Royal Roads
UNIVERSITY

2024 Commuter Count and Mode Split Study

Royal Roads University
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Prepared by Todd Thexton
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Executive summary

Royal Roads University has committed to reducing its Scope 3 emissions by 50% by 2030. As part of that commitment, the university's Climate Action Plan identifies the need to "prioritize, measure and publicly report on a preliminary set of scope 3 emissions: 1) business travel, 2) commuter travel (employees and students), 3) waste, 4) food, and 5) embodied energy in new building materials."[1] (p. 39) The Commuter Count and Mode Split Survey contributes to that goal by estimating greenhouse gas emissions generated by employees, students, and visitors commuting to the campus.

The commuter count and survey were conducted during the mornings of October 1 – 3, 2024 with the support of research assistants from the Bachelor of Business Administration program at Royal Roads University. Each morning, observers counted the number of people arriving on campus and categorized each arrival according to the mode of transportation used.

Over the three days, 1,499 arrivals were counted—a decline of 13.3% from the previous commuter count in 2018. Among those arrivals, there was a notable decrease in the proportion of commuters arriving by private vehicle. The mode share for single occupant vehicles declined from 57.9% in 2018 to 42.4%, and the share for multi-occupant vehicle declined from 21% to 18%. Conversely, since 2018, the mode share for public transit increased from 8.1% to 22.5%, for bicycles from 2.3% to 5.2%, and for pedestrians from 10.7% to 11.5%.

While the direction of these mode share trends is largely consistent with regional trends reported in the Capital Regional District's 2022 origin-destination household travel survey,[2] the magnitude of the decrease in RRU auto drivers is much greater. And the substantial increase in RRU commuters' transit use contrasts with a slight decline in regional transit use.

The commuter survey solicited details from volunteer participants regarding their commuting mode, the make, model, year, and fuel type of their vehicle (if they commuted in a private vehicle), and the distance of their round-trip commute. Those details enabled an estimate of annual commuter-related greenhouse gas (GHG) emissions. Total annual GHG emissions for the morning commute were estimated at 570 tonnes CO2-eq. Of that total, 262.3 tonnes are attributed to employees (staff and faculty), 131.7 tonnes to students, and 176 tonnes to visitors.

This study confirms that employee, student, and visitor transportation to campus represents a significant contribution to the University's greenhouse gas emissions, equivalent to 80% of total 2023 scope 1 and 2

[1] Royal Roads University. (2022). *2022 – 2027 Climate Action Plan*. https://www.royalroads.ca/sites/default/files/2022-02/RRU_ClimateActionPlan_Full_Final_PagesWEB.pdf

[2] R.A. Malatest & Associates Ltd. & David Kriger Consultants Inc. (September 2023). *2022 Capital Regional District origin destination household travel survey: Final report*. p.113. https://www.crd.bc.ca/docs/default-source/regional-planning-pdf/transportation/crd-2022-origin-destination-household-travel-survey-report.pdf?sfvrsn=5aec13ce_1

emissions (720 tonnes CO_2-eq) reported by the University.[3] The University has implemented several policies intended to have a beneficial impact on commuter-related emissions, including flexible work options, enrollment in the BC Transit ProPass program, parking fee disincentives, installation of electric vehicle chargers and provision of end-of trip facilities for cyclists. However, further strategies will be required to achieve the Climate Action goal of 50% reduction by 2030.

[3] Royal Roads University. (May 2024). *2023 PSO climate change accountability report.* https://www.royalroads.ca/sites/default/files/2024-06/2023%20Climate%20Change%20Accountability%20Report_Final-Signed%20PT%20Esignature.pdf

Introduction

In Canada, personal vehicle transportation accounts for approximately 10% of our national greenhouse gas emissions.[4] In 2022, Royal Roads University committed to reducing its Scope 3 emissions (which includes employee, student and visitor commuting) by 50% by 2030 (from 2019 levels). In its 2022 – 2027 Climate Action Plan, the university identified the need to establish baseline Scope 3 emissions and to "prioritize, measure and publicly report on a preliminary set of scope 3 emissions," [5] (p. 39) including emissions related to commuter travel by employees and students.

The present study follows prior commuter mode split counts conducted at Royal Roads University in 2018 and 2013. While previous commuter counts have relied entirely on observational methods and have been limited to reporting on mode share only, the present study has also incorporated a commuter survey that has enabled an estimate of commuter-related greenhouse gas emissions. As such, the study provides a baseline for commuting emissions in accordance with the university's commitments on Scope 3 emissions.

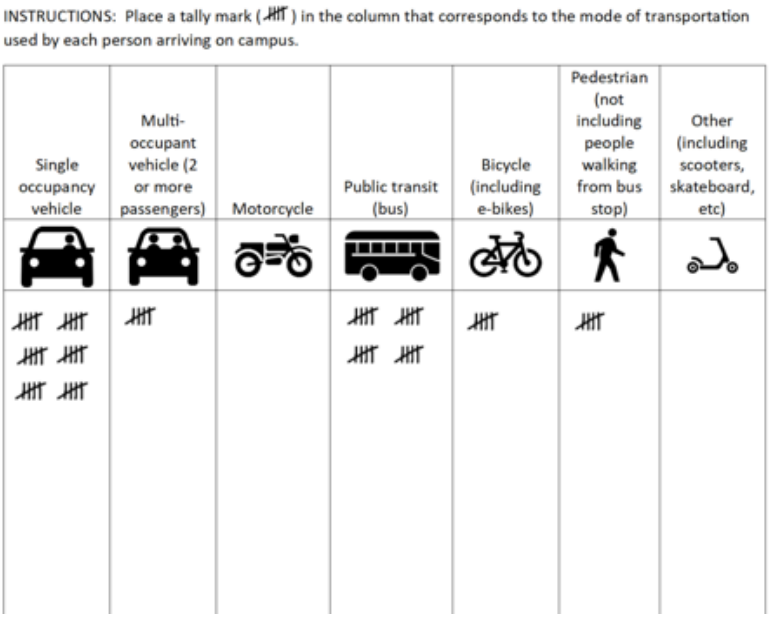
[4] Canadian Geographic. (n.d.). *Commuting challenge.* https://canadiangeographic.ca/wp-content/uploads/2023/08/CGEO-216_Challenge_1_Primer_Commuting_ENG_v1.3.pdf

[5] Royal Roads University. (2022). *2022 – 2027 Climate Action Plan*. https://www.royalroads.ca/sites/default/files/2022-02/RRU_ClimateActionPlan_Full_Final_PagesWEB.pdf

Methods

The observation station was located at the intersection of University Drive and West Campus Road. Three observers classified and counted the transportation mode of each individual arriving on campus between the hours of 7:45 AM and 9:45 AM for three consecutive days--October 1 – 3, 2024 (see Figure 1). Individuals arriving by foot along University Drive were asked if they had arrived by bus or as pedestrians to correctly classify those who had arrived by bus at the Sooke Road at Aldeane east- and west-bound bus stops.

Figure 1
Sample data collection form for observations



INSTRUCTIONS: Place a tally mark (𝍸) in the column that corresponds to the mode of transportation used by each person arriving on campus.

Single occupancy vehicle	Multi-occupant vehicle (2 or more passengers)	Motorcycle	Public transit (bus)	Bicycle (including e-bikes)	Pedestrian (not including people walking from bus stop)	Other (including scooters, skateboard, etc)
𝍸 𝍸 𝍸 𝍸 𝍸 𝍸	𝍸		𝍸 𝍸 𝍸 𝍸	𝍸	𝍸	

In addition, survey stations were established adjacent to the upper, central, and west parking lots (see Figure 2). Surveyors invited commuters to provide additional information regarding their commute by completing a paper survey.[6] If a commuter did not have sufficient time to complete the paper survey, they were provided with a QR code linked to an online version of the survey that could be completed at a more convenient time.

[6] The research and survey were reviewed and approved by Royal Roads University's Research Ethics Board. See Appendix A for the text of the survey.

Figure 2

Observation and survey station locations

The survey stations also served as information booths. Commuters were offered the opportunity to estimate their commuting-related emissions using a search tool based on the Natural Resources Canada's *Fuel consumption ratings search tool*[7]

Survey responses were used to estimate the carbon footprint of each survey participant's commute. Survey respondents were asked to provide the postal code associated with the origin of their trip. A smartphone app was used to estimate the return trip distance from the postal code area to RRU. Respondents also provided information regarding the transportation mode and—for private automobiles—the class, year, and fuel type of their vehicle. Emissions factors were calculated using the average emissions for each class, year, and fuel type, based on Natural Resources Canada's (NRC) *Fuel Consumption Ratings Search Tool*.[8]

For battery electric and plug-in hybrid vehicles, the Consumption L_E/100 km value provided by the NRC was converted to equivalent kWh/km[9] and then multiplied by the emissions intensity factor per kWh for

[7] Natural Resources Canada. (2024). Fuel consumption ratings search tool. https://fcr-ccc.nrcan-rncan.gc.ca/en

[8] Natural Resources Canada. (2024). Fuel consumption ratings search tool. https://fcr-ccc.nrcan-rncan.gc.ca/en

[9] Natural Resources Canada. (2023). *Understanding the tables.* https://natural-resources.canada.ca/energy-efficiency/transportation-alternative-fuels/personal-vehicles/choosing-right-vehicle/buying-electric-vehicle/understanding-the-tables/21383?_gl=1%2A19hhmgn%2A_ga%2AMjA0NTEzNzU0OC4xNzI1NTg1MTYw%2A_ga_C2N57Y7DX5%2AMTcyNTU4NTE2MC4xLjAuMTcyNTU4NTE2MC4wLjAuMA..

grid-connected electricity in British Columbia[10]. For plug-in hybrid electric vehicles, the value for *Consumption L_E/100 km* was taken from the combined electricity/fuel consumption estimate provided by NRC.

$$Emissions\ factor\ = \frac{L_E/_{100km}}{100} \times \frac{8.9\ kWh}{L_{gasoline}} \times \frac{11.3g\ CO2 - eq}{kWh}$$

For busses, the emissions factor was based on B.C. Ministry of Environment and Climate Change Strategy's *2023 B.C. best practices methodology for quantifying greenhouse gas emissions* (101.6 g CO_2-eq/passenger/km).[11] Emissions related to multi-occupant vehicles were allocated equally to two passenger arrivals (0.5 X emissions factor/arrival), following the convention used for the 2018 RRU Mode Split Count. E-bicycles were treated as "zero-emissions" vehicles since they consume only 6.8Wh/km of electricity and are responsible for only 0.078 grams CO_2-eq emissions/km.

Emissions per round trip were calculated by multiplying trip distance times the applicable emissions factor.

As per GHG Protocol guidance[12], this report tracked transportation emissions as either *Employee Commuter* (for staff and faculty) or, for students and visitors, as *Downstream Transportation and Logistics* since these emissions are generated by users of the services (educational, cultural, recreational) provided by the university and its campus.

[10] Province of British Columbia. (2024). Electricity emission intensity factors for grid-connected entities. https://www2.gov.bc.ca/gov/content/environment/climate-change/industry/reporting/quantify/electricity

[11] B.C. Ministry of Environment and Climate Change Strategy. (2023). 2023 B.C. best practices methodology for quantifying greenhouse gas emissions. https://www2.gov.bc.ca/assets/gov/environment/climate-change/cng/methodology/2023_pso_methodology_for_quantifying_greenhouse_gas_emissions.pdf

[12] Greenhouse Gas Protocol. (n.d.). *Technical guidance for calculating Scope 3 emissions.* https://ghgprotocol.org/sites/default/files/2023-03/Scope3_Calculation_Guidance_0%5B1%5D.pdf

Results

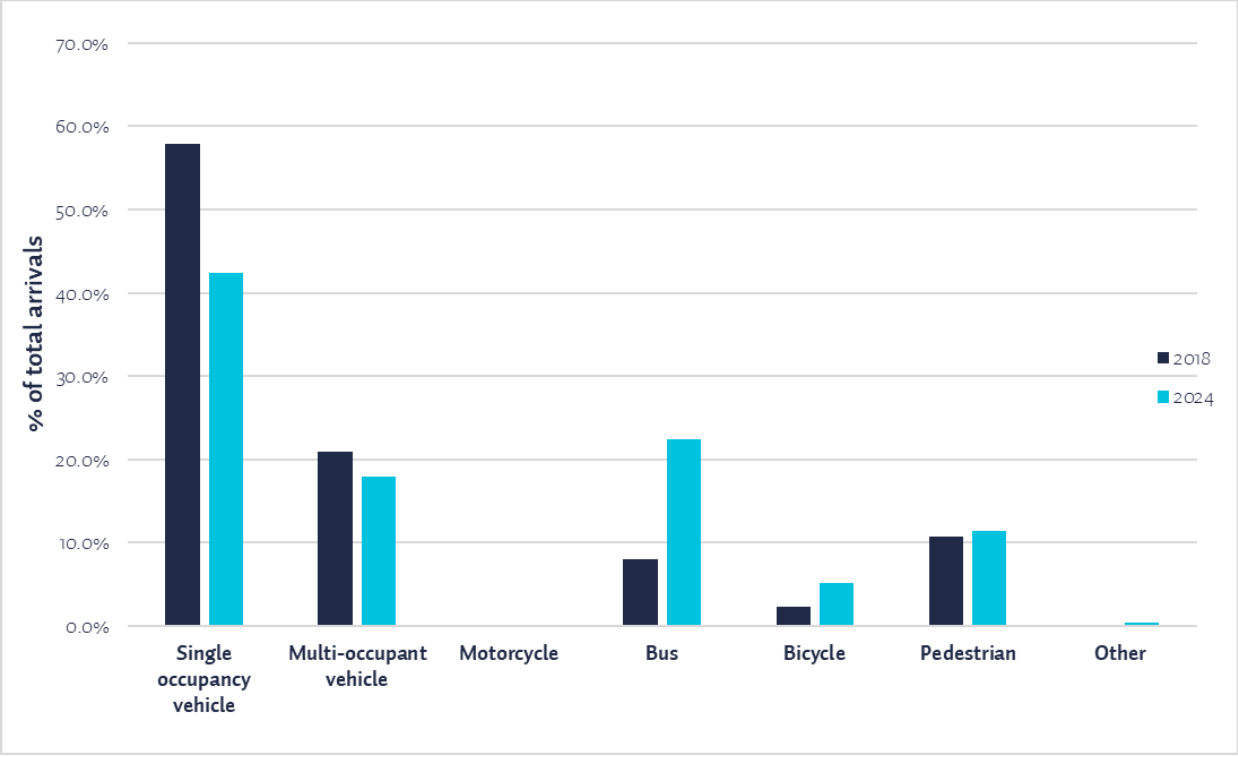
Commuter Mode Split

In total, 1,499 arrivals were observed over the three days of the mode split count. Compared to the previous mode-split survey conducted in 2018, the overall number of arrivals decreased by 13.3% from 577 to 500 arrivals per morning. This is consistent with regional reductions in trip rates reported in the 2022 Capital Regional District Origin-Destination Household Travel Survey Final Report,[13] which found a 10% decrease in daily trips and a 17% decrease in daily trips/person between 2017 and 2022.

Most commuters arrived on campus by single occupancy vehicle (42.4%), followed by public transit (22.5%), multi-occupant vehicles (18.0%)[14], and walking (11.5%). These mode shares represent significant changes in transportation mode since the 2018 RRU commuter count. Single occupancy vehicle arrivals decreased substantially from 58% of arrivals in 2018 to 42.4% of arrivals in 2024. Public transit use increased over the same period, from 8% in 2018 to 22.5% in 2024. Figure 3 illustrates the 2018 and 2024 mode share for RRU commuters.

Figure 3

Commuter mode shares: 2018 and 2024



[13] R.A. Malatest & Associates Ltd. & David Kriger Consultants Inc. (September 2023). *2022 Capital Regional District origin destination household travel survey: Final report*. p.113. https://www.crd.bc.ca/docs/default-source/regional-planning-pdf/transportation/crd-2022-origin-destination-household-travel-survey-report.pdf?sfvrsn=5aec13ce_1

[14] Following the convention used in the 2018 RRU mode split count, each multi-occupant vehicle (MOV) was counted as two individual arrivals, based on the minimum number of riders in a MOV.

Compared to regional and local averages, RRU commuters were less likely to arrive by auto driver trip (51.4%) than the regional (54%) and Westshore mode share (63.9%). The transit mode share for RRU commuters (22.5%) is greater than the average regional and local mode share (6.5% and 3.1% respectively), though this likely reflects higher transit mode share reported by post-secondary students throughout the region. Regionally, within CRD, 42% of post-secondary students use public transit to commute to college or university.[15,]

While mostly following the same direction as regional trends, changes in mode shift are much more pron0unced among RRU commuters compared to CRD travellers. Auto driver trips[16] among RRU commuters fell by 24% between 2018 and 2024, compared to a 3.6% decline among CRD travellers from 2017 to 2022. Bicycle trips among RRU commuters increased by 126% since the last mode split count, compared to a 60% increase in the regional count. Transit use among RRU commuters increased by 177.8% since 2018, while regional transit use decreased by 14.4%.[17]

Table 1 provides a comparison of RRU mode shares and mode share changes with regional and local values.

Table 1
Comparison with regional averages

	% of total trips		% of total trips (% change in total trips)		
	CRD 2017	**RRU 2018**	**CRD 2022**	**Westshore 2022**	**RRU 2024**
Auto driver[18]	56%	68.4%	54% (-3.6%)	63.9%	51.4% (-24%)
Transit	7%	8.1%	6% (-14.3%)	3.1%	22.5% (+177.8%)
Bicycle	5%	2.3%	8% (+60%)	3.2%	5.2% (+126.1%)
Walk	14%	10.7%	15% (+7.1%)	7.1%	11.5% (+7.5%)

Though the reason for the changes observed since 2018 were not explored in this research, the changes are consistent with recent RRU policy changes enabling greater work-at-home options for staff and disincentivizing private vehicle use through higher parking fees.[19]

[15] R.A. Malatest & Associates Ltd. & David Kriger Consultants Inc. (September 2023). 2022 Capital Regional District origin destination household travel survey: Final report. https://www.crd.bc.ca/docs/default-source/regional-planning-pdf/transportation/crd-2022-origin-destination-household-travel-survey-report.pdf?sfvrsn=5aec13ce_1

[16] Includes drivers of both single- and multi-occupant automobiles

[17] However, the most recent CRD travel survey was conducted by some COVID-19 anxiety may still have been present among travelers

[18] Includes drivers of both single- and multi-occupant vehicles

[19] Costs of operating a vehicle may also be a factor. Ratehub estimates that the total cost of ownership for a car in Canada is $1,387/month (Ratehub.ca. (2024). *What is the total cost of ownership for a car?* https://www.ratehub.ca/blog/what-is-the-total-cost-of-owning-a-car/)

Survey results

In total, 259 surveys were completed, representing a return rate of 17.3% of arrivals for the three-day period. Response rates were highest among those arriving by single-occupant vehicle (20.3%) and lowest among those arriving in multi-occupant vehicle (9.3%). Table 2 reports the number of surveys returned for four arrival categories, compared to the total number of arrivals observed for each category.

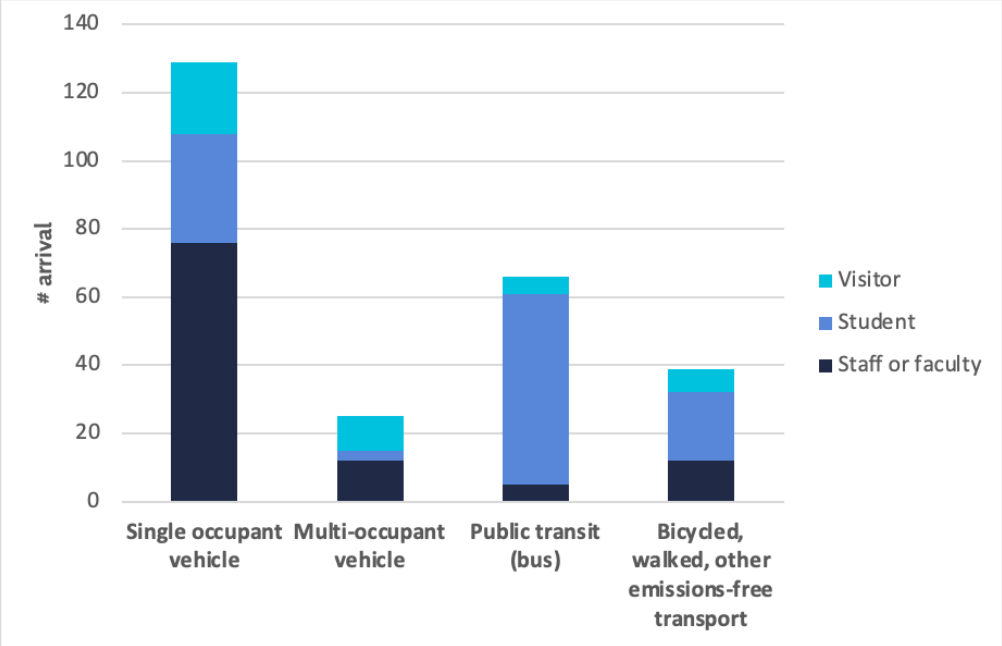
Table 2
Survey return rate

Arrival mode	Surveys returned	Total Arrivals	Survey return rate (%)
Travelled alone by automobile (car, truck, station wagon, van)	129	637	20.3%
Carpooled with at least one other person by automobile (car, truck, station wagon, van)	25	270	9.3%
Public transit (bus)	66	337	19.6%
Bicycled (including e-bike), walked, or used another form of transportation (e.g., scooter, skateboard)	39	255	15.3%
Total	**259**	**1499**	**17.3%**

The survey results reveal significant differences in transportation mode used by staff and faculty versus students (see Figure 4). Staff and faculty represent most arrivals by single occupant vehicle (59%), while students represent most arrivals by public transit (bus) (85%). Seventy-two percent of staff and faculty surveyed reported arriving by single-occupant vehicle, compared to 29% of students. Alternately, 50% of students arrived by public transit, compared to 5% of staff and faculty.

Figure 4

Mode frequency by commuter group



Survey responses were used to estimate greenhouse gas emissions for each participant. Round trip commuting distances and emissions factors (see *Methods*, above) were used to calculate average per trip carbon footprints for the three commuter groups and for four commuter modes. Results are presented in Table 3, below. Average round trip emissions for single occupant vehicle ranged from 7.26 – 7.41 kg CO2-eq, for multi-occupant vehicles from 1.60 – 4.67 kg CO2-eq, and for public transit between 2.00 – 6.14 kg CO2-eq.

Of note, round-trip distances for zero-emissions commuters (pedestrians, cyclists, scooters, and skateboards) are only one third of those for other commuters. The average one-way distance for cyclists, pedestrians, and other zero-emissions commuters is 5.37 km, compared to an average one-way distance of 14.84 km for all other commuters. This may suggest that commuting distance is an important predictor of commuting transportation mode to the university. While a trip from Oak Bay to RRU may take 49 minutes by automobile, bussing may add 8 – 10 minutes to the trip, while cycling may take up to 70 minutes.[20]

[20] Google Maps. (2024). *Directions*. https://www.google.com/maps/dir//

Table 3

Average total emissions per commuter per day

Travel mode	Commuter group	Average daily round-trip distance (km)	Average emissions factor (kg CO_2/km)	Average total emission (kg CO_2)/commuter/ day
Single occupant vehicle 	Staff or faculty	34.6	.2142	7.41
	Student	32.1	.2261	7.26
	Visitor	30.0	.2456	7.36
Multi-occupant vehicle 	Staff or faculty	18.8	0.085	1.60
	Student	38.0	0.123	4.67
	Visitor	39.4	0.102	4.02
Public transit (bus) 	Staff or faculty	34.8	.1016	3.54
	Student	19.6	.1016	2.00
	Visitor	60.4	.1016	6.14
Zero-emissions commuters 	Staff or faculty	17.0	0.0	0.0
	Student	7.0	0.0	0.0
	Visitor	10.6	0.0	0.0

The 2022 *Capital Regional District Origin Destination Household Travel Survey: Final report* suggests that distances equal to or less than 1.6 km are "walkable", while those equal to or less than 4.6 km are "bike-able".[21] Of those living within a walkable distance (6.25% of all survey respondents), 68.75% walk or cycle to campus, while only 18.75% commute to campus in a private vehicle. However, of those living within a bike-able distance (25.8% of survey respondents), only 30.3% walk or cycle, while 37.9% commute to campus in a private vehicle.

If the mode split count represents a "typical" level and type of travel for the morning commute, and survey respondents were representative of all university commuters (with respect to type of vehicle, frequency of commute, and distance travelled), then these */commuter/day* values can be extrapolated to estimate total annual emissions from the morning commute.

Table 4 reports estimated annual emissions for travel to campus for each travel mode and commuter group. For the purposes of the estimate, 244 commuting days were used for staff, faculty and students

[21] R.A. Malatest & Associates Ltd. & David Kriger Consultants Inc. (September 2023). *2022 Capital Regional District origin destination household travel survey: Final report*. p.113. https://www.crd.bc.ca/docs/default-source/regional-planning-pdf/transportation/crd-2022-origin-destination-household-travel-survey-report.pdf?sfvrsn=5aec13ce_1

(total workdays/year minus statutory holidays and Christmas break) and 364 commuting days for visitors (based on days/year the Recreation Centre is open).

Table 4

Estimated annual emissions by travel mode and commuter group

Travel mode	Commuter group	Average total emission (kg CO_2)/ commuter/day	Average commuters/ morning	Estimated total annual emission (tonnes CO_2)[A]
Single occupant vehicle 	Staff or faculty	7.41	131	236.9
	Student	7.26	43	76.2
	Visitor	7.36	38	101.8
Multi-occupant vehicle 	Staff or faculty	1.60	45	17.6
	Student	4.67	8	9.1
	Visitor	4.02	37	54.1
Public transit (bus) 	Staff or faculty	3.54	9	7.8
	Student	2.00	95	46.4
	Visitor	6.14	9	20.1
Zero-emissions commuters 	Staff or faculty	0.0	26	0.0
	Student	0.0	44	0.0
	Visitor	0.0	15	0.0
Total			Scope 3.7 Employee Commuting[B]	262.3
			Scope 3.9 Downstream Transportation and Distribution[C]	307.7
			All	570.0

NOTES:

[A]Assuming 244 commuting days for staff, faculty, and students (total annual weekdays minus statutory holidays and Christmas closure) and 364 commuting days for visitors (annual operating days for Recreation Centre)

[B]Includes staff and faculty only

[C]Includes students and visitors

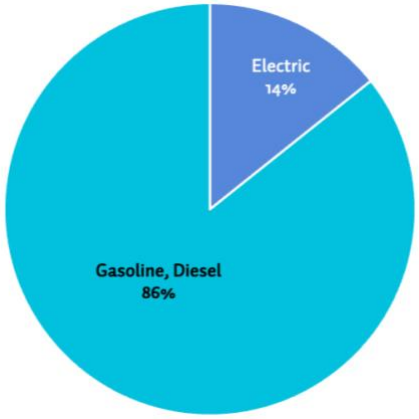
Total annual emissions from the morning commute are estimated at 570 tonnes CO2-eq/year—nearly 80% of the university's total scope 1 and 2 emissions for 2023.[22] Of that 570 tonnes, 262.3 tonnes CO2-eq are allocated to Scope 3.7 *Employee Commuter* emissions. The remaining 307.7 tonnes CO2-eq are allocated to Scope 3.9 *Downstream Transportation and Logistics* (per GHG Protocol guidelines[23]), since they are generated by users of the services (educational, cultural, recreational) provided by the university and its campus.

Electric Vehicles

Electric vehicle use by Royal Roads University faculty, staff, students, and visitors currently exceeds the provincial average. In 2023, battery electric vehicles (BEV) comprised 2.7% of total vehicle registrations in British Columbia,[24] while 14.3% of the vehicles arriving at Royal Roads University during the morning commute were reported as BEVs. The proportion of EVs commuting to RRU also exceeds the 8.4% regional average private vehicle stock of electric vehicles (hybrid – 3.4%, plug-in hybrid – 0.8%, and battery-electric – 4.3%).[25]

The BEV fleet in B.C. is growing rapidly. BEVs represented 16.8% of all new vehicle registrations in BC in the second quarter of 2024.[26] Royal Roads University currently has 24 electric vehicle charging stations at various locations across campus.[27]

Figure 5
Vehicles by fuel type: RRU employee commuter



[22] Royal Roads University. (2024). *Climate Action Plan Report*. https://www.royalroads.ca/sites/default/files/2024-07/rru_climate_action_plan_report_june_2024_0.pdf

[23] Greenhouse Gas Protocol. (n.d.). *Technical guidance for calculating Scope 3 emissions.* https://ghgprotocol.org/sites/default/files/2023-03/Scope3_Calculation_Guidance_0%5B1%5D.pdf

[24] Statistics Canada. (2024). *Table 23-10-0308-01 Vehicle registrations, by type of vehicle and fuel type*

[25] R.A. Malatest & Associates Ltd. & David Kriger Consultants Inc. (September 2023). *2022 Capital Regional District origin destination household travel survey: Final report.* https://www.crd.bc.ca/docs/default-source/regional-planning-pdf/transportation/crd-2022-origin-destination-household-travel-survey-report.pdf?sfvrsn=5aec13ce_1

[26] S&P Global mobility. (2024). *Canadian automotive insights: Q2 – 2024*.

[27] Royal Roads University. (2024). *Parking at RRU.* https://www.royalroads.ca/parking

Limitations

There are several limitations to the present study that may have influenced the results:

1. Non-representative sample period for observations. Observations were made mid-week (Tuesday – Thursday) during the morning commute period (7:45 – 9:45 AM) during one week of October only. Actual commuter trips on Mondays and Fridays may be lower as employees attach flex days or remote work dates to the weekends. Some commuters may have arrived outside of the observation times (e.g., arrivals at noon for afternoon work only). And the actual number of commuters is likely to be highly variable at different times of year (e.g., during peak vacation periods, or at times of year during which there is a high concentration of student residencies).
2. Local traffic only. The observations and surveys were intended to capture local transportation patterns only and estimates of commuter emissions do not include those related to transportation to the Capital Regional District by out-of-town students and visitors. As such, the emissions reported here represent only a portion of the University's total Scope 3.9 *Downstream transportation and logistics* emissions.
3. Non-probability sample for surveys. The survey sample was comprised of volunteers and, as such, may not be representative of the actual population of commuters to Royal Roads. As such, conclusions reached by extrapolating their responses to the total commuter population (such as annual commuter emissions) should be interpreted with some caution.

Current emissions reductions strategies at Royal Roads University

Royal Roads University has several policies in place that contribute to reductions in commuter-based emissions:

1. Flexible work options. Flexible work options can contribute to a reduction in commuter trips. RRU's options for blended work, compressed work weeks, variable hours, and reduced work weeks[28] potentially reduce the number of trips per week made to campus by employees. reduction
2. Enrollment in the BC Transit ProPass Program. BC Transit provides unlimited travel passes to employees of enrolled organizations. The passes are purchased through employer facilitated payroll deductions at an annual rate that is $144.50 less than the cost of twelve monthly passes.[29] At the time of this travel study, there were 14 active ProPass holders by RRU staff.

[28] Royal Roads University. (n.d.). *Flexible work options.* https://ourpeople.royalroads.ca/employees/flexible-work/flexible-work-planning-guide/flexible-work-options

[29] BC Transit. (n.d.). *ProPass Transit Pass*. https://www.bctransit.com/victoria/fares/propass/

3. Automatic enrollment in the BC Transit UPass Program for full-time on-campus students (with "opt-in" option available to other students for a fee). This program provides unlimited, discounted transit travel passes to students at enrolled universities.[30]
4. End-of-trip facilities for cyclists. RRU provides bicycle racks outside of all buildings. Some of those racks are covered, and there is one repair station that includes tools and pumps. Shower facilities for bicycle commuters are available in the Recreation Centre and the Sequoia Building.[31]
5. Electric vehicle charging stations. There are currently 24 EV charging stations available on campus.[32] A fee of $0.2828/kWh is charged.
6. Increased parking rates. Royal Roads University substantially increased its parking fees beginning in 2023, with a subsequent increase in 2024. The increase "aligns with the principles and objectives of the University's Climate Action Plan."[33] The current annual parking fee is $320.[34]

Recommendations

In addition to continuing actions already underway to reduce commuter-related emissions, the university should implement several strategies:

Increase awareness of climate impacts of commuting

The GHG emissions of the average survey respondent who used a personal vehicle (SOV, MOV) to commute to the University were 0.823 tonnes CO_2-eq/yr. That represents nearly 25% of per capita annual emissions (3.2 tonnes) for Canadians.[35] Many members of the Royal Roads community may be unaware of the significant contribution to personal carbon footprints arising from commuting choices. Increasing awareness of this impact may motivate community members to explore lower impact commuting options.

[30] Royal Roads University. (n.d.) *Transit and U-Pass*. https://www.royalroads.ca/current-students/student-life/transit-u-pass

[31] Royal Roads University. (n.d.). *Getting to campus*. https://www.royalroads.ca/campus/about-campus/getting-campus

[32] Twyford, P. (March 5, 2024). 24 electric vehicle charging ports available on campus. *Crossroads*. https://ourpeople.royalroads.ca/crossroads/crossroads-news/24-electric-vehicle-charging-ports-available-campus

[33] Royal Roads University. (April 3, 2023). *New parking policy and rates effective May 1.* https://www.royalroads.ca/news/new-parking-policy-and-rates-effective-may-1

[34] Royal Roads University. (n.d.). *Parking rates effective July 30, 2024*. https://www.royalroads.ca/campus/campus-services-maps/parking/parking-rates-effective-july-30-2024

[34] Statistics Canada. (2023). *Canadian system of environmental–economic accounts: Energy use and greenhouse gas emissions, 2020.* The Daily. https://www150.statcan.gc.ca/n1/daily-quotidien/230216/dq230216f-eng.htm

Strategies for increasing awareness could include:

1. highlighting the carbon footprint of commuting in internal communications (e.g., via Crossroads) and/or providing a dedicated web page that provides information on commuter emissions and alternatives. Communications could also emphasize the health co-benefits of active transportation.
2. making the commuter emissions estimator (Microsoft Excel file) available to all faculty, staff, and students to enable them to accurately calculate the carbon footprint of their commute.
3. assessing commuter emissions more frequently and reporting findings in public and community reports (e.g., annual Climate Change Accountability reports and Climate Action Plan reports).
4. highlighting the issue at community events (e.g., Campus Conversation).
5. publicly reporting how increased parking fee revenues are being invested to promote zero- and low-carbon commuting.

Promoting active transportation for faculty, staff, and students living within 7 km of the campus.

Of the commuters surveyed, 7.3% reside within walking distance of campus (< 1.6 km), 27.8% within walking or cycling distance (<4.6 km), and half (50.2%) live within 7 km—a realistic distance for commuting by e-bike. For every 30% of commuters who live within walking or cycling distance and convert to active transportation for their commute, total commuter emissions would be reduced by 5%. For every 25% of those within a realistic distance for e-bike commuting who switch to active transportation, total commuter emissions would be reduced by 10%. Promoting active transportation for those who live within 7 km of campus has the potential to significantly reduce commuter emissions.

Strategies could include:

1. partnering with an e-bike distributor to provide discounts on e-bike rentals and purchases. In the UBC e-bike subsidy program, UBC provides subsidies up to $200 and the partnering e-bike vendor adds another 10% discount from purchase prices. Discounts are also available for e-bike rentals.[36, 37]
2. enabling faculty and staff to access their “wellness fund” to support the purchase of a bicycle, e-bike, or e-scooter. The UBC e-bike subsidy program allows faculty and employees to use their “personal spending account” (equivalent to the CUPE and RRUFA “wellness fund”) toward the purchase or rental of an e-bike.[38, 39]

[36] University of British Columbia. (n.d.). UBC e-bike subsidy program. https://planning.ubc.ca/e-bike-subsidy

[37] Zygg. (n.d.). UBC + Zygg: Subsidized subscriptions and purchases! https://www.ridezygg.com/ubc-subsidy

[38] University of British Columbia. (n.d.). UBC e-bike subsidy program. https://planning.ubc.ca/e-bike-subsidy

[39] Zygg. (n.d.). UBC + Zygg: Subsidized subscriptions and purchases! https://www.ridezygg.com/ubc-subsidy

3. enhancing existing end-of trip facilities by adding e-bike charging stations and bicycle lockers.

Promote low-emissions options for commuters living more than 7 km from the University

Half of those commuting to Royal Roads University live outside the range for which active transportation is a feasible option (i.e., > 7 km from the University). For those commuters, incentives to switch to lower-emissions options (electric vehicles, public transit, carpooling) are the most realistic solution. Those strategies could include:

1. providing incentives for Electric Vehicle ownership and use such as offering discounts on charging fees (RRU currently charges $0.2828/kWh[40], compared to residential tiered rates of $0.1097 - $0.1418[41]) or discounts on parking fees for EVs.
2. providing additional subsidies for BC Transit ProPass purchasers. The current cost to ProPass purchasers is approximately $950/year.[42] BC Transit reports that with a 50% employer-paid subsidy, 14% of employees will become transit users.[43]
3. deploying an "off-the-shelf" carpooling app for RRU employees and students. For example, for a cost of approximately US$800, the *Poola* app could be supported for up to 500 University users annually. The *Poola* app (and others like it) incorporate algorithms to match riders with rides, optimize trips, and incorporate flexible travel times.

Collaborate with BC Transit and local municipalities to improve services to and from the University

Royal Roads University employees and students are dispersed across a large geographic area. In some cases, public transit options to and from the university are limited and/or impractical with trip times that are more than twice the travel time with a private vehicle. Engaging in collaboration with BC Transit may support improved services in the long-term.

Offsetting emissions from commuting

BC's Carbon Neutral program does not require the university to offset emissions associated with scope 3. However, the University may request that the Province of BC's Ministry of Environment and Climate Change Strategy retire offsets equivalent to its commuter emissions. At 2023 prices, offsetting RRU's 570 tonnes of commuter-related emissions would cost $14,250. RRU could offset its emissions through a recognized third-party organization or allocate the amount to a dedicated and ongoing alternative transportation program.

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[40] Royal Roads University. (n.d.). *Parking rates effective July 30, 2024*. https://www.royalroads.ca/campus/campus-services-maps/parking/parking-rates-effective-july-30-2024

[41] B.C. Hydro. (n.d.). *Residential tiered rate*. https://app.bchydro.com/accounts-billing/rates-energy-use/electricity-rates/residential-rates/tiered.html

[42] Royal Roads University. (n.d.). *RRU ProPass.* https://ourpeople.royalroads.ca/services/perks-discounts/rru-propass

[43] BC Transit. (n.d.). *ProPass Transit Pass*. https://www.bctransit.com/victoria/fares/propass/

Conclusions

The 2024 mode-split count and commuter survey suggests that commuter-related emissions have likely decreased since 2018 as a function of lower volumes of morning commuters and a shift in transportation mode away from single-occupant vehicles to lower emissions options (especially public transit). There are many factors that may have contributed to this decrease, including inflation, behaviour changes since the COVID-19 pandemic, and the higher costs of operating a vehicle in 2024. The decrease in single-occupant vehicle use is also compatible with the outcomes expected from recent policy changes related to working from home and parking fees.

Many Royal Roads University commuters signal a concern for their greenhouse gas emissions. Seventeen percent of morning commuters arrived at campus via a zero-emissions mode of transportation (bicycle, e-bicycle, walking, scooter, skateboard). Furthermore, 14.3% of automobile commuters arrived in battery electric vehicles.

Despite the apparent reduction since 2018, emissions related to the morning commute remain a significant contributor to the university's overall carbon footprint, with estimated emissions contributing 570 tonnes of CO_2-eq per year. Single occupant vehicles remain the most-used transportation mode for RRU's morning commuters. That may be, in part, due to the lengthy distances traveled by many commuters. If so, reducing commuter emissions may remain a challenging task without significant public investment in local infrastructure (e.g., housing near the campus, improved transit routes or modes). Financial incentives that may encourage lower emissions commutes include: free EV charging, loans and/or grants for EV, e-bike, and bicycle purchases, and subsidized public transit. Existing policies related to flexible work arrangements and parking fees may already be creating incentives aligned with the university's emissions reduction goals.

References

B.C. Hydro. (n.d.). *Residential tiered rate*. https://app.bchydro.com/accounts-billing/rates-energy-use/electricity-rates/residential-rates/tiered.html

B.C. Ministry of Environment and Climate Change Strategy. (2023). 2023 B.C. best practices methodology for quantifying greenhouse gas emissions. https://www2.gov.bc.ca/assets/gov/environment/climate-change/cng/methodology/2023_pso_methodology_for_quantifying_greenhouse_gas_emissions.pdf

BC Transit. (n.d.). *ProPass Transit Pass*. https://www.bctransit.com/victoria/fares/propass/

Canadian Geographic. (n.d.). *Commuting challenge.* https://canadiangeographic.ca/wp-content/uploads/2023/08/CGEO-216_Challenge_1_Primer_Commuting_ENG_v1.3.pdf

Google Maps. (2024). *Directions*. https://www.google.com/maps/dir//

Greenhouse Gas Protocol. (n.d.). *Technical guidance for calculating Scope 3 emissions.* https://ghgprotocol.org/sites/default/files/2023-03/Scope3_Calculation_Guidance_0%5B1%5D.pdf

Natural Resources Canada. (2023). *Understanding the tables.* https://natural-resources.canada.ca/energy-efficiency/transportation-alternative-fuels/personal-vehicles/choosing-right-vehicle/buying-electric-vehicle/understanding-the-tables/21383?_gl=1%2A19hhmgn%2A_ga%2AMjA0NTEzNzU0OC4xNzI1NTg1MTYw%2A_ga_C2N57Y7DX5%2AMTcyNTU4NTE2MC4xLjAuMTcyNTU4NTE2MC4wLjAuMA..

Natural Resources Canada. (2024). Fuel consumption ratings search tool. https://fcr-ccc.nrcan-rncan.gc.ca/en

Province of British Columbia. (2024). Electricity emission intensity factors for grid-connected entities. https://www2.gov.bc.ca/gov/content/environment/climate-change/industry/reporting/quantify/electricity

R.A. Malatest & Associates Ltd. & David Kriger Consultants Inc. (September 2023). *2022 Capital Regional District origin destination household travel survey: Final report*. p.113. https://www.crd.bc.ca/docs/default-source/regional-planning-pdf/transportation/crd-2022-origin-destination-household-travel-survey-report.pdf?sfvrsn=5aec13ce_1

Ratehub.ca. (2024). *What is the total cost of ownership for a car?* https://www.ratehub.ca/blog/what-is-the-total-cost-of-owning-a-car/

Royal Roads University. (n.d.). *Flexible work options.* https://ourpeople.royalroads.ca/employees/flexible-work/flexible-work-planning-guide/flexible-work-options

Royal Roads University. (n.d.). *Getting to campus*. https://www.royalroads.ca/campus/about-campus/getting-campus

Royal Roads University. (April 3, 2023). *New parking policy and rates effective May 1.* https://www.royalroads.ca/news/new-parking-policy-and-rates-effective-may-1

Royal Roads University. (n.d.). *Parking rates effective July 30, 2024*. https://www.royalroads.ca/campus/campus-services-maps/parking/parking-rates-effective-july-30-2024

Royal Roads University. (n.d.). *RRU ProPass.* https://ourpeople.royalroads.ca/services/perks-discounts/rru-propass

Royal Roads University. (n.d.) *Transit and U-Pass*. https://www.royalroads.ca/current-students/student-life/transit-u-pass

Royal Roads University. (2022). *2022 – 2027 Climate Action Plan*. https://www.royalroads.ca/sites/default/files/2022-02/RRU_ClimateActionPlan_Full_Final_PagesWEB.pdf

Royal Roads University. (May 2024). *2023 PSO climate change accountability report.* https://www.royalroads.ca/sites/default/files/2024-06/2023%20Climate%20Change%20Accountability%20Report_Final-Signed%20PT%20Esignature.pdf

Royal Roads University. (2024). *Climate Action Plan Report*. https://www.royalroads.ca/sites/default/files/2024-07/rru_climate_action_plan_report_june_2024_0.pdf

Royal Roads University. (2024). *Parking at RRU.* https://www.royalroads.ca/parking

S&P Global mobility. (2024). *Canadian automotive insights: Q2 – 2024*.

Statistics Canada. (2023). *Canadian system of environmental–economic accounts: Energy use and greenhouse gas emissions, 2020.* The Daily. https://www150.statcan.gc.ca/n1/daily-quotidien/230216/dq230216f-eng.htm

Statistics Canada. (2024). *Table 23-10-0308-01 Vehicle registrations, by type of vehicle and fuel type*

Twyford, P. (March 5, 2024). 24 electric vehicle charging ports available on campus. *Crossroads*. https://ourpeople.royalroads.ca/crossroads/crossroads-news/24-electric-vehicle-charging-ports-available-campus

University of British Columbia. (n.d.). UBC e-bike subsidy program. https://planning.ubc.ca/e-bike-subsidy

Zygg. (n.d.). UBC + Zygg: Subsidized subscriptions and purchases! https://www.ridezygg.com/ubc-subsidy

Appendix A: Commuter Survey

This survey is designed to help the university estimate the greenhouse gas emissions that are associated with students, staff, and faculty commuting to the campus. The survey is comprised of questions related to your commuting (your postal code; the class, year, and fuel type of your vehicle; your average number of commutes to university per week and per year).

The information that you provide is anonymous and confidential. You will not be asked anything that could be used to personally identify you. The data provided by all participants will be aggregated and summarized so that no individual responses can be identified.

The information obtained from the survey will be used to produce emissions estimates that may be publicly reported in the University's climate accountability reporting and/or in communications to the university community. The data you provide will not be used for any other purpose.

Data will be securely stored on Canadian servers for up to one year.

The survey is voluntary. You can decline to participate. Even if you start the survey and decide later that you no longer wish to participate, you can withdraw simply by closing the survey window in the browser. Unfortunately, once you have completed the survey, you will no longer be able to withdraw from the research, as we will no longer be able to determine which responses belong to you in order to delete those responses from the data.

Your consent is required in order to include your data in the research. You can choose whether or not to consent by selecting the appropriate button below and then clicking on the "Next" button.

1. Consent

    - ☐ Yes, I consent to participate
    - ☐ No, I do not consent to participate

2. Are you staff or faculty, a student, or a visitor?

- ☐ Staff or faculty
- ☐ Student
- ☐ Visitor

3. Please enter the postal code of the address from which you typically commute to RRU. (If you don't know the postal code, please enter the community/neighbourhood from which your typically commute)

4. What mode of transportation did you use to travel to campus today?

- ☐ Travelled alone by automobile (car, truck, station wagon, van)
- ☐ Carpooled with at least one other person by automobile (car, truck, station wagon, van)
- ☐ Traveled by motorcycle
- ☐ Public transit (bus)
- ☐ Bicycled (including e-bike), walked, or used another form of transportation (e.g., scooter, skateboard)

5. Is this your usual mode of transportation when traveling to campus?

- ☐ Yes
- ☐ No

6. If no, what is your usual mode of transportation?

- ☐ Drive alone by car
- ☐ Carpool
- ☐ Motorcycle
- ☐ Bicycle or e-bike
- ☐ Public transit (bus)
- ☐ Walking
- ☐ Other

7. What class of vehicle did you use to commute to campus today?

- ☐ Motorcycle
- ☐ Small car (two-seater, mini compact, subcompact, compact)
- ☐ Mid-size car
- ☐ Full-size car
- ☐ Small station wagon
- ☐ Mid-size station wagon
- ☐ Small pickup truck
- ☐ Standard pickup truck
- ☐ Small sport utility vehicle (SUV)
- ☐ Standard sport utility vehicle (SUV)
- ☐ Minivan
- ☐ Cargo van
- ☐ Passenger van
- ☐ Special purpose vehicle

8.In what year was your vehicle built?

9.What type of fuel does your vehicle use?

- ☐ Regular gasoline
- ☐ Premium gasoline
- ☐ Diesel
- ☐ Ethanol (E85)
- ☐ Electricity
- ☐ Natural gas

10.How many days per week on average do you commute to the university?

11.How many weeks per year do you commute to the university?