-12-19	NA
393	84A010	聖祿杞里 10-12 號 - 澳門	Beco de S.Roque nos 10-12 - Macau	2014-09-29	NA
394	84A011	亞婆井斜巷 6 號 - 澳門	Calçada do Lilau n° 6 - Macau	2016-03-16	NA

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395	84A021	纜廠巷 11-11A 號, 打纜圍 4-6 號及亞美打利庇廬里 4 號 - 澳門	Travessa da Cordoaria nos 11-11A, Pátio da Cordoaria nos 4-6 e Beco de Almeida Ribeiro nº 4 - Macau	2015-09-15	2015-09-15
396	84A021	纜廠巷 11-11A 號、打纜圍 4-6 號及亞美打利庇廬里 4 號 - 澳門	Travessa da Cordoaria nos 11-11A, Pátio da Cordoaria nos 4-6 e Beco de Almeida Ribeiro nº 4 - Macau	2018-06-13	2018-06-13
397	85A026	位於鄰近茨林園第二巷之土地 - 澳門	Terreno junto à Travessa Segunda do Pátio do Espinho - Macau	2018-08-29	NA
398	85A051	新市巷 2A-2B 號及清平巷 22 號 - 澳門	Travessa do Bazar Novo nos 2A-2B e Travessa do Auto Novo nº 22 - Macau	2016-01-20	NA
399	85A139	公局市場巷 30-32 號	Travessa do Mercado Municipal nos 30-32	2014-06-19	NA
400	85A166	手肘里 8-8A 號及寶塔巷 7 號 - 澳門	Beco dos Cotovelos nos 8-8A e Travessa do Pagode nº 7 - Macau	2015-07-16	NA
401	85A217	寶塔巷 14A 號 - 澳門	Travessa do Pagode no 14A - Macau	2015-07-29	NA
402	85A268	草堆街 80 號 - 澳門	Rua das Estalagens nº 80 - Macau	2016-06-02	NA
403	85A297	聖美基街 23 號 - 澳門	Rua de S. Miguel nº 23 - Macau	2016-06-28	NA
404	85A321	巴士度街 8-10 號 - 澳門	Rua de António Basto nos 8-10 - Macau	2014-10-15	NA
405	85A358	缸瓦巷 15 號 - 澳門	Travessa da Louça no 15 - Macau	2015-08-11	2015-08-11
406	85A358	缸瓦巷 15 號 - 澳門	Travessa da Louça nº 15 - Macau	2018-10-24	2018-10-24
407	85A411	水坑尾街 24-26 號 - 澳門	Rua do Campo nos 24-26 - Macau	2018-06-13	NA
408	85A431	約翰四世大馬路 8-14 號及南灣巷 2 號 - 澳門	Avenida de D. João IV nos 8-14 e Travessa da Praia Grande nº 2 - Macau	2018-08-29	NA
409	85A473	聖美基街 34-36 號 - 澳門	Rua de S. Miguel nos 34-36 - Macau	2015-10-30	NA
410	85A491	位於鄰近高冠街之土地 - 澳門	Terreno junto à Rua da Mitra - Macau	2016-03-16	NA
411	85A504	位於鄰近高園街之土地 - 澳門	Terreno junto à Rua de D. Belchior Carneiro - Macau	2015-07-29	NA
412	86A022	青洲河邊馬路 1188-1244 號及青洲新馬路 78-112 號 - 澳門	Estrada Marginal da Ilha Verde nos 1188-1244 e Estrada Nova da Ilha Verde nos 78-112 - Macau	2016-06-28	NA
413	86A050	板樟堂街 4 號 - 澳門	Rua de S. Domingos nº 4 - Macau	2016-04-20	NA
414	86A087	位於鄰近何林園之土地 - 澳門	Terreno junto ao Pátio de Além-Bosque - Macau	2015-09-15	NA
415	86A088	位於鄰近劏狗環巷之土地 - 澳門	Terreno junto à Travessa da Praia - Macau	2016-06-28	NA
416	86A122	得勝馬路 26-26A 號 - 澳門	Estrada da Vitória nos 26-26A - Macau	2016-03-16	NA
417	86A134	亞婆井斜巷 5 號及龍頭里 3 號 - 澳門	Calçada do Lilau nº 5 e Beco do Lilau nº 3 - Macau	2017-11-29	NA
418	86A167	位於鄰近罈些喇提督大馬路之土地(天主教殯儀館) - 澳門	Terreno junto à Avenida do Almirante Lacerda (Casa Mortuária Diocesana) - Macau	2017-05-31	NA
419	86A208	南灣大馬路 459, 龍嵩正街 1-9 號及位於鄰近南灣大馬路之土地 - 澳門	Avenida da praia Grande nº 459, Rua Central nos 1-9 e terreno junto à Avenida da Praia Grande - Macau	2016-09-05	NA
420	86A213	天神巷 31-33 號 - 澳門	Travessa dos Anjos nos 31-33 - Macau	2015-09-15	2015-09-15
421	86A213	天神巷 31-33 號 - 澳門	Travessa dos Anjos nos 31-33 - Macau	2017-11-29	2017-11-29
422	86A261	蓬萊新街 2-2B 號, 柯邦迪前地 14-16A 號及馬車巷 2-2B 號 - 澳門	Rua do Bocage nos 2-2B, Praça de Ponte e Horta nos 14-16A e Travessa dos Tréns nos 2-2B - Macau	2016-10-31	NA
423	86A266	主教巷 1A-1AB 號 - 澳門	Travessa do Bispo nos 1A-1AB - Macau	2014-09-12	2014-09-12
424	86A266	主教巷 1A-1AB 號 - 澳門	Travessa do Bispo nos 1A-1AB - Macau	2017-02-23	2017-02-23
425	86A339	仁慕巷 8 號及仁慕圍 2A 號—澳門	Travessa da Saudade no 8 e Pátio da Saudade no 2A—Macau	2018-07-18	NA

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426	87A013	民國大馬路 58-60 號 - 澳門	Avenida da República nos 58-60 - Macau	2016-10-31	NA
427	87A069	水榕樹巷 1A 號 - 澳門	Travessa de S. João no1A - Macau	2015-05-26	2015-05-26
428	87A069	水榕樹巷 1A 號 - 澳門	Travessa de S. João nº1A - Macau	2018-10-24	2018-10-24
429	87A142	亞美打利庇盧大馬路 529-533 號	Avenida de Almeida Ribeiro nos 529-533	2014-06-19	NA
430	87A210	天神巷 8 號 - 澳門	Travessa dos Anjos no8 - Macau	2014-10-28	NA
431	87A227	關前正街 53 號-澳門	Rua dos Ervanários nº 53 - Macau	2018-06-13	2018-10-24
432	87A238	白眼塘橫街 24 號 - 澳門	Rua da Caldeira no 24 - Macau	2018-03-29	NA
433	87A297	十月初五日街 203 號 - 澳門	Rua de Cinco de Outubro nº 203 - Macau	2015-09-15	NA
434	87A303	高樓里 4-6 號 - 澳門	Beco dos Coulaus nos 4-6 - Macau	2015-11-27	2015-11-27
435	87A303	高樓里 4-6 號 - 澳門	Beco dos Coulaus nos 4-6 - Macau	2018-08-29	2018-08-29
436	88A013	殷豐素王前地 76-90 號，廣州街 49-63 號及佛山街 48A-78 號 - 澳門	Praça de D. Afonso Henriques nos 76-90, Rua de Cantão nos 49-63 e Rua de Foshan nos 48A-78 - Macau	2016-09-05	NA
437	88A022	草堆街 20-22 號 - 澳門	Rua das Estalagens nos 20-22 - Macau	2015-07-16	NA
438	88A041	三巴仔斜巷 3 號 - 澳門	Calçada dos Remédios no 3 - Macau	2015-02-13	2015-10-30
439	88A063	馬場海邊馬路 100 號及位於鄰近馬場海邊馬路之土地 - 澳門	Estrada Marginal do Hipódromo nº 100 e terreno junto à Estrada Marginal do Hipódromo - Macau	2018-08-29	NA
440	88A073	殷豐素王前地 97 號 - 澳門	Praça de D. Afonso Henriques nº 97 - Macau	2017-05-31	NA
441	88A074	洞穴街 7 號 - 澳門	Rua da Gruta no 7 - Macau	2014-07-17	NA
442	88A180	草堆街 21 號 - 澳門	Rua das Estalagens no21 - Macau	2015-01-22	NA
443	88A210	板樟堂街 16A-16E 號及大堂巷 1-5 號 - 澳門	Rua de S.Domingos nos 16A-16E e Travessa da Sé nos 1-5 - Macau	2014-08-15	NA
444	89A095	位於鄰近炮兵馬路之土地 - 澳門	Terreno junto ao Caminho dos Artilheiros - Macau	2015-09-15	2016-05-10
445	89A156	爹美刁施拿地大馬路 7A 號及林茂巷 8 號 - 澳門	Avenida de Demétrio Cinatti nº 7A e Travessa de Lam Mau nº 8 - Macau	2018-01-24	NA
446	89A166	羅理基博士大馬路 417 號(昔日門牌 31 號) - 澳門	Avenida do Dr. Rodrigo Rodrigues nº 417 (antigo nº 31) - Macau	2016-07-25	NA
447	89A168	伯多祿局長街 2A-4D 號及天神巷 24-34 號 - 澳門	Rua de Pedro Nolasco da Silva nos 2A-4D e Travessa dos Anjos nos 24-34 - Macau	2014-10-15	2015-05-26
448	89A198	南灣大馬路 795 號 - 澳門	Avenida da Praia Grande nº 795 - Macau	2016-01-20	NA
449	89A201	白眼塘橫街 8-10 號 - 澳門	Rua da Caldeira nos 8-10 - Macau	2016-09-05	NA
450	89A208	鮑公馬路 23-23A 號 - 澳門	Estrada de D. João Paulino nos 23-23A - Macau	2014-07-17	NA
451	90A023	位於鄰近夜嘢里之土地 - 澳門	Terreno junto ao Beco do Gamboa - Macau	2017-07-26	NA
452	90A068	李寶椿街 250-358 號，台中街 253-353 號及位於鄰近台中街之土地（B 及 C 地塊） - 澳門	Rua de Lei Pou Ch'ôn nos 250-358, Rua Central de T'oi Sán nos 253-353 e terreno junto à Rua Central de T'oi Sán (Parcela B e C) - Macau	2015-06-10	2016-03-16
453	90A068	李寶椿街 250-358 號及台中街 253-353 號 - 澳門	Rua de Lei Pou Ch'ôn nos 250-358, Rua Central de T'oi Sán nos 253-353 - Macau	2018-12-19	2018-12-19
454	90A126	河邊新街 197 號 - 澳門	Rua do Almirante Sérgio no 197 - Macau	2015-02-13	NA
455	90A137	位於鄰近連丁里之土地 - 澳門	Terreno junto ao Beco da Carpideira - Macau	2016-12-30	NA
456	90A138	羅理基博士大馬路 165-193A 號及位於鄰近羅理基博士大馬路之土地 - 澳門	Avenida do Dr. Rodrigo Rodrigues nos 165-193A e terreno junto à Avenida do Dr. Rodrigo Rodrigues - Macau	2016-04-20	NA

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457	90A152	沙梨頭海邊街 48 號 - 澳門	Rua da Ribeira do Patane no 48 - Macau	2014-07-17	2014-07-17
458	90A152	位於鄰近沙梨頭海邊街之土地 - 澳門	Terreno junto à Rua da Ribeira do Patane - Macau	2015-11-27	2016-07-25
459	90A160	大井巷 5-7 號 - 澳門	Travessa dos Poços nos 5-7 - Macau	2017-07-26	NA
460	90A164	連勝馬路 88B-88C 號及高士德大馬路 96-100 號-澳門	Estrada de Coelho do Amaral nos 88B-88C e Avenida de Horta e Costa nos 96-100- Macau	2014-08-15	NA
461	90A191	亞婆井前地 27 號及亞婆井街 1 號 - 澳門	Largo do Lilau no27 e Rua do Lilau no1 - Macau	2014-07-03	NA
462	90A209	爹美刁施拿地大馬路 21B-22 號-澳門	Avenida de Demétrio Cinatti nos21B-22 - Macau	2014-08-15	NA
463	90A210	位於鄰近學校巷及西坑街之土地 - 澳門	Terrenos junto à Travessa do Colégio e Rua da Penha - Macau	2016-09-05	NA
464	90A245	連勝馬路 167-169 號及美副將大馬路 75 號 - 澳門	Estrada de Coelho do Amaral nos167-169 e Avenida do Coronel Mesquita nº75 - Macau	2017-07-26	NA
465	90A338	位於鄰近友誼大馬路之土地新口岸填海區-6 街區, K 地段 - 澳門	Terreno junto à Avenida da Amizade Zona de Aterros do Porto Exterior (ZAPE) - Quarteirão 6, Lote K - Macau	2016-07-25	NA
466	90A382	士多烏拜斯大馬路 2-8 號, 得勝馬路 5-19 號及高偉樂街 2-4 號 - 澳門	Avenida de Sidónio Pais nos 2-8, Estrada da Vitória nos 5-19 e Rua Filipe O'Costa nos 2-4 - Macau	2016-07-25	NA
467	91A034	位於鄰近青洲河邊馬路之土地 - 澳門	Terreno junto à Estrada Marginal da Ilha Verde - Macau	2016-07-25	NA
468	91A048	羅理基博士大馬路 465-513 號(昔日門牌 33-37 號)新口岸填海區-134 街區 - 澳門	Avenida do Dr. Rodrigo Rodrigues nos 465-513 (antigo nos 33-37) ZAPE-Quarteirão 134 - Macau	2014-12-12	NA
469	91A081	鶴鴿巷 12 號 - 澳門	Travessa da Codorniz nº 12 - Macau	2016-01-20	NA
470	91A099	渡船街 14D-14F 號 - 澳門	Rua da Barca nos 14D-14F - Macau	2016-07-25	NA
471	91A120	小新巷 26 號 - 澳門	Travessa dos Alfaiates nº 26 - Macau	2016-03-16	2016-03-16
472	91A120	小新巷 26 號 - 澳門	Travessa dos Alfaiates nº 26 - Macau	2018-10-24	2018-10-24
473	91A130	罈些喇提督大馬路 5 號及位於鄰近罈些喇提督大馬路之土地 - 澳門	Avenida do Almirante Lacerda no 5 e terreno junto à Avenida do Almirante Lacerda - Macau	2015-06-10	NA
474	91A134(A)	學校巷 3 號 - 澳門	Travessa do Colégio nº3 - Macau	2015-05-26	NA
475	91A152	位於鄰近連勝街之土地 - 鏡湖醫院 - 澳門	Terreno junto à Rua de Coelho do Amaral - Hospital “Kiang Wu” - Macau	2018-03-29	NA
476	91A174	位於鄰近馬交石炮台馬路之土地 - 澳門	Terreno junto à Estrada de D. Maria II - Macau	2014-10-28	2017-05-31
477	91A176	南灣大馬路 831 號, 美麗街 28-30A 號及水坑尾街 25-37 號 - 澳門	Avenida da Praia Grande nº 831, Rua Formosa nos 28-30A e Rua do Campo nos 25-37 - Macau	2017-07-26	2018-05-09
478	91A203	新填巷 7-7A 號 - 澳門	Travessa do Aterro Novo nos 7-7A - Macau	2017-04-05	NA
479	91A226	木橋街 38 號 - 澳門	Rua do Pagode nº.38 - Macau	2014-08-15	2014-08-15
480	91A226	木橋街 38 號 - 澳門	Rua do Pagode nº 38 - Macau	2016-10-31	2016-10-31
481	91A229	位於鄰近南灣大馬路之土地 - 澳門	Terreno junto à Avenida da Praia Grande - Macau	2015-06-10	NA
482	91A236	蓬萊新巷 2-2B 號及道德巷 3 號 - 澳門	Travessa da Caldeira nos 2-2B e Travessa das Virtudes nº 3 - Macau	2016-03-16	2016-10-31
483	91A256	位於鄰近慕拉士大馬路及馬交石炮台馬路之土地 - 澳門	Terreno junto à Avenida de Venceslau de Moraes e Estrada de D. Maria II - Macau	2016-07-25	NA
484	91A265	板樟堂街 1E-1F - 澳門	Rua de S.Domingos nos 1E-1F - Macau	2016-09-05	NA
485	91A268	位於鄰近西墳馬路之土地 - 澳門	Terreno junto à Estrada do Cemitério - Macau	2015-05-12	2016-06-02

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486	91A269-1e2	位於鄰近羅理基博士大馬路及宋玉生廣場之土地 新口岸填海區-9a1 及 9a2 地段 - 澳門	Terreno junto à Avenida do Dr. Rodrigo Rodrigues e Alameda Dr. Carlos d'Assumpção ZAPE – Lotes 9a1 e 9a2 - Macau	2015-02-13	NA
487	92A003	位於鄰近亞馬喇馬路及新雅馬路之土地 — 澳門	Terreno junto à Estrada de Ferreira do Amaral e Estrada da Bela Vista — Macau	2014-08-01	NA
488	92A008	亞美打利庇廬大馬路 580-588 號及海邊新街 313 號 - 澳門	Avenida de Almeida Ribeiro nos 580-588 e Rua do Guimarães n° 313 - Macau	2016-09-05	NA
489	92A033	位於鄰近永安園之土地 - 澳門	Terreno junto ao Pátio da Canja - Macau	2018-06-13	NA
490	92A055	皇子街 25 號及快艇頭街 30 號 - 澳門	Rua do Infante n° 25 e Rua dos Faltões n° 30 - Macau	2015-07-16	NA
491	92A076	媽閣街 12-16 號 - 澳門	Rua da Barra nos 12-16 - Macau	2015-03-27	NA
492	92A082	菜園涌巷 1 號及工廠街 2 號 - 澳門	Travessa do Canal das Hortas n°1 e Rua da Fábrica n°2 - Macau	2015-09-15	NA
493	92A088	柯邦迪前地 12 號及馬車巷 4-4A 號 - 澳門	Praça de Ponte e Horta n° 12 e Travessa dos Tréns nos 4-4A — Macau	2016-12-30	NA
494	92A103	若憲馬路 5 號 - 澳門	Estrada do Visconde de S. Januário n° 5 - Macau	2015-06-10	NA
495	92A116	草堆街 57 號及擔桿里 4-4A 號 - 澳門	Rua das Estalagens n° 57 e Beco da Pinga nos 4-4A - Macau	2016-01-20	2016-01-20
496	92A116	草堆街 57 號及擔桿里 4-4A 號 - 澳門	Rua das Estalagens n° 57 e Beco da Pinga nos 4-4A - Macau	2018-08-29	2018-08-29
497	92A127	青洲河邊馬路 701-741 號 - 澳門	Estrada Marginal da Ilha Verde nos 701-741 - Macau	2016-06-28	NA
498	92A146	位於鄰近高美士街之土地 新口岸填海區—6 街區, C, D 及 E 地段 - 澳門	Terreno junto à Rua de Luis Gonzaga Gomes Zona de Aterros do Porto Exterior (ZAPE)—Quarteirão 6, Lotes "C", "D" e "E" - Macau	2016-03-16	2016-06-28
499	92A149	民國街 95-133 號 - 澳門	Rua da República nos 95-133 - Macau	2016-09-05	NA
500	92A155	位於鄰近殷豐素王前地之土地 - 澳門	Terreno junto à Praça de D. Afonso Henriques - Macau	2016-04-20	NA
501	92A156	白灰街 29 號 - 澳門	Rua da Cal no 29 - Macau	2015-06-30	NA
502	92A182	蕉園圍 13 號 - 澳門	Pátio da Pedra n° 13 - Macau	2016-02-24	NA
503	92A208	通衢街 2 號及位於鄰近通衢街之土地 - 澳門	Rua do Passadiço n° 2 e terreno junto à Rua do Passadiço - Macau	2016-07-25	NA
504	92A211	美副將大馬路 13 號 - 澳門	Avenida do Coronel Mesquita no13 - Macau	2015-06-30	2016-10-31
505	92A238	高樓里 28 號 - 澳門	Beco dos Coulaus n° 28 - Macau	2015-06-10	NA
506	92A242	幻覺圍 4-12 號 - 澳門	Pátio da Ilusão nos 4-12 - Macau	2017-09-27	NA
507	93A009	位於鄰近白頭馬路之土地 - 澳門	Terreno junto à Estrada dos Parses - Macau	2016-02-24	NA
508	93A024	板樟堂巷 3 號 - 澳門	Travessa de S. Domingos n° 3 - Macau	2017-11-29	NA
509	93A033	位於鄰近巴素打爾古街之土地 - 澳門	Terreno junto à Rua do Visconde Paço de Arcos - Macau	2015-08-11	2015-08-11
510	93A033	位於鄰近巴素打爾古街之土地 - 澳門	Terreno junto à Rua do Visconde Paço de Arcos - Macau	2018-12-19	2018-12-19
511	93A060	大堂街 10-10A 號及大堂里 11 號 - 澳門	Rua da Sé nos 10-10A e Beco da Sé no 11 - Macau	2014-10-28	NA
512	93A064	馬大臣街 55 號 - 澳門	Rua de Henrique de Macedo n° 55 - Macau	2015-11-27	NA
513	93A089	位於鄰近咸蝦圍之土地 - 澳門	Terreno junto ao Pátio da Balachão - Macau	2017-09-27	NA
514	93A105	位於鄰近西望洋聖母眺望台之土地 - 澳門	Terreno junto ao Miradouro de Nossa Senhora da Penha - Macau	2016-04-20	NA
515	93A111	約翰四世大馬路 50-56 號及 殷皇子大馬路 33-37 號 - 澳門	Avenida de D.João IV nos 50-56 e Avenida do Infante D.Henrique nos 33-37 - Macau	2018-06-13	2018-07-18

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516	93A124	位於鄰近木橋街及寶塔巷之土地 - 澳門	Terreno junto à Rua do Pagode e Travessa do Pagode - Macau	2015-11-27	NA
517	93A167	位於鄰近永安圍之土地 - 澳門	Terreno junto ao Pátio da Canja - Macau	2018-06-13	NA
518	93A188	關前正街 22, 24 及 26A 號 - 澳門	Rua dos Ervanários nos 22, 24, 26A - Macau	2016-02-24	NA
519	93A203	約翰四世大馬路 16-18 號, 南灣巷 1-9 號及馬統領街 2-30 號 - 澳門	Avenida de D. João IV nos 16-18, Travessa da Praia Grande nos 1-9 e Rua do Comandante Mata e Oliveira nos 2-30 - Macau	2018-10-24	NA
520	94A007	關前正街 10 號及玫瑰里 1 號 - 澳門	Rua dos Ervanários n° 10 e Beco da Rosa n° 1 — Macau	2016-12-30	NA
521	94A032	位於鄰近鏡湖馬路及大纜巷之土地 - 澳門	Terreno junto à Estrada do Repouse e Travessa da Corda - Macau	2015-03-11	2015-10-30
522	94A080	大三巴街 30 號 - 澳門	Rua de S. Paulo n° 30 - Macau	2015-03-27	2015-04-27
523	94A094	罈些喇提督大馬路及青洲大馬路交匯處之土地(治安警察局第二警務警司處) - 澳門	Terreno no cruzamento da Avenida do Almirante Lacerda com a Avenida do Conselheiro Borja (Comissariado Policial no 2 do CPSP) - Macau	2016-06-28	2016-06-28
524	94A094	罈些喇提督大馬路及青洲大馬路交匯處之土地(治安警察局第二警務警司處) - 澳門	Terreno no cruzamento da Avenida do Almirante Lacerda com a Avenida do Conselheiro Borja (Comissariado Policial n°2 do CPSP) - Macau	2018-12-19	2018-12-19
525	94A098	何智英東園 4 號 - 澳門	Pátio Leste de Hó Chi Ieng n° 4 - Macau	2016-04-20	NA
526	94A116	大堂街 9-11 號及羅結地巷 11 號 - 澳門	Rua da Sé nos 9-11 e Travessa do Roquete n° 11 - Macau	2016-04-20	NA
527	94A158	河邊新街 50-54 號 - 澳門	Rua do Almirante Sérgio nos 50-54 - Macau	2017-02-23	NA
528	95A002	位於鄰近高美士街之土地-澳門理工學院 - 澳門	Terreno junto à Rua de Luís Gonzaga Gomes-Instituto Politécnico de Macau - Macau	2017-04-05	NA
529	95A030	西望洋馬路 18-18A 號 - 澳門	Estrada da Penha nos 18-18A - Macau	2017-04-05	NA
530	95A050	爹利仙拿姑娘街 1C, 1D 及 1E 號及位於鄰近爹利仙拿姑娘街之土地 - 澳門	Rua da Madre Terezina nos 1C, 1D e 1E e terreno junto à Rua da Madre Terezina - Macau	2014-09-12	2014-09-12
531	95A050	爹利仙拿姑娘街 1C, 1D 及 1E 號及位於鄰近爹利仙拿姑娘街之土地 - 澳門	Rua da Madre Terezina nos 1C, 1D e 1E e terreno junto à Rua da Madre Terezina - Macau	2017-11-29	2017-11-29
532	95A056	位於鄰近東望洋街之土地 - 澳門	Terreno junto à Rua de Ferreira do Amaral - Macau	2016-02-24	NA
533	95A075	位於鄰近海邊馬路之土地 - 澳門	Terreno junto à Estrada de Cacilhas - Macau	2018-12-19	NA
534	95A092	竹仔室斜巷 14-16 號 - 澳門	Calçada das Chácaras nos 14-16 - Macau	2016-07-25	NA
535	95A111	位於鄰近林茂海邊大馬路之土地-A 地段 - 澳門	Terreno junto à Avenida Marginal do Lam Mau - Lote A - Macau	2016-12-30	NA
536	95A127	太平里 3 號-澳門	Beco do Canto n° 3- Macau	2014-08-01	NA
537	96A004	連丁里 7 號 - 澳門	Beco da Carpideira n° 7 - Macau	2018-06-13	NA
538	96A013	位於鄰近青洲河邊馬路之土地 - 澳門	Terreno junto à Estrada Marginal da Ilha Verde - Macau	2016-10-31	NA
539	96A018	大關斜巷 6 號及俊秀圍 1 - 3 號 - 澳門	Calçada do Amparo no 6 e Pátio de Chôn Sau nos 1 - 3 - Macau	2015-08-11	NA
540	96A023	位於鄰近虔信街之土地 - 望廈墳場 - 澳門	Terreno junto à Rua da Piedade – Cemitério de Nossa Sra. da Piedade, Macau	2014-12-12	NA
541	96A050	位於鄰近何賢紳士大馬路之土地（澳北變電站） - 澳門	Terreno junto à Avenida do Comendador Ho Yin (Subestação Macau Norte) - Macau	2016-02-24	NA
542	96A058	位於鄰近劏狗環巷及菜園巷之土地 - 澳門	Terreno junto à Travessa da Praia e Travessa das Hortas - Macau	2017-02-23	NA

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543	96A069	三層樓上街 2-2B 號 - 澳門	Rua do Barão nos 2-2B - Macau	2015-05-26	2015-05-26
544	96A069	三層樓上街 2-2B 號及位於鄰近三層樓上街之土地 - 澳門	Rua do Barão nos 2-2B e terreno junto à Rua do Barão - Macau	2018-01-24	2018-01-24
545	96A073	公局新市西街 24 號 - 澳門	Rua Oeste do Mercado de S. Domingos nº24 - Macau	2015-05-12	2015-05-12
546	96A073	公局新市西街 24 號 - 澳門	Rua Oeste do Mercado de S. Domingos nº 24 - Macau	2018-10-24	2018-10-24
547	96A083	賣魚巷 16-20 號 - 澳門	Travessa do Alpendre nos 16-20 - Macau	2015-09-15	NA
548	97A009	馬揸度博士大馬路 228-308 號及圓台巷 90-144 號 - 澳門	Avenida do Dr. Francisco Vieira Machado nos 228-308 e Travessa da Doca dos Holandeses nos 90-144 - Macau	2016-05-10	NA
549	97A013	福隆里 3 號 - 澳門	Beco das Galinhas nº 3 - Macau	2016-02-24	NA
550	97A022	黑沙環馬路 1A 號 - 澳門	Estrada da Areia Preta nº 1A - Macau	2015-09-15	NA
551	97A023	田螺石級 3-5 號、小山石級 5 號及位於鄰近田螺石級之土地 - 澳門	Escada do Caracol nos3-5,Escada do Muro nº5 e terreno junto à Escada do Caracol - Macau	2014-11-13	NA
552	97A025	新維里 24-26A 號 - 澳門	Beco do Cisne nos24-26A - Macau	2017-07-26	NA
553	97A028	風順堂街 14C-16 號，咩路馬揸度街 7 號，高樓街 1 號及和平斜巷 3-3C 號 - 澳門	Rua de S. Lourenço nos 14C-16, Rua de Álvaro de Melo Machado nº 7, Rua do Padre António nº 1 e Calçada da Paz nos 3-3C - Macau	2016-03-16	2016-04-20
554	97A062	巴素打爾古街 161-177 號及通商新街 67-75 號 - 澳門	Rua do Visconde Paço de Arcos nos 161-177 e Rua Nova do Comércio nos 67-75 - Macau	2015-03-27	2015-04-27
555	97A065	爹美刁施拿地大馬路 23 - 28 號 - 澳門	Avenida de Demétrio Cinatti nos 23 - 28 - Macau	2015-08-11	NA
556	97A069	土庫圍 5-23 號 - 澳門	Pátio do Godão nos 5-23 - Macau	2016-03-16	NA
557	97A076	羅理基博士大馬路 367 號 - 澳門	Avenida do Dr. Rodrigo Rodrigues nº 367 - Macau	2016-09-05	NA
558	98A015	位於鄰近林茂海邊大馬路之土地-F 地段 - 澳門	Terreno junto à Avenida Marginal do Lam Mau - Lote F - Macau	2016-12-30	NA
559	98A023	連勝馬路 38A 號 - 澳門	Estrada de Coelho do Amaral nº 38A - Macau	2017-11-29	NA
560	98A033	位於鄰近罈些喇提督大馬路及美副將大馬路之土地 - 澳門	Terreno junto à Avenida do Almirante Lacerda e Avenida do Coronel Mesquita - Macau	2018-01-24	NA
561	99A007	河邊新街 19A-21 號及陳樂巷 1-1A 號 - 澳門	Rua do Almirante Sérgio nos 19A-21 e Travessa de Chan Loc nos 1-1A - Macau	2014-11-27	NA
562	99A027	位於鄰近羅馬街及冼星海大馬路之土地 - 外港新填海區 23(A1/E)地段 - 澳門	Terreno junto à Rua de Roma e Avenida Xian Xing Hai , Novos Aterros do Porto Exterior (NAPE) - Lote 23(A1/E) - Macau	2015-07-29	NA