The Canadian Cycling Network Database: Metadata Report

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Table of contents

Executive summary

The Canadian Cycling Network Database compiles cycling infrastructure data from 75 municipal open data sources. This dataset classifies cycling infrastructure across municipalities using the Canadian Bicycle Infrastructure Classification System (Can-BICS). This report presents the methodology used to produce the dataset, key results, insights, and limitations.

The Canadian Cycling Network Database release includes:

- A geospatial dataset representing the cycle network across 75 municipalities (GPKG)
- A summary table indicating the length of cycle infrastructure in each municipality (CSV)
- A dictionary mapping municipal infrastructure classifications to Can-BICS (CSV)
- A data sources metadata file (CSV)
- A column definition metadata file (CSV)

Across the 75 municipalities, 18,700 km of cycling infrastructure was classified, with 12,407 km meeting criteria for Can-BICS cycle infrastructure types. The date of publication for 70 % of municipalities was 2024 or 2023, with the remaining datasets published between 2018 to 2022.

The total lengths of each Can-BICS type are summarized in Table 1. The municipalities with the most high-comfort infrastructure were Montréal (360 km), Vancouver (246 km), Edmonton (226 km) and Québec (190 km). A full breakdown of length per municipality for each Can-BICS category is given in the comparison table CSV file included in the release folder.

Table 1. Length and proportion of Can-BICS cycling infrastructure types.

Can-BICS type	Comfort-safety level	Length (km)	Proportion (%)
Cycle track	High	1,090	6
Local street bikeway	High	636	3
Bike path	High	683	4
Multi-use path	Medium	5,088	27
Painted bike lane	Low	4,910	26
Gravel trail	Non-conforming	643	3
Shared roadway	Non-conforming	3,819	20
Major shared roadway	Non-conforming	1,831	10
Total high comfort	**...**	**2,409**	**13**
Total	**...**	**18,700**	**100**

1. Introduction

Purpose

The Canadian Cycling Network Database dataset provides an updated view of cycling infrastructure across Canada, compiling data from 75 municipalities and applying the Canadian Bicycle Infrastructure Classification System (CAN-BICS). The dataset facilitates analysis of Canada's cycle network over time and supports evidence-based decision-making on active transportation infrastructure.

Background

Can-BICS framework

The Can-BICS framework was developed in 2019 through a partnership between Dr. Meghan Winters' CHATR Lab at Simon Fraser University and the Public Health Agency of Canada (PHAC) to classify cycle infrastructure in Canada. Can-BICS classifications were established through a review of national transportation engineering design guides, as well as from public health literature focusing on the user perspective of comfort and safety. Feedback from public health and engineering experts was incorporated into the final classification.

Can-BICS standardizes cycling infrastructure into eight bikeway types and three comfort-safety levels (shown in Table 2). High comfort bikeways are considered comfortable and safe for most people, and include cycle tracks, off-road paved bike paths, and local street bikeways. Medium comfort bikeways include multi-use paths shared by cyclists and pedestrians. Low comfort bikeways are considered high stress routes and include painted bike lanes along busy roads. Bikeways that are not classified in Can-BICS but were classified in the dataset include shared roads (including sharrows) and gravel paths.

Other Canadian bikeway datasets

As part of the initial work on Can-BICS, PHAC classified cycling infrastructure from 26 cities using municipal open data in 2019, establishing a baseline for future analysis[1]. By expanding the geographic scope and incorporating updated data, this project aims to support longitudinal analyses of municipal cycle networks over time.

Subsequent work by Dr. Winter's CHATR Lab in 2022[2] and 2024[3] applied the Can-BICS classification to OpenStreetMap data. The authors found approximately 23,000 km of bicycle infrastructure across Canada that met Can-BICS standards. The OSM data was found to provide broader coverage across Canada. However, municipal datasets remain important source for the latest data reported by municipalities and for measuring infrastructure changes over time.

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[1] Measuring Bicycling Infrastructure Across Canada
[2] Can-BICS National Data - Overview
[3] Can-BICS metric dataset (2024), developed by Colin Ferster and Meghan Winters (Cities Health & Active Transportation Research Lab (CHATR lab))

Table 2. Description of Can-BICS Categories[4].

Facility	Description
High-comfort bikeways: Comfortable for most people	
Cycle Track	A roadway lane exclusively for cyclists and physically separated from both motor vehicles and the sidewalk. Separation from motor vehicle traffic must include a vertical barrier (e.g., a raised median; bollards; box planters; or trees and landscaping). Separation from the sidewalk may include street furniture, a curb, or landscaped buffer. Facility may be at the roadway level, sidewalk level, or between the two.
Local Street Bikeway	A local street (no centre line or lanes) where cyclists share the roadway with motor vehicles. Traffic calming elements limit motor vehicle speeds and volumes and inhibit their through travel. Bicycle priority measures facilitate cyclists' safe crossing of streets and limit stops and delays. The facility includes measures to improve cyclist comfort: smooth surfaces; street lighting; wayfinding signage and pavement markings; and consistent paving material and colour.
Bike Path	An off-road paved path exclusively for cyclists located along independent corridors away from a road. May be one-way or two-way with a centre line. Often adjacent to a walking path and separated by a painted line, curb, or landscaped buffer.
Medium-comfort bikeways: Comfortable for some people	
Multi-use path	A two-way paved path shared by cyclists, pedestrians, and other users (e.g., skateboarders and rollerbladers). May be located along independent corridors away from a road or next to a roadway and physically segregated from motor vehicles (replacing a sidewalk).
Low-comfort bikeways: Comfortable for few people	
Painted bike lane	A painted lane along a busy roadway that is designated by bicycle and diamond pavement markings and signs as exclusively for cyclists. The lane is positioned between a vehicle travel lane and the curb. May be unbuffered or buffered using diagonal or chevron hatching. Includes both advisory bike lanes (marked by broken lane lines) on the edge of roadways too narrow to provide exclusive cycling and driving spaces and bicycle accessible paved shoulders (indicated by an edge line and bike route signs or stencil markings) on roads without a curb.
Not conforming bikeways: unclassified in Can-BICS	
Major street shared lane	A major street lane shared by people cycling and driving in side-by-side or in-line (i.e., single file) operations. Bicycle route signage or pavement markings (e.g., sharrows) notify motorists that cyclists may be present and guide their lateral positioning within the lane.
Local street shared lane	A local street shared roadway with bicycle route wayfinding signage or roadway pavement markings. The street lacks traffic calming, and diversionary elements needed to minimise motor traffic volumes and speeds or bicycle-friendly crossing treatments at major streets.
Gravel path	An unpaved trail for walking, cycling, and limited rolling. Trail is surfaced in gravel, dirt, woodchips, or other aggregate. Includes hiking and mountain biking trails, informal desire paths, and sidewalks (including paved) where cycling is permitted.

2. Data collection and processing

Data sources

Over 170 open data portals and municipal websites within Canada were assessed for cycle network data. The initial search was conducted using a list of the 100 largest cities in Canada by population and then expanded to include lower population cities and towns. Municipalities with cycling facility data in geospatial formats were included, whereas cycle network information contained in static images or PDF files were not included. Data were collected between November 2023 and February 2024. The date of publication for the datasets ranged between 2018 and 2024. Further details on the data sources can be found in the accompanying data sources CSV included in the release folder.

Infrastructure classification using Can-BICS

Reclassifying the data using Can-BICS involved interpretation of each provider's individual naming conventions and verifying them where possible using Google Street View. This was a manually intensive process to interpret the nuances of each individual municipality's cycling infrastructure definitions.

In total, there were 317 different names used to describe bikeway types across municipalities, which were condensed down into eight Can-BICS infrastructure categories as given in Table 2. The full dictionary converting municipal names to Can-BICS names is available in the data dictionary CSV included in the release folder.

Once the initial classification of the cycling infrastructure was completed based on naming and written descriptions alone, route segments for each municipality were manually inspected using Google Street View and satellite imagery across several locations to verify the Can-BICS categorizations. For each inspection, if a Street View image was found that was more recent than the date of data publication, it was used to verify the Can-BICS designation. In each such case, a link to the Street View URL was added to the data dictionary CSV file to support future reviews of the data. In total, Street View links were found for 358/514 segments. This classification validation helped to ensure that cycling infrastructure was classified in line with Can-BICS definitions.

Data classification was not perfect, and some known issues are presented in Section 4 Limitations.

Data processing

Filtering

Basic filtering was carried out using the classification columns and status columns where available from the data sources. Non-bikeway infrastructure such as pedestrian-only pathways were

[4] **Source**: Can-BICS Classification System: Supplementary Guidance, available at: https://chatrlab.ca/projects/

removed, as well as decommissioned or future proposed infrastructure. Similarly, blank rows and duplicated data were dropped.

Assigning spatial regions
The data was spatially assigned to a Census subdivision (CSD) and Census metropolitan area (CMA) from the 2021 Census geographies using the midpoint of each route segment. CSDs are municipalities or areas designated as the equivalent to municipalities for statistical purposes.

Calculating route distances and geographic projection
To calculate the distances along each route segment, the centroid of each segment was used to determine the appropriate Universal Transverse Mercator (UTM) projection. Distances along each segment were then calculated after converting each segment to its appropriate UTM projection. After the calculation, the data was projected back to NAD83 / Statistics Canada Lambert coordinate reference system (CRS).

Cleaning
Any source data, including source classification columns, was left as-is. The surface type variable, if included, was standardized to paved or unpaved. Where lane width data was available, these were converted to a standard unit of meters.

Validation

The data were subject to several rounds of validation. First, internal checks included searching for Google Street View imagery along at least one segment of each route classification for each municipality, as described in the previous section. Geographic validation ensured data fell within Canada's spatial boundaries and removed geometric duplicates. The data were validated against the 2019 PHAC dataset for comparison.

Finally, the data was reviewed by several external teams, including the original 2019 team at PHAC, members from Dr. Winter's CHART lab and teams at Housing, Infrastructure and Communities Canada (HICC). As a result of the consultations, several edge cases for infrastructure classification were revised.

3. Data overview

Geographic coverage

The cycling data spanned 158 Census subdivisions (CSDs) across Canada. The provinces with the highest number of CSDs covered were British Columbia, Ontario, and Quebec. The full breakdown of coverage by province is given in Table 3. It should be noted that since the data scope is not exhaustive, the percentage population covered does not represent that percentage of population in each province with access to bike infrastructure. Some municipalities may have contained bike infrastructure but did not make its data accessible via an open data portal.

Table 3. Count of data providers per province

Province/Territory	Number of data providers
Newfoundland and Labrador	1
Prince Edward Island	1
Nova Scotia	1
New Brunswick	3
Quebec	14
Ontario	27
Manitoba	1
Saskatchewan	2
Alberta	2
British Columbia	21
Yukon	1
Northwest Territories	1
Nunavut	0
Canada Total	**75**

National overview

Across the 75 municipalities, a total of 18,700 km of cycling infrastructure was mapped, with 12,407 km meeting criteria for classification under Can-BICS. The most common Can-BICS facility type was multi-use path, which accounted for 27% of the reported cycle infrastructure, followed by painted bike lanes which covered 26%. The least common categories were local street bikeways (3%) and bike paths (4%). In total, high comfort bike facilities accounted for 13% of all infrastructure (Table 2. Description of Can-BICS Categories.).

Comparison across municipalities

The municipalities with the highest length of high comfort infrastructure (cycle tracks, bike paths and local street bikeways) were Montréal (360 km), Vancouver (246 km), Edmonton (226 km), Québec (190 km), and Oakville (121 km).

When accounting for population, the municipalities with the highest amount of high comfort infrastructure per 100,000 citizens were Senneville (Montréal CMA, 751 km per 100,000), Sainte-Anne-de-Bellevue (Montréal CMA, 162 km per 100,000) and Baie-D'Urfé (Montréal CMA, 117 km per 100,000). Of the larger urban centres, Sherbrooke, Victoria, and Vancouver CSDs had the highest length of high comfort biking infrastructure per 100,000, at 63km, 38km and 37km respectively.

Additional variables

Source datasets sometimes included additional variables beyond infrastructure classifications. The most common of these were surface material type (found in 20/75 datasets) and lane width

(found in 9/75 datasets). Two municipalities provided secondary information about the type of barrier used to separated bikeways from road traffic, such as flex posts, concrete bollards, and curbs.

4. Limitations

Geographic coverage and data availability

The Canadian Cycling Network Database does not offer exhaustive coverage of Canada's cycle infrastructure – it reflects availability of open data through municipal portals. Municipal data can be complimented by other data sources, such as OpenStreetMap, to provides more extensive coverage across Canada.

Open data offerings have expanded significantly across Canada in the past five years, resulting in the addition of 49 new municipal data sources since the initial work carried out by PHAC in 2019. However, the availability of open data was uneven across provinces, with Ontario, British Columbia and Quebec having the highest number of providers.

Using open data presented some challenges – data exploration to search open data portals is time-consuming, and open data portals differ in their usability. Municipalities referred to their cycling datasets using a variety of terms, which required multiple searches to find (e.g., bikeways, cycle network, bike lanes, active transport, bike infrastructure, etc.).

Challenges applying the classification to municipal data

Overall, Can-BICS categories mapped well onto the terms used by municipalities and provided an important lens to distinguish low safety and comfort infrastructure from high. However, converting from municipal to Can-BICS classifications presented some challenges where municipal definitions did not always line up perfectly with Can-BICS. Noted below are some issues identified with the dataset classification.

Local street bikeways

Local street bikeways may be underrepresented in our classification of municipal data. Cities such as Montreal were known to have infrastructure that satisfied requirements for local street bikeways, but the data did not allow us to distinguish them from painted bike lanes or shared roads. Therefore some routes were likely misclassified as shared roads or painted bike lanes rather than local street bikeways.

In other cities, labels were present such as "neighbourhood greenways", but upon inspection in recent Google Street View imagery it was not clear whether the traffic calming, signage or safe crossing conditions for local street bikeways were being met. Analysis could be improved by using other data sources such as Open Street Map to identify road speeds and presence of traffic calming measures.

Cycle tracks and bike paths

The terms cycle track and bike path were conflated by some municipalities to describe cycling infrastructure that was protected from vehicle traffic, whether on-street or off-street. For some cities, such as Quebec, both were placed under the same category. The figures between these variables may change with further work, but the total length of high comfort infrastructure would not be affected by this distinction.

In addition, bike paths may be underrepresented since it some cases municipal definitions conflated gravel trails with paved bike-only paths. In these cases, the lower comfort Can-BICS category was used. Further inspection of surface material variables where available could assist with improved identification.

5. Conclusions

Mapping Canadian bikeways using a single classification system such as Can-BICS can help municipalities and federal agencies support Canadians in their access to safe and equitable active transportation infrastructure, by prioritizing higher safety and comfort bikeways. The extent of a city's network can shift significantly when viewed through the lens of high and low comfort infrastructure.

As cycle network data become more commonly released to the public, compiling available datasets on a regular basis allows for a greater understanding of changing bike infrastructure over time. The UDL team will look further into consulting municipalities on whether a wider system such as Can-BICS could help to meet individual classification needs. Cycling infrastructure is a dynamic area of open data, with many possibilities for further analysis of infrastructure type and usage.

Note to readers

The Canadian Cycling Network Database was made possible by the ongoing efforts of organizations that produce and maintain open data and by the cooperation of organizations that have either given permission to include their publicly available data or directly provided their data for release as open data. The contribution and assistance of these organizations are gratefully acknowledged.

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- Supported by: Housing, Infrastructure and Communities Canada (HICC), Public Health Agency of Canada (PHAC), Cities, Health, and Active Transportation Research Lab (CHATR)

Contact information

Feedback is welcomed on the Bikeways Canada dataset. For more information, or to enquire about the concepts, methods or data quality of this release, contact us (toll-free **1-800-263-1136**; **514-283-8300**; infostats@statcan.gc.ca) or Media Relations (statcan.mediahotline-ligneinfomedias.statcan@statcan.gc.ca).

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