A "Bikeability" Planning Tool:
Using research to guide urban design strategies for active travel

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Background

The built environment – the urban form in which we live, work, and commute – has been found to correlate with travel behavior and physical activity. To date, research has focused on walking or general physical activity. Walkability and sprawl indices have been useful in predicting physical inactivity, obesity, air pollution, and chronic disease.

Compared with walking, cycling allows for faster travel and longer trips distances, and may be a more desirable mode substitute for car trips. At present cycling rates in Canadian cities are low compared to certain European cities (2% modal share, compared with 15-30%), a disparity explained in part by differences in urban form and cycling infrastructure. These trends suggest that changes to our urban design may create environments more suitable for cycling.

What is "bikeability"?

There has been little effort to use existing data and knowledge to define and map "bikeability" as an approach to promote cycling as a form of active transportation. There are likely important differences between walkability and bikeability. For example, whereas sidewalks may be important to walking, bicycle facilities and flat terrain are key factors for cyclists. Given that determinants of walking and cycling are different, and that cycling potentially reaches a different target market, new metrics are needed.
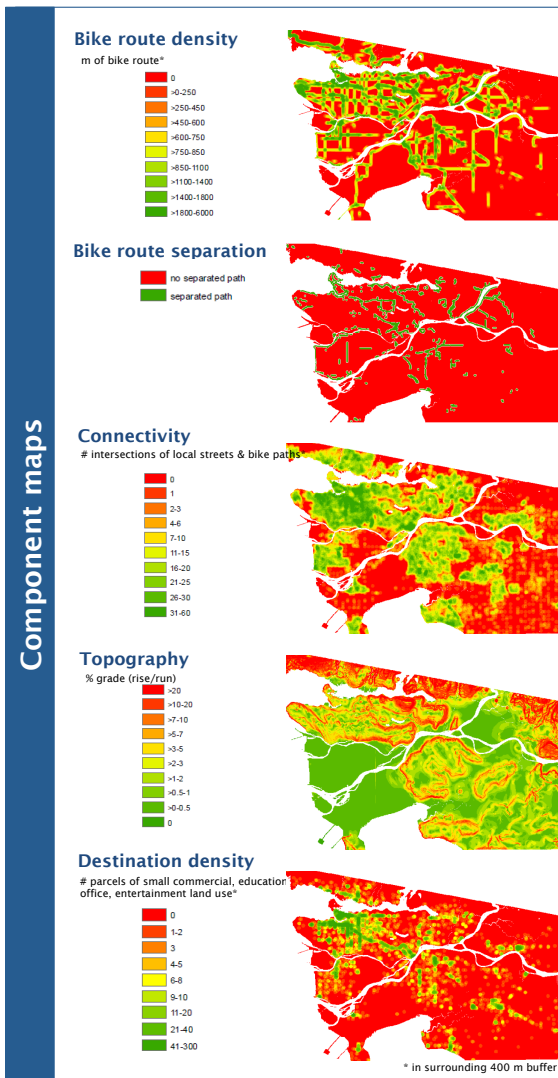
To define our bikeability index we relied on empirical data from the Cycling in Cities opinion survey, focus groups, travel behavior data, and insights from walkability research.

Our goal was to build a flexible planning tool to identify areas that are more and less conducive to cycling.

Findings

The bikeability index was comprised of five factors that consistently influenced cycling: **bicycle facility availability; bicycle facility quality; street connectivity; topography; and land use**. We used GIS to integrate data layers for these metrics to produce a high-resolution bikeability surface, applied to Metro Vancouver as a case study. Green depicts bike-friendly areas and red depicts areas where cycling conditions need to be improved.

An evaluation of the scores for individual component layers can guide strategies to improve biking conditions. For example, certain areas in the region have high scores for topography (i.e., no hills), and a reasonably high density of shops and other destinations, but score low in terms of the density of bicycle facilities. Such areas could be prioritized for new bicycle routes in order to promote bicycle travel. The bikeability surface can also be aggregated to provide average scores for individual cities, neighbourhoods, or travel routes (see handouts).

Component maps

Bike route density
m of bike route*

- 0
- >0-250
- >250-450
- >450-600
- >600-750
- >750-850
- >850-1100
- >1100-1400
- >1400-1800
- >1800-6000

Bike route separation

- no separated path
- separated path

Connectivity
intersections of local streets & bike paths

- 0
- 1
- 2-3
- 4-6
- 7-10
- 11-15
- 16-20
- 21-25
- 26-30
- 31-60

Topography
% grade (rise/run)

- >20
- >10-20
- >7-10
- >5-7
- >3-5
- >2-3
- >1-2
- >0.5-1
- >0-0.5
- 0

Destination density
parcels of small commercial, education, office, entertainment land use*

- 0
- 1-2
- 3
- 4-5
- 6-8
- 9-10
- 11-20
- 21-40
- 41-300

* in surrounding 400 m buffer

Bikeability index

Bikeability = Bicycle route density + Bicycle route separation + Connectivity + Topography + Destination density

Low bikeability
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
High bikeability
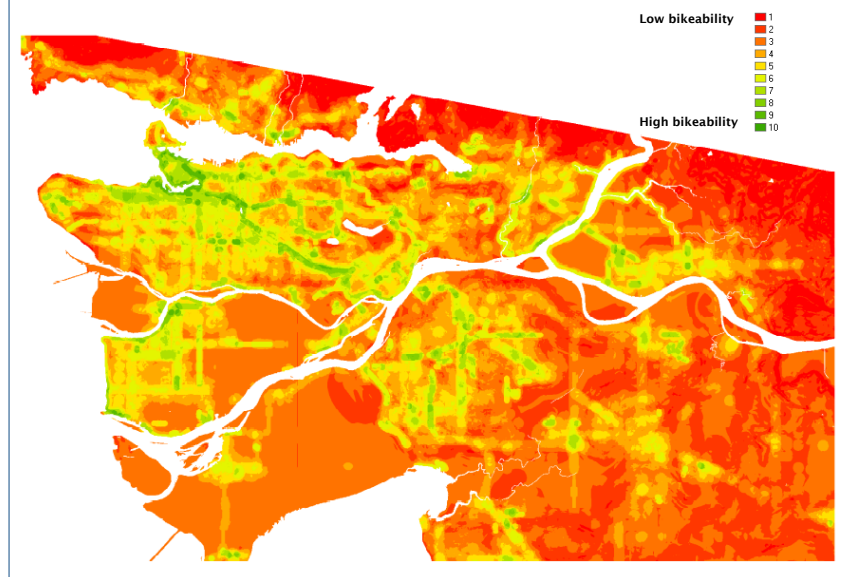
Policy implications & Future directions

Mapping bikeability provides a powerful visual aid to identify zones that need improvement to support healthy travel choices. This is an evidence-based tool that presents data in a user-friendly way for planners and policy makers. The overall bikeability score and its five component scores can guide local action to stimulate changes in cycling rates.

Key strengths:
- based on empirical evidence about factors influencing cycling
- generated as a surface, allowing for scaleability and study-specific aggregation (see handouts)
- used widely available data types facilitating easy application in other cities
- has flexible parameters and weighting scheme that enables users to tailor it to evidence about local preferences and conditions

The next step is to create the tool for major cities across Canada, relying on open data sources where possible,. We will also develop an interactive web interface where users can explore the impact of changes to weighting schemes, and assess how changes to the built environment can influence bikeability.

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