Melbourne 2050: Scenario Planning for 20-minute Neighbourhoods

Stella Felicia Sinaga (Monash University) and Md Kamruzzaman (Monash University)

Introduction

Urban land-use and transportation policies worldwide are struggling to find ways to reduce automobile dependence and encourage the use of more sustainable travel modes such as walking, cycling, and public transportation – collectively referred to as active transport (Alfonsin et al., 2019). Recently, the 20-minute neighbourhood concept is advocated as a key urban development strategy in Australia to encourage residents to access most of their daily needs through active transport (DELWP, 2019).

However, little understanding exists about the effectiveness of 20-minute neighbourhoods in promoting active transport. More importantly, if this concept is proven to be effective, policy guidance is currently lacking; beyond some case studies such as in Croydon South, Strathmore, and Sunshine West; on how to plan for a city of 20-minute neighbourhoods. The literature also lacks a methodological framework to guide the selection of location and design characteristics (density, land use pattern) of a 20-minute neighbourhood that fit for a specific context.

The present study intends to fill this gap by developing neighbourhood typologies and performing a scenario-based approach to identify the types of 20-minute neighbourhoods that can increase walking propensity.

Literature Review

Development of neighbourhood typologies have been applied in various contexts e.g., transit-oriented development (Kamruzzaman et al., 2014; Kumar, 2020), yet little research exists classifying 20-minute neighbourhoods. Existing studies have developed typologies based on various built environment indicators, such as employment density, residential density, land use diversity, intersection density, cul-de-sac density, and public transportation accessibility – often referred to as the 5Ds (Ewing and Cervero, 2010).

Deilami and Kamruzzaman (2017) highlighted that scenario planning methods can assess the potential effect of a planning proposal including the various types of 20-minute neighbourhoods. As an example, Hickman and Banister (2007) developed alternative planning scenarios using the back casting method and evaluated their effectiveness to reach a 60% CO_2 reduction target by 2030 in the UK transport sector.

Data and Methods

This study was conducted in the context of Greater Melbourne (see Figure 1). Melbourne plans to be a city of 20-minute neighbourhoods (DELWP, 2017). The study assessed the 309 suburbs of Melbourne to identify their potential for a 20-minute neighbourhood by classifying them into various types.

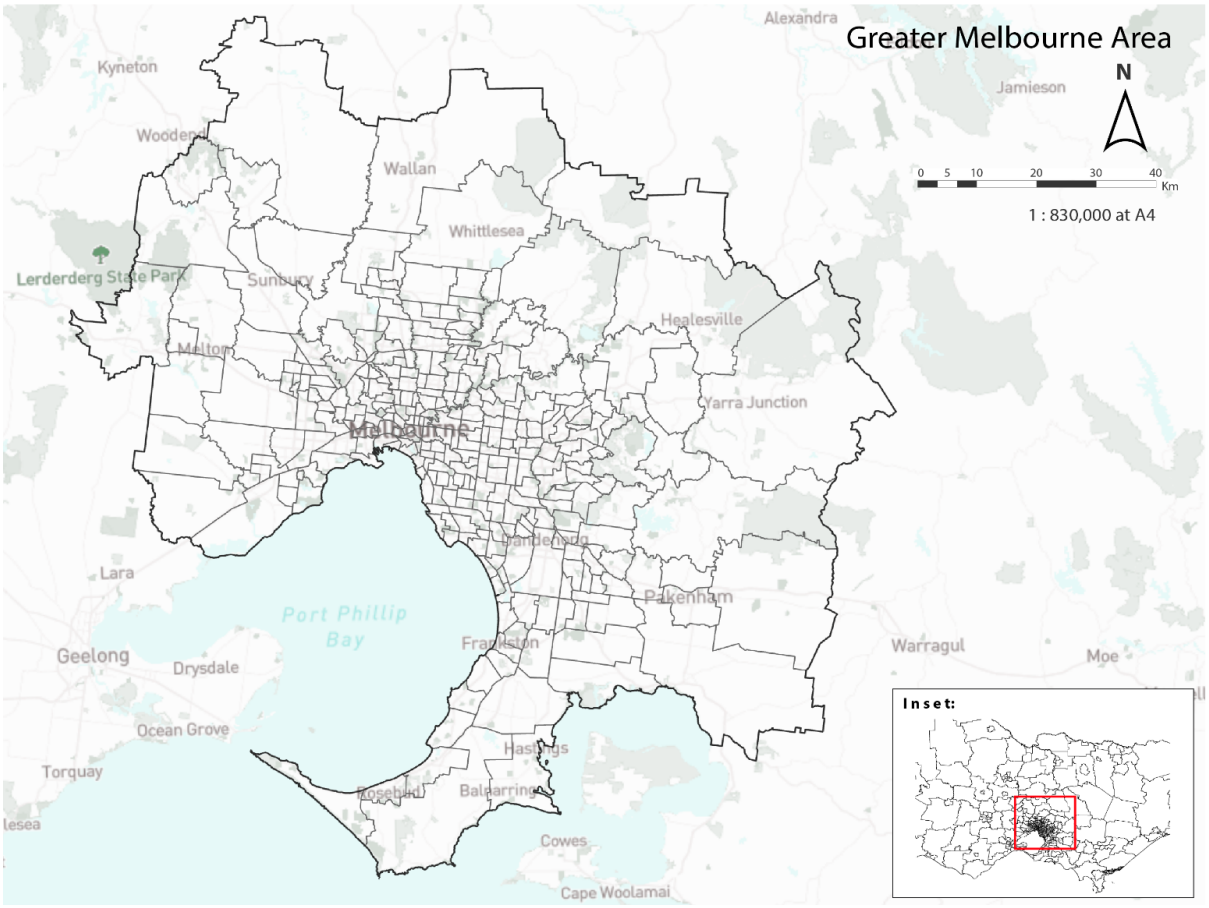

Figure 1: Greater Melbourne Area (Source: Authors)

The classification was made using the Two-Step Cluster analysis technique (Kamruzzaman et al., 2014) and based on six built environment characteristics of the suburbs (different types of opportunities located within the suburbs where activities can be performed on foot, concentration of the opportunities, directional distribution of the opportunities, residential density, intersection density, and cul-de-sac density).

The walking behaviour of people living within these different types of suburbs was then examined using the VISTA data by estimated three linear regression models for three different walking outcomes: a) percent of trips made on foot to different destinations; b) average commuting distance on foot; and c) average commuting time on foot.

These outcomes were regressed on the neighbourhood typologies and a range of controlling factors (built environment indicators, socio-demographics of the suburbs).

The estimated models were then used to assess the impacts of alternative urban growth management scenarios.

The study designed four urban growth scenarios: existing condition, business as usual (BAU), standard 20-minute neighbourhoods, and optimistic 20-minute neighbourhoods. The characteristics of the scenarios are outlined in Table 1. The first scenario is the result of the two-step cluster analysis showing the current neighbourhood typologies of Greater Melbourne. Under the BAU scenario, urban growth is assumed to follow the current trend without specific or additional interventions. Urban growth trend over the last two decades were identified and interpolated for the future in this scenario. The last two scenarios are based on the 20-minute neighbourhood principles. Standard and optimistic versions differ in dwelling density, number of destinations, and the number of suburban areas that were converted into typologies that have better walkability (Table 1).

Table 1. Brief characteristics and assumptions of the scenarios (Source: Authors)

Typologies	Assumptions	Existing condition	Business as usual	20-minute neighbourhoods (standard)	20-minute neighbourhoods (optimistic)
1	NDD	The result of natural groupings	100	130	150
	Des 800		9	12	13
2	NDD		13	25	30
	Des 800		6	9	12
3	NDD		12	16	18
	Des 800		6	8	9
4	NDD		8	10	9
	Des 800		5	6	6
5	NDD		3	3	3
	Des 800		2	3	2

*NDD: Net Dwelling Density (Dwellings/Hectare); Des 800: Destinations within 800 metres (Destinations)

Results

1. Neighbourhood typologies in Melbourne

The cluster analysis resulted in five unique clusters. The spatial distribution of the clusters within Greater Melbourne is shown in Figure 2 and the interpretation of the clusters is presented in Table 2 with examples from Greater Melbourne suburbs.

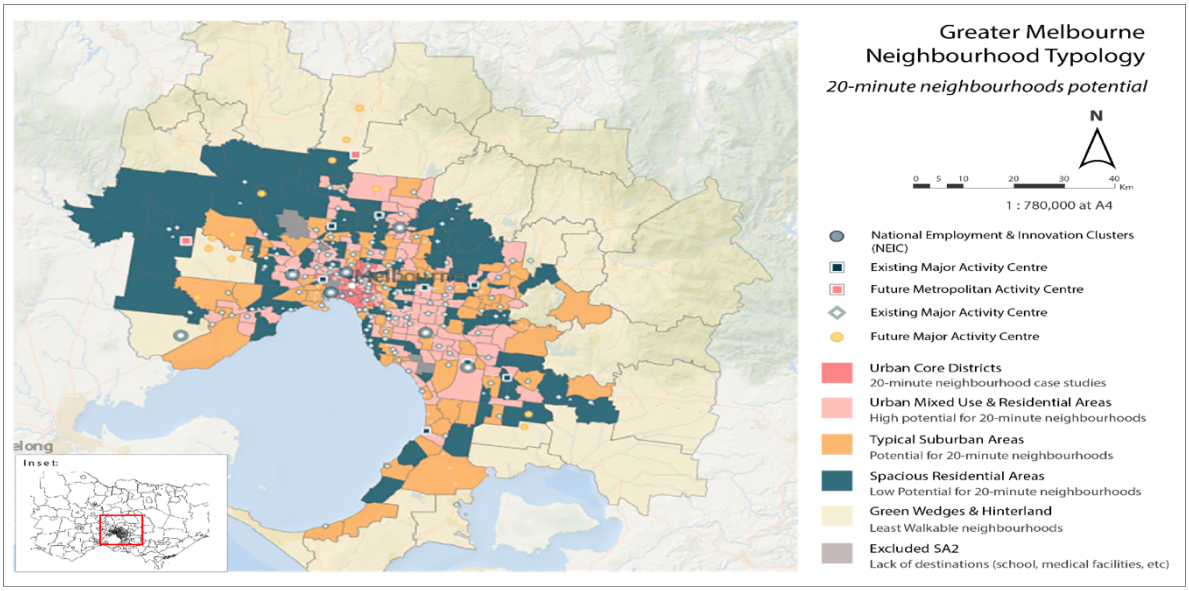

Figure 2: Neighbourhood clusters in Melbourne

Neighbourhood Typology	Urban Core District	Urban Mixed Use & Residential Area	Typical Suburban Area	Spacious Residential Area	Hinterlands & Green Wedge
Brief description	Suburban areas that have proper arrangement to make 20-minute living more convenient	Medium to high density urban areas that have relatively compact destinations	Sprawling residential areas with relatively dispersed opportunities	Single family homes of upscale quality. Opportunities are spread out in the vicinity of automobile-oriented streets	Dominated by green space and productive land with minor urban uses
Number of neighbourhoods	17	106	77	70	17
Some SA2s under this class	East Melbourne, Richmond, Southbank, Port Melbourne, South Yarra	Carnegie, Essendon – Aberfeldie, Coburg North, Braybrook	Doncaster, Altona North, Glenroy, Kew, Coburg	Brighton, Glen Iris – East, Box Hill North, Hawthorn East, Melton	Whittlesea, Gisborne, Flinders, Yarra Valley, Lilydale - Coldstream
Aerial view of the sample area	Southbank 	Essendon – Aberfeldie 	Doncaster 	Brighton 	Whittlesea 
On the Ground	Southbank 	Essendon – Aberfeldie 	Doncaster 	Brighton 	Whittlesea 
Average population densities (Person/Ha)	65.5	25.23	21.06	14.9	0.63
Net Dwelling Density (Dwelling/Ha)	Average: 92.6 Maximum: 721.5	Average: 13.8 Maximum: 121.46	Average: 11.9 Maximum: 36.3	Average: 8.9 Maximum: 29.18	Average: 3.2 Maximum: 19.6
Intersection density (intersection/SqKm)	186.70	41.33	38.06	28.75	3.74
Cul de sac density (cul de sac/SqKm)	36.18	17.98	12.59	9.43	2.70
Level of opportunity compactness	Very high	High	Medium	Low	Very low
Opportunities linearity level	4 out of 5	3 out of 5	Least linear (5 out of 5)	The best linearity (1 out of 5)	Good (2 out of 5)

Table 2: Examples of the 20-Minute City from Greater Melbourne Suburbs

2. Impacts of the neighbourhood typologies on walking outcomes

Table 3 outlines the walking behaviour of people living in the five types of neighbourhoods in Melbourne under the optimistic scenario. Regression analysis results show that people in the urban core districts are 162% more likely to make

walking trip compared to people in mixed use areas. The average walking distance and walking time of people in the urban core are also significantly higher than those live in the mixed-use areas. People living in other three areas were less likely to make a walking trip, and their walking distances and times were also significantly shorter.

Table 2. The results obtained from the three regression models (Source: Authors)

Neighbourhood typologies	Descriptive statistics						Regression analysis results: % increase/decrease compared to the reference category					
	% Of walking trips		Average walking distance (meters)		Average walking time (minutes)		Walking trips		Average walking distance		Average walking time	
	A	B	A	B	A	B	A	B	A	B	A	B
Urban Core Districts	36.11	36.10	1,188	1,500	15.5	17.76	176	161.59	68.5	61.99	57.68	53.10
Urban Mixed use & residential areas	13.01	13.8	705	926	9.83	11.60	Reference Category					
Typical suburban areas	13.50	12.99	752	952	10.75	12.45	3.77	-5.87	6.67	2.80	9.36	7.3
Spacious residential areas	13.14	12.92	759	801	10.60	11.17	0.99	-6.38	7.11	-13.50	7.83	-3.70
Green wedges & Hinterlands	9.7	9.8	449	448	9.30	9.22	-25.44	-28.99	-36.31	-51.62	-5.39	-20.52
Overall	**14.6**	**15.4**	**740**	**930**	**10.57**	**12.08**						

A: Existing Condition; B: Optimistic 20-minute Neighbourhoods Scenario

3. Impacts of the neighbourhood planning scenarios on walking outcomes

The evaluation results show that under the optimistic 20-minute scenario people in Greater Melbourne would make 15.4% of the trips on foot (Figure 4) compared to current average of 14.6% (Table 2). Optimistic scenario would not only enable more walking trips, but their average walking distance would increase from 740 metres (current Melbourne average) to 930 meters.

Figure 3. The walking outcomes of optimistic 20-minute neighbourhood scenario (Source: Authors)

Conclusion

The findings suggest that Melbourne can create a network of walkable suburban areas by implementing a more optimistic or progressive approach to the 20-minute neighbourhood scenario. It suggests that if suburban areas are redesigned following the 20-minute principles, more people may choose to walk as their primary mode of transport to perform most of their daily needs. In addition to an increase in total

walking distance, the findings indicate that people are more inclined to walk further and longer in suburban areas with a 20-minute neighbourhood character.

References

Alfonsin, N., McLeod, V., Loder, A. and DiPietro, L., 2019. Evaluating a buildings' impact on active transportation: An interdisciplinary approach. *Building and Environment*, 163, p.106322.

Deilami, K. and Kamruzzaman, M., 2017. Modelling the urban heat island effect of smart growth policy scenarios in Brisbane. *Land Use Policy*, 64, pp.38-55.

Department of Environmental, Land, Water, and Planning, 2017. *Plan Melbourne 2017 - 2050*. Melbourne: Victoria State Government.

Department of Environmental, Land, Water, and Planning, 2019. *20-Minute Neighbourhoods: Creating a more liveable Melbourne*. Melbourne: Victoria State Government.

Ewing, R. and Cervero, R., 2010. Travel and the Built Environment. *Journal of the American Planning Association*, 76(3), pp.265-294.

Hickman, R. and Banister, D., 2007. Looking over the horizon: Transport and reduced CO2 emissions in the UK by 2030. *Transport Policy*, 14(5), pp.377-387

Kamruzzaman, M., Baker, D., Washington, S. and Turrell, G., 2014. Advance transitoriented development typology: case study in Brisbane, Australia. *Jl of Transport Geogy*, 34, pp.54-70.

Phani Kumar, P., Ravi Sekhar, C. and Parida, M., 2020. Identification of neighborhood typology for potential transit-oriented development. *Transportation Research Part D: Transport and Environment*, 78, p.102186.