

Analysis of local walkability in Wellington

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Introduction

“Reducing car reliance and encouraging more transport-related physical activity are now recognised as beneficial objectives from health, social and environmental perspectives. Evidence is accumulating that a number of built environment attributes are associated with the likelihood of residents using active transport.

Valid and reliable measures of these urban attributes are critical for improving our understanding of the relationship between the built environment and transport mode use.”

Measuring neighbourhood walkability in NZ cities [1]

What is the influence of the Wellington's hilly topography on walkability?
How does walkability vary across the city's neighbourhoods (suburbs)?



Local Walkability

Every playground in the city has a catchment area. The council has designed playgrounds with a 600 m catchment [4]. Homes within 600 m of a council playground are considered to be within 10 mins walking time. But, speeds vary by gradient!

The effect of hill gradients on travel time can be seen in the different catchment areas between playgrounds on flat ground vs. hills: Lyall Bay Beach Youth Centre Play Area (on flat ground) and Montgomery Avenue Play Area (at an elevation of 260 m). While it takes longer to walk in hilly areas, travel times are also made worse by longer and windier streets.

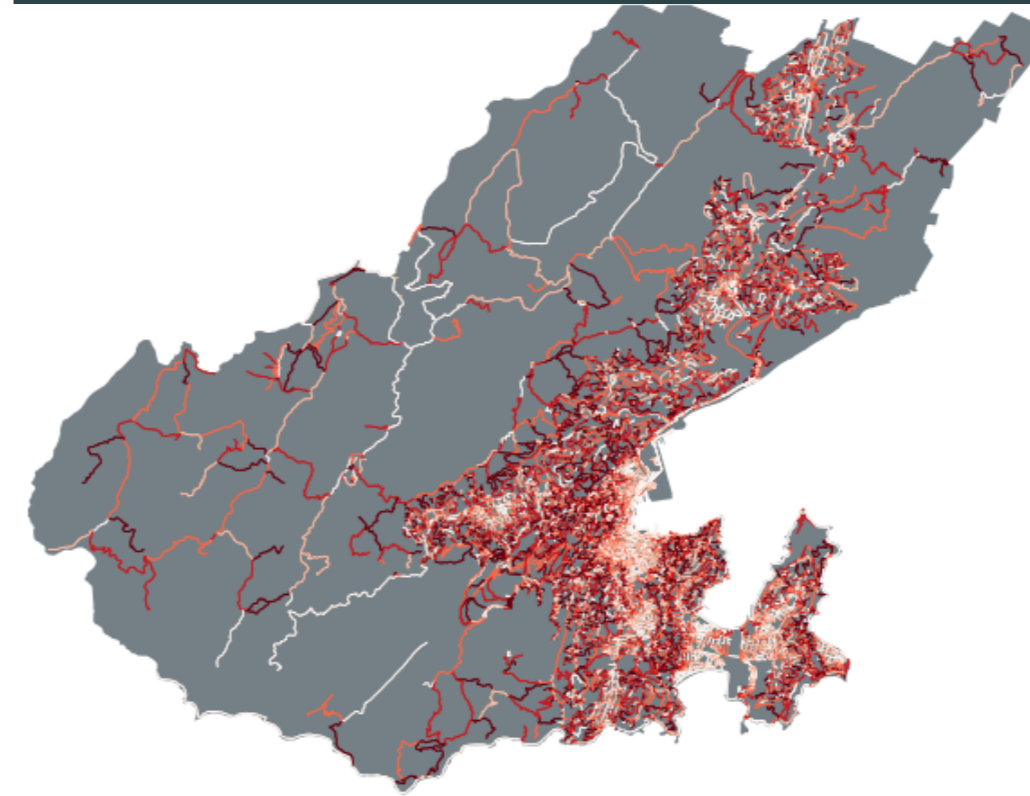
Playground on flat

Playground on hill



Hilly Wellington

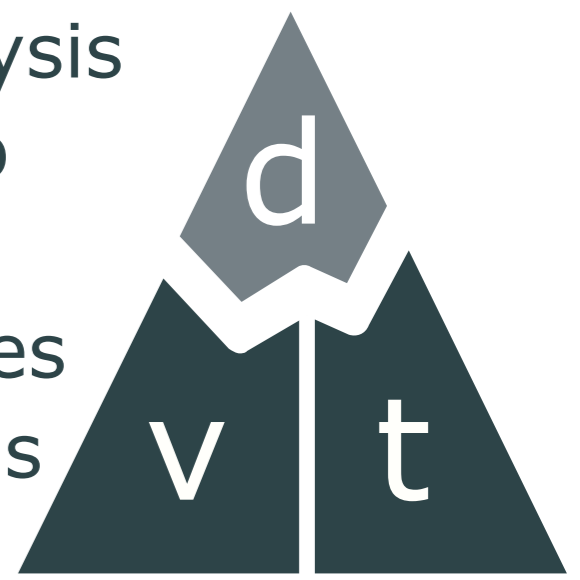
Street steepness (°)



Source: OpenStreetMap street network elevation from Google Elevation API

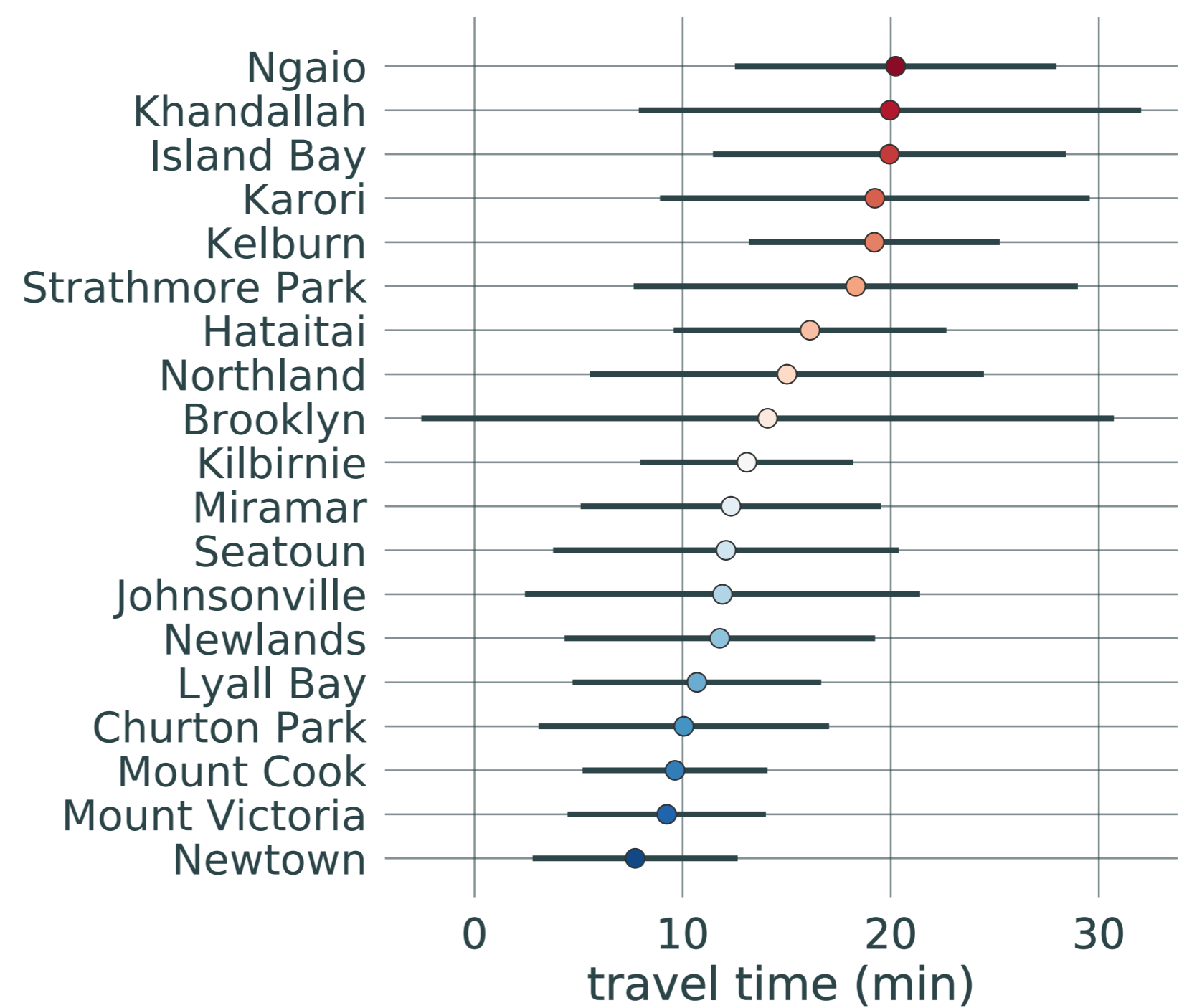
47% of residential Wellington is 100 m above sea level. Half of residential Wellington streets are steeper than a comfortable gradient of 3°. Streets above 100 m are steeper: 5° on average.

Accounting for hills in a walkability analysis requires conversion from distance (d) to travel time (t) via real-world walking speeds (v). Tobler's function [2] manages this but underestimates time since it was formulated for hikers.



An operational analysis of walkability should use real world walking speeds from crowd-sourced or survey samples. An example analysis by Chris Brunson [3] using Strava data has shown that real speeds can be quite different to Tobler's.

Modelling walkability



A complete analysis of local walkability can be done by calculating total walk time to the nearest playground from every node in the street network [5]. These values can be assigned to suburbs using a geospatial mask of suburb boundaries.

Walking times can now be modelled by suburb with an appropriate statistical model [6]. Modelled mean and standard deviation of walking times show significant variation across suburbs with worst walkability for suburbs on the hills.

References

- [1] Measuring neighbourhood walkability in NZ cities, Knowledge Auckland
- [2] https://en.wikipedia.org/wiki/Tobler%27s_hiking_function
- [3] <https://rpubs.com/chrisbrunson/hiking>
- [4] Wellington Play Spaces Policy (2017), Wellington City Council

- [5] <https://github.com/UDST/pandana>
- [6] <https://shriv.github.io/Modelling-accessibility-by-suburb/>

Image: Walk by Bakunetsu Kaito from the Noun Project
Image: hills by Vectors Market from the Noun Project