

Parking Classification and Supply Modelling for Inter-Regional Truck Trips

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Objectives

1. A **classification scheme** for truck parking locations.
2. A **systematic approach** to apply the classification using available geospatial data.
3. A **model to estimate the truck parking** spaces in transportation analysis zones (TAZ).

Rationale

- A **lack of safe and legal truck parking** is considered as a major issue in the freight transportation industry.
- **Hours-of-service (HOS)** and **electronic logging device (ELD)** mandates, implemented to reduce fatigue, can force drivers to choose between parking illegally or driving longer than allowed.
- It is important to quantitatively **assess the locations** and extent of any truck parking deficiencies.

Truck Parking Classification Scheme

Table 1: Nine Proposed Truck Parking Classifications

Category	Description
Public Rest Areas and Gas Stations	Legal, publicly accessible locations designated as rest areas or gas stations
Weigh Stations	Legal locations where parking is available adjacent to weigh station infrastructure
Publicly Accessible Truck Parking	Legal, publicly accessible firm locations identified as logistics and warehousing facilities
Privately Accessible Truck Parking	Firm locations that will typically restrict access to authorized vehicles only
Legal Roadside Parking	Locations where roadside parking is considered legal
Illegal Roadside Parking	Locations where roadside parking is not considered legal
Illegal Highway Ramp Parking	Highway entrance and exit ramps where parking is usually illegal
Illegal Parking on Public Property	Illegal, publicly owned locations for truck parking such as parks, airports, and conservation areas
Illegal Parking on Private Property	Illegal, privately owned locations where no trucks are allowed to park for extended periods

Truck Parking Supply Model

- After parcels for truck parking are identified and classified as per Table 1, there is a further need to determine the **number of parking spaces** available at a given location. This provides the total supply for parking by classification.
- A preliminary **negative binomial (NB) regression model** is used to avoid negative predicted values and complications from large variance. The number of spaces per parcel represents the dependent variable.
- Results are shown in Figure 2 after creating a density map of parking spaces from the model results.

Table 2: Negative Binomial Model to Predict Truck Parking Supply

Variable	Description	β	SE	z	p
Intercept	Constant term for the NB model	1.47	0.36	4.10	<0.001***
Area _{paved,i}	Area of pavement in parcel <i>i</i> (10 ⁻⁶ m ²)	3.58	2.16	1.66	0.097*
Perimeter _i	Length of perimeter for parcel <i>i</i> (10 ⁻³ m)	1.80	0.63	2.85	0.004***
Class _{public,i}	1 if parcel <i>i</i> is classified as <i>Publicly Accessible Truck Parking</i> , 0 otherwise	0.99	0.44	2.23	0.026**
IND _{59,i}	1 if parcel <i>i</i> is associated with is classified as <i>Miscellaneous Retail (SIC59)</i> , 0 otherwise	-1.61	0.61	-2.64	0.008***
Rural _i	1 if parcel <i>i</i> is rural, 0 otherwise	-3.66	1.21	-3.02	0.003***
Perimeter _i × Rural _i	Interaction term of Perimeter _i and Rural _i	-1.60	0.92	-1.73	0.084*
	AIC	726			
	2LL	-710			

(***), (**), (*) represent statistical significance to 99%, 95%, or 90% respectively

Study Area: Region of Peel, Canada

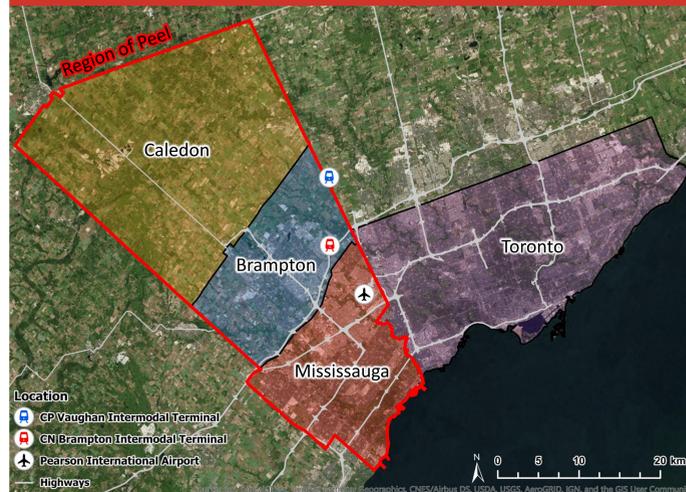


Figure 1: Key Features of the Region of Peel

Classification Approach

- **Tree-based stratification** is used to ensure classifications are practical and exhaustive.
- **Land parcels** with truck parking are identified using **GPS data** relating to the movement of Canadian-owned trucks.
- Parcels are then categorized based on geometric, land classification, firmographic, and enforcement variables.

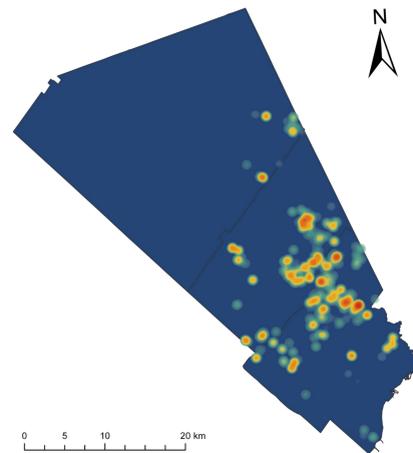


Figure 2: Truck Parking Space Hotspots in the Region of Peel

Conclusion and Recommendations

- Neglecting some categories of viable parking locations can lead to an underestimate of the available truck parking supply.
- An analysis of current or future potential parking shortages can be examined when combined with a suitable **model of parking demand**.
- This research is an important area for transportation policy due to the **safety, economic, and environmental implications** of inadequate truck parking capacity.
- The type of **accessibility** (public or private) for a location is currently difficult to establish without manual verification. Industry type is currently being considered as a practical replacement that is easier to reproduce.
- Further analysis can work to improve the **predictive accuracy** of the supply model.
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